The East Lancashire Institute of Higher Education at Blackburn College

East Lancashire Research

2008

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http://www.east-lancashire-research.org.uk

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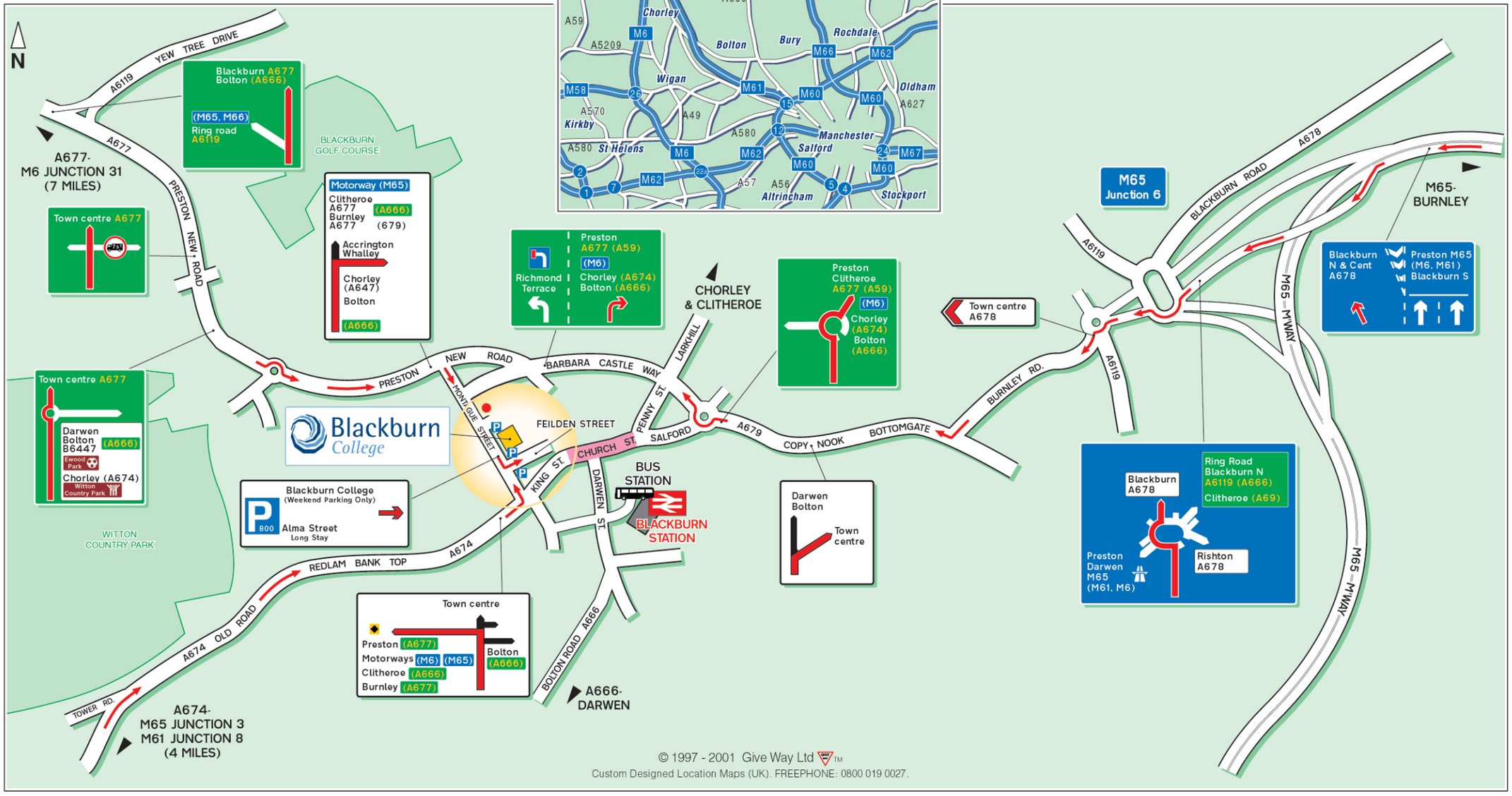

Foreword

I am delighted to announce the second edition of the *East Lancashire Research Journal* for the academic year 2007/2008. This Journal celebrates the research achievements of ELIHE staff and students, by publishing their journal, conference papers and other work as a series of Academic Reports. It is a pleasure to see an expansion of research activity at Blackburn College and the breadth of interest and commitment demonstrated by ELIHE staff in my first year as Dean.

Helen Mathers,

Dean of the East Lancashire Institute of Higher Education at Blackburn College.

www.elihe.ac.uk

Preface

This is the second annual East Lancashire Research Journal and is produced as a result of the coordination of research activity by the Research Committee within East Lancashire Institute of Higher Education (ELIHE). The document and the associated web site (www.east-lancashire-research.org.uk) are produced to disseminate research output within ELIHE and Blackburn College in particular as well as more widely to East Lancashire and beyond.

The Research Committee has four members, one appointed from each of the four main *Schools;* Trevor Green[1] of the *East Lancashire Business School*, Stephen Kirkup[2] of the *School of Science and Technology*, Stephen Pickles[3] of the *School of Arts, Humanities and Social Sciences* and Barry Powell[4] of the *School of Law, Health and Community Studies*. The Research Committee aims to support, promote and widen participation in research-related activities by ELIHE/ Blackburn College staff in particular and in East Lancashire in general.

The *Research Committee* has now organised six *Research Groups* within ELIHE:
1. *Criminology*, 2. *Engineering*, 3. *Sustainable Development*, 4. *Sociological*, 5. *Computing*, and 6. *Education*. Other ELIHE research themes include *Art and Design*, *Literature*, *Organisational Development*, *Human Rights*, *History* and *Knowledge/Information Management/Systems*.

I would like to thank my colleagues on the Research Committee - Barry, Trevor and Stephen – for our continued team work. I am grateful to those who have contributed to the sum of our research at ELIHE, particularly the authors of the Academic Reports. Recently the Research Committee has been working on funding applications and I would like to thank Stefano Pacelli, Blackburn College Challenge Funds Manager, for his work and support.

Over the last year, the ELIHE research effort has enjoyed significant encouragement and support. I would like to acknowledge the support received from Ian Clinton, Blackburn College Principal, Chris Osborne, Blackburn College Vice-Principal, and Helen Mathers, Dean of ELIHE. Finally I would like to thank the ELIHE management team for their continued support of the Research Committee in its objective of making research an increasingly important part of our work.

Dr Stephen Kirkup
Research Committee (Chair)

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East Lancashire Institute of Higher Education

The East Lancashire Institute of Higher Education (ELIHE) is part of Blackburn College. ELIHE provision is mainly delivered in its own site within the Blackburn College campus, close to Blackburn town centre and provides a convenient and secure environment for study.

ELIHE consists of five schools:

East Lancashire Business School
School of Education
School of Arts, Humanities and Social Sciences
School of Science and Technology
School of Law, Health and Community Studies

East Lancashire comprises of a cluster of towns including Accrington, Bacup, Barnoldswick, Blackburn, Brierfield, Burnley, Clitheroe, Colne, Darwen, Great Harwood, Haslingden, Nelson, Oswaldtwistle, and Rawtenstall. ELIHE has over 2000 students studying a wide range of programmes, about two thirds of all of the higher education in East Lancashire is delivered by ELIHE. East Lancashire does not have a University, but ELIHE has significant research output and has delivered degrees (awarded by Universities of Lancaster, Glamorgan, Huddersfield) for many years; ELIHE is the nearest thing to a University in East Lancashire.

Work has begun on a new Higher Education building on Barbara Castle Way in Blackburn, due to be completed in 2009, to accommodate the growth in the H. E. student population. The architects are Buttress Fuller Alsop Williams (BFAW) of Manchester. Partner Architect, Alistair Weir said: “The new Higher Education building, which will cost just under £13 million, has three main elements including a curved teaching block running alongside Barbara Castle Way, an administration block facing the Campus and a glazed atrium linking them both. The building is being designed to give a “distinctive” edge to the main highway and will incorporate landscaped areas to help promote local ecology.” “The new energy efficient Higher Education block will include facilities for rainwater harvesting and solar water heating and is expected to become a landmark for the campus” added Alistair.

If you would like to know more about ELIHE then please visit the website or telephone the numbers below. Please contact us if you wish to be involved in research, teach, study or be involved in any other way with ELIHE.

Website www.elihe.ac.uk Email: he-admissions@blackburn.ac.uk
Admissions , telephone 01254 292594 Student Services, telephone 01254 292929
Address: ELIHE, Blackburn College, Blackburn, Lancashire, UK. BB2 1LH

Blackburn College

Blackburn College, with its base in Blackburn in East Lancashire, UK, has a long tradition of providing education, higher education and training locally and today is a vibrant place to study. With strong links in Blackburn, East Lancashire, nationally and overseas with business, partners, other colleges and schools, Blackburn College is a major force for progress in the local community and business sectors - and transforms lives and opportunities for individuals.

Blackburn College's Mission

Blackburn College aims to be a centre of excellence for demand-led education, to be the provider of choice for employers and to work with learners and stakeholders to enhance employability and social cohesion.

History

Blackburn College was founded in 1888 as the Technical College for the town. Its initial curriculum base was vocational with a strong emphasis on Textiles and Engineering, as well as Art, Physics, Chemistry and Building. The original Blackburn College building is still in constant use today and is known as the Victoria Centre, housing amongst other things the College's Music and Media Departments. It is a Grade II listed building and has recently been extended at a cost of around £4.4 million, which included a 35% contribution from the Learning and Skills Council.

In 1984 the academic / tertiary element was introduced when the local schools' sixth forms were centred on Blackburn College as an Institute of Tertiary Education offering A Levels and GCSEs.

The Department of Education and Employment in 1998 awarded Blackburn College £750,000 to set up a Centre of Excellence for IT, in partnership with Blackburn with Darwen Borough Council, aimed at local business. This has been the catalyst for the development of very strong links with employers across all areas now in commercial training and workforce development, largely delivered in the workplace.

Recent History

In 2002 Blackburn College was awarded its first Centre of Vocational Excellence (CoVE) in Digital Communication Technology and since then has gone on to achieve recognition and funding for 3 further Centres of Vocational Excellence - in Childhood Studies, Teaching Support Staff and Textiles in Fashion.

In the same year all the Higher Education offered in Blackburn College was centralised to create the Higher Education Centre, which today provides over two thirds of the Higher Education in East Lancashire and is known as The East Lancashire Institute of Higher Education at Blackburn College.

The Blackburn College's New Victoria Centre was the first new building in a phased programme of re-investment. Work on the £7.5million Blackburn College 6th Form and Computing Centre was then completed in 2007. A new Higher Education building is to be completed in 2009.

A recent inspection by Ofsted[1] awarded Blackburn College a grade of Outstanding: Grade 1 in every category:

Effectiveness of provision	Outstanding: Grade 1
Capacity to improve	Outstanding: Grade 1
Achievement and standards	Outstanding: Grade 1
Quality of provision	Outstanding: Grade 1
Leadership and management	Outstanding: Grade 1
Equality of Opportunity	Outstanding: Grade 1

Further Information

Blackburn College offers a diverse range of further education courses including the areas of Art and Design, Beauty Therapy, Brickwork, Business and Legal, Carpentry and Joinery, Childcare, Construction, Engineering, Graphic Design, Hairdressing, Health and Social Care, Information Technology, Interior Design, Media, Motor Vehicle, Painting and Decorating, Performing Musicianship, Photography, Plumbing, Public Services, Science, Sport, Textiles/Fashion, Travel and Tourism. Blackburn College delivers a wide range of A and AS level courses.

For more information on these courses see www.blackburn.ac.uk or see www.elihe.ac.uk for higher education courses. The prospectuses for full-time, part-time, further education, A level and higher education courses are available from the website. Hard copies of the prospectuses can be ordered.

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Student Hotline: 01254 292929 Employer Hotline: 01254 292500

[1] http://www.ofsted.gov.uk/oxedu_reports/download/(id)/91689/(as)/130736_316663.pdf

Academic Reports

The East Lancashire Institute of Higher Education at Blackburn College

Academic Report: AR-08-01

THE BURNLEY PROJECT INTERFAITH INTERVENTIONS AND COHESIVE COMMUNITIES

The effectiveness of interfaith activity in towns marked by enclavisation and parallel lives

Dr Andrew Holden[1] and Dr Alan Billings[2]

February 2008

Sociological Research Group
Sustainable Development Research Group

Edited by the *ELIHE Research Committee*: Stephen Kirkup, Barry Powell, Trevor Green and Stephen Pickles.

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THE BURNLEY PROJECT
INTERFAITH INTERVENTIONS AND COHESIVE COMMUNITIES
The effectiveness of interfaith activity in towns marked by enclavisation and parallel lives

Dr Andrew Holden and Dr Alan Billings

Academic Report AR-08-01. East Lancashire Institute of Higher Education, Blackburn, UK.

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EXECUTIVE SUMMARY

Preamble

This report is the result of a two year research project (2005-2007) funded initially by the Home Office and latterly by the Department for Communities and Local Government, and supported by Building Bridges Burnley (an interfaith group) into the contribution that interfaith dialogue can make to community cohesion. (Interfaith dialogue was broadly interpreted to mean any activity that enhanced the mutual understanding of people of different faiths). The research has been undertaken principally in Burnley, one of the towns subject to severe disturbances in the summer of 2001, and also in Blackburn to provide some comparison. The field-work has been undertaken mainly by Dr Andrew Holden and the analysis of the results by Dr Holden, Professor Ian Reader (now Manchester University), Professor Paul Heelas and the Revd Canon Dr Alan Billings in the Religious Studies Department of Lancaster University.

The research has been both qualitative – including forty interviews with young adults of different genders, ages and religious faiths in Burnley – and quantitative – using a questionnaire among Year 10 (i.e. 15 year old) school students. In the event, the questionnaire yielded results that in some respects confound what may be popular assumptions about attitudes towards liberal values among different ethnic groups and require us to recognize the existence of more than one kind of worrying extremism in contemporary British society.

One report into the 2001 Burnley disturbances coined the term ‘parallel lives’ to describe the way people in the (mainly) Pakistani Asian community and the White community in Burnley lived separately from one another. We see this as a consequence of what we have termed ‘enclavisation’, something that continues to be the case. Enclavisation begins with people living in separate residential districts. This then has consequences for schooling and general social interaction. We believe this has far-reaching consequences in towns such as Burnley where there are essentially two distinct racial, religious and cultural groups.

The research findings

The first part of the research sought to discover how far interfaith dialogue ameliorated the effects of parallel lives and what sort of activities should be encouraged in future as a contribution towards cohesion.

Our overall conclusions for this part of the research were:

- **Faith communities make an important contribution towards building and sustaining cohesive communities principally by sustaining local leaderships (in secular groups as well as their own), providing meeting places and encouraging values and attitudes conducive to cohesion. This contribution is out of all proportion to their relative size among the population as a whole. Local congregations are significant among the 'little platoons' that sustain civil society in towns such as Burnley.**

- **Interfaith activities have a valuable part to play in bringing people of different faiths, cultures and ethnicities together and in understanding one another better, but they are not by themselves enough. They only engage a small minority of people and there are those among both Christian and Muslim communities who resist or hold back from interfaith activity. Interfaith activities should be supported but interfaith groups must be encouraged to develop partnerships that involve secular groups as well.**

The second area of research focused on the attitudes of younger people to questions of faith and cohesion. We interviewed forty young adults and distributed a questionnaire to all Year 10 students in selected community schools in Burnley and Blackburn (and to a lesser extent, for the purposes of comparison, Sheffield). In the event, this last area of research revealed unexpected and disturbing results.

The young people interviewed were very diverse in terms of their religious or non-religious affiliations and interests.

Overall, our conclusions from this part of the research were

- **The more young people have some sort of social interaction with those from other faith and ethnic communities, the more positive were their attitudes towards them.**

- **Ignorance of other ethnic groups, especially where those groups are identified with a different religion, and ignorance of commitment to integration within the other religion, seriously inhibits the development of more positive attitudes towards ethnically different groups.**

The purpose of the questionnaire among 15 year olds was to explore the relationship between school composition and social group tolerance. It was completed by students in three types of school:

A - where enclavisation resulted in pupils being almost entirely White (and if religious, Christian).

B – where encalvisation resulted in pupils being almost entirely Asian (and mainly Muslim).

C – schools that served a more ethnically mixed area which was reflected in the school population (with religious diversity too).

The results from school A presented us with an unanticipated and troubling picture. A significant number of these students expressed extreme views: they thought their own racial group was superior to others; they were hostile to learning about other faiths and cultures. In short, we encountered a type of *White extremism* which we believe must be one consequence of continuing enclavisation. Presumably these attitudes reflect those of the parents of the young people. In other words, while White racism is challenged at many points during the course of the young people's education, the White mono-cultural school is not able to oppose it as effectively as we might want: the influence of parents, peers and the enclave proves decisive.

These intolerant attitudes were not mirrored, however, in school B where the pupils were drawn almost exclusively from an Asian (and Muslim) background. (The responses of pupils in school C were more mixed though closer to those of school B than school A.). Pupils in school B expressed commitment to liberal and integrative values that were conducive to sustaining cohesive communities. As far as we could tell, the values of these pupils reflected both those of the home and the mosque and were also the values of the school. In other words, the enclave provided an oasis of liberal values for young Muslims.

Although enclavisation did not produce among the Asian/Muslim pupils the antagonism and hostility towards other cultural and ethnic groups that it did for White students in school A, we believe that lack of contact with fellow students of other races and cultures probably has consequences when school careers are over

and these young people take their place in further education or the labour market. When they then encounter White racist attitudes first-hand for the first time, they are unprepared and unrehearsed and without adult help. This has the effect of making some young people withdraw into their own community and/or faith, and perhaps become more conservative (though not extremist). We suggest that for a more conservative response to develop into a form of religious extremism a further element is needed – the persuasive intervention of those with a coherent extreme political theology.

However, we noted that even Muslim students are like their non-Muslim peers in believing that finding one's own way in life without being dependent on others, was an important value. In this respect, Asian Muslim pupils are becoming *more like* their White contemporaries.

The all-White school is unable by itself to overcome the entrenched White extremism that is mediated through the family, the peer group and the enclave. This strongly suggests that in towns with sizeable ethnic minorities, unless White young people are exposed during their school careers to fellow pupils of different ethnic and religious backgrounds, attitudes of White superiority and hostility towards those of other cultures are unlikely to be ameliorated and smouldering resentments will continue into adult life. Enclavisation, however, assists the development of liberal and integrative attitudes among young Asian/Muslim people by providing an oasis of liberality in a strong and cohesive sub-community.

But why should young Asian/Muslims who also spend their school careers in mono-cultural (Asian/Muslim) schools become more conservative on leaving school and in a few cases become more amenable to extremist ideology/theology? We have formed a hypothesis that it is not enough for young people to be influenced by and to hold liberal values. If they are not to lose faith in liberal society when they leave school they also need to develop as early as possible skills in dealing with racism and prejudice.

There are also lessons for faith groups, particularly the Muslim community. Our research suggests that most young Muslims have little contact with their local mosques and their knowledge of Islam is not very profound. As they wrestle with the question of identity – 'What is it to be Muslim and British?' – they have few theological resources to help them and few people able to help them. This is in some contrast to the resources – human and material – that the extremist groups have available. This is a major challenge to the Muslim community.

Our overall conclusions from reflecting on the questionnaire, therefore, were:

- **Enclavisation in towns such as Burnley will continue to perpetuate extremist attitudes among a significant number of young White people**

- **But enclavisation acts as a protective and nurturing oasis for young Asian/Muslim people**

- **There is an urgent need for the Muslim community to produce fresh theological expressions of how one can be both British and Muslim that is at least as comprehensive and coherent as the ideology of the Islamic extremists. This is a challenge not only for imams and others who exercise leadership at the local level, but also for universities, colleges and teacher-training institutions**

Policy implications and recommendations

Finally we considered what the implications of all this might be for community cohesion and the development of public policy. In summary we recommend:

- **Government should continue to support the 'little platoons' including faith groups**

- **Interfaith activities should be encouraged but especially where they are part of wider partnerships with secular groups**

- **Faith groups should be encouraged to draw more of their members into interfaith activity and interfaith activity should be supported.**

- **The 'mixed school' should be seen as a form of interfaith activity in itself and probably the most effective in ameliorating illiberal attitudes among some young White people and helping young Asian/Muslims to encounter and learn how to deal with racism and prejudice early in their lives – in the classroom and the playground - while they have helpful adults around them**

- **The mono-cultural school in towns like Burnley should be avoided whenever possible and when this is not possible, attempts should be made to bring young people together from the different communities as part of their normal school experience**

- **The Muslim community and those involved in education should be encouraged to develop an Islamic theology that deals with the issue of multiple identity**

The Report

1. Introduction

Context of the research

In June 2001 there were serious disturbances in several northern English towns, principally Bradford, Oldham and Burnley. Rival groups of White and Asian males attacked one another and there was widespread media reporting of the towns as segregated and bipolar, characterised by social and economic deprivation, low expectations and fragile identities. Subsequently, a number of reports were written as local and national government sought to draw lessons from what had occurred in order to make these communities, and others that shared similar profiles, more cohesive. This report follows on from that.

In August 2005, we were commissioned by the Home Office (and then by the Department of Communities and Local Government) to undertake a two year investigation into the contribution of interfaith dialogue to community cohesion. We decided to interpret 'interfaith dialogue' broadly to mean any activity that enhanced mutual understanding between people of different faiths. The study was to be conducted in Burnley where, throughout the project, we received the support of the town's interfaith group, Building Bridges Burnley (BBB), set up after the 2001 disturbances.

Burnley is an East Lancashire mill town situated in the Pennine hills of North West England with a population of around 88,000 people. The borough spans an area of approximately forty-two square miles, most of which is open moor land. Like most other mill towns in the north of England, Burnley's history is rooted in the textile industry - an industry which has been in decline since the early 1970s.[1]

The influx of several thousand Pakistani and Bangladeshi migrants between 1964 and 1967 presented a new challenge to community relations in Burnley. In addition to their (mainly) Islamic beliefs, these new arrivals brought with them distinctive languages, values, dress codes, cuisine and a whole host of other norms and practices. In the decades that followed, the pronouncements of far right-wing organizations such as Combat 18, the National Front and the British National Party did little to allay the unfounded fears of the White majority that public services, jobs and even the country as a whole were being taken over by undeserving foreigners.

There are 15 wards in Burnley, 10 of which fall within the lowest 20 per cent of the most deprived wards in the country.[2] According to the 2003 Mid Year Population Estimates, the overall population of Burnley had been in decline since the early 1990s. Between 1991 and 2001, the number of inhabitants fell from 91,148 to 89,541 due to an unusually high level of migration among young people between the ages of 15 and 29 years (Burnley Borough Council 2005a). By 2006, the figure stood at 88,100 (Burnley Borough Council 2006). Current estimates suggest that if this trend continues, there will be only 82,700 people living in the borough in 2028 – a decline that is atypical of the wider region. At the time of our research, the figures showed a higher than average number of children living in Burnley, but a relatively small number of adults between the ages of 20 and 40 years. The figures for ethnic membership were also significant. The BME population had increased from 5% in 1991 to 8.2% in 2001 with a growing number of Asian residents, including married couples, in the younger age groups (ibid 2006).

In addition to these demographic changes, there is substantial evidence of social segregation. The 2004 Deprivation Index (cited in Burnley Borough Council 2005b) confirmed that Burnley fell within the top fifty most deprived local authorities in the country and that this manifested itself in housing, health and education. While in the few years prior to our investigation a small number of Asian residents had begun to purchase properties in wards that had previously been occupied by

[1] Currently, the most common sectors of employment were public administration, health and education which collectively provided work for around 28% of the town's population – a similar percentage to manufacturing employment (Census 2001).

[2] See Appendix E for a description of the two main wards in which most of our fieldwork was undertaken.

members of the indigenous White population, spatial segregation between ethnic communities remains pronounced. In 2001, the main ethnic groups living in the borough were, in descending order, White British (90.11%), Pakistani (4.94%), Bangladeshi (1.58%) and Indian (0.48%). The Caribbean, Chinese and African communities constituted only 0.25% collectively (Census 2001). The fact that the overwhelming majority of the town's Pakistani and Bangladeshi residents are concentrated in the two most deprived wards suggests that whatever desires progressive thinkers may have to promote integration in Burnley, ethnic divisions still exist.[3]

Predictably, the 2001 Census confirms a close relationship between faith and ethnicity. The town's 6.6% Muslim population is drawn from the Pakistani and Bangladeshi communities, while the 74.5% of 'Christian' residents are predominantly White British. This Christian-Muslim majority reflects that of the national landscape. Although the opportunities to promote social unity vary from locality to locality, the bipolar composition of Burnley makes it a prime location for the investigation. Almost every voluntary sector convention in the town between 2001 and 2005 made stark reference to the lack of political engagement between local agencies, alarming levels of social exclusion, low social aspirations among young people and, perhaps most disturbing of all from the point of view of community cohesion, the success of the British National Party in winning seven seats on the local council.

The comparative town: Blackburn

In the early stages of planning, it was decided that one of the best ways of evaluating the success of faith and community cohesion strategies in Burnley was through comparative research. The town that was chosen for comparison was Blackburn – another mill town some ten or so miles west. By comparing two industrial northern towns, both of which had a sizeable Muslim population, more empirical evidence could be collected and more weight added to the analysis.

The similar industrial landscapes of Burnley and Blackburn were not the only reasons, they were chosen for comparison. From a faith cohesion perspective, Blackburn had, in the years preceding the investigation, initiated a number of schemes that had been successful in mobilizing local faith communities into action. The Blackburn with Darwen Interfaith Council (BDIC) was established in 2004, and in 2005, several school partnership schemes were introduced in the town with a view to promoting faith and ethnic unity among children in primary and junior education. The BDIC had also invested a considerable amount of time trying to engage with people of no faith and in encouraging faith leaders to play a more active role in civic events; hence, it was clear that the BDIC had adopted similar interfaith strategies to Building Bridges Burnley. What was not known was how these strategies had been implemented or if they had been successful. By comparing the initiatives of both towns, our hope was that a better understanding of faith cohesion would be achieved.

The 2001 Census reveals that 77.9% of the residents of Blackburn are White British, 10.7% are Indian and 8.7% are Pakistani. Christians constitute the largest faith group of the town (63.3%) followed by a Muslim population of 19.4% (ibid). Despite the differences in ethnic group composition between Burnley and Blackburn and the fact that Blackburn is a much larger borough with a population of 137,470 residents, there are similar levels of educational underachievement and strong evidence of spatial segregation.

In both towns, the biggest majority of the Asian residents live in the most deprived wards. The Daneshouse/Stoneyholme ward of Burnley and the Bastwell and Shear Brow wards of Blackburn are known by indigenous White locals as Asian (or 'Paki') enclaves. All three wards have shops, restaurants and places of worship established by the Indian, Pakistani and Bangladeshi communities during the 1960s and '70s. As one might expect, most of the schools in these wards are attended by Asian children - a pattern of educational recruitment that has gradually changed the ethnic profiles of state and voluntary-aided schools alike. This is a consequence not only of Asian settlement, but of the actions of White parents who have made a conscious decision to send their children to schools on the outskirts of town (or even in other boroughs) where there are fewer Asian pupils. This White flight response to the presence of British Asians in primary and secondary schools and in the local community is generally seen as doing little to assist cohesion.

2. The contribution of faith to community cohesion

The question of cohesion

[3] Seven of the eight mosques were situated in one of these wards - a ward which contained no churches. In the remaining fourteen wards, there were thirty-eight churches and only one mosque.

What makes for cohesive community?[4] Clearly, it is not enough that people live in geographical proximity. They could remain a collection of individuals with no relationships between them. Government (local and national) uses a broad definition of a cohesive community as one where

- there is a common vision and a sense of belonging for all communities
- the diversity of people's different backgrounds and circumstances are appreciated and positively valued
- those from different backgrounds have similar life opportunities; and
- strong and positive relationships are being developed between people from different backgrounds in the workplace, in schools and within neighbourhoods.[5]

Cohesion requires frequent, formal and informal pathways of communication. The more pathways, the greater the frequency and density of interaction, and the greater the degree of cohesion.

Ferdinand Toennies classically distinguished two types of community, pre and post industrial revolution, which he called *Gemeinschaft* and *Gesellschaft*.[6] Before the industrial revolution individuals were bound together by kinship, by working together, and by sharing a common faith, common values and common traditions and customs. There was also frequent interaction - *Gemeinschaft*. In modern, urban society, what bound people together were the networks of friendships that came about through work and found expression in organisations such as trade unions, political parties, working men's clubs and societies - *Gesellschaft*. These organisations served to mediate the relationship of the individual to the state, local and national, and promoted moral frameworks within which communities made sense of the world and ordered their collective lives. Since the 1960s all of these organisations have been in decline.

If, however, a society needs for its health a critical mass of its citizens involved in voluntary associations – what Edmund Burke (1729-1797) called the 'little platoons' – a recently published report of the Royal Society for the Encouragement of Arts, Manufactures and Commerce (the RSA), based on a YouGov poll, sounds a note of alarm.[7] It found that increasing numbers of Britons do not join or support voluntary societies. Membership of organisations as diverse as the Women's Institute, the Boy Scouts, and political parties has fallen dramatically over the past few decades. This led one Sunday newspaper to headline its report of the RSA's findings, 'The rise of can't-be-bothered Britain'.[8] One general conclusion that should be drawn from this is that if voluntary bodies are valuable they should not be undermined by public policies, and public policies need to be scrutinised for their indirect as well as their direct consequences for the little platoons.[9] We should nurture with more care those groups that do exist.

Although the RSA report is broadly correct, it did, however, fail to draw out the significance of faith groups, probably because it misinterpreted some of the evidence of support for them and underestimated the numbers of people involved in them. In doing so, it failed to grasp the importance of the contribution faith groups can and do make. For example, it quoted figures from the England and Wales churches survey of Christian Research that showed that the average church attendance on any given Sunday was about 7%. (A figure confirmed by Lancaster University research in Kendal in 2001[10]). But the report assumed that this meant that only 7% of people are regular churchgoers and involved in church activities. In fact, Christian Research has been saying for a number of years now that the figures based on Sunday-only sampling need qualifying. Not all regular churchgoers are Sunday attenders and not all Sunday attenders are weekly attenders. Some attend every other week, some monthly, some on the high days of the liturgical calendar. The 7% figure is, therefore, an underestimate of the numbers of people involved with local churches. The true figure (which has yet to be established by research) is probably nearer 10-11% and may even be higher since some people attend much less frequently (Christian Research, for example, found that as many as 40% of people attended some form of service over the Christmas season). Every parish priest or minister knows that if s/he is to have 100 people in church each Sunday s/he

[4] For a full discussion of the term see: Community cohesion: A Literature Review, Centre for Research in Ethnic Relations, University of Warwick, Coventry, CV4 7AL

[5] Guidance on Community Cohesion (Local Government Association 2002)

[6] Ferdinand Toennies, Community and Society, translated by Charles Loomis (New York Harper 1963) 47

[7] Edmund Burke, Reflections on the Revolution in France, 1790

[8] Sunday Telegraph 1 April 2007

[9] To take simple financial examples. Gift Aid - tax relief on charitable giving – is an example of how voluntary bodies can be assisted. VAT on repairs to the fabric of places of worship (other than listed buildings) is an example of how voluntary bodies can be very adversely affected.

[10] Paul Heelas and Linda Woodhead, The Spiritual Revolution (Blackwell 2005)

must have a congregation that is at least 150 strong. Priests and ministers will also know of those who are content to be in a wider penumbra that support social and fundraising activities but are reluctant to attend services at all.[11] Taken together, all of this adds up to a considerably higher number of people than the next most popular organisation – Neighbourhood Watch (1 in 10 belong). What this means is that the voluntary bodies that are by far the most numerous and ubiquitous in Britain today are the churches.

The latter point – the ubiquity of the churches – is as important as their numerical strength. Churches are found in every part of the country and in every type of community – urban, suburban, rural, coastal. Although they tend to be more middle class than working class, involve more women than men (except among the leaders), and have an age profile that is older than the population as a whole, they nevertheless span social classes, sexes and age groups. There are few if any other groups that are quite as successfully comprehensive. When other faiths are added to the picture, then faith groups also include all ethnic groups as well; all of which needs saying because faith groups can easily be taken for granted and their significance simply overlooked.

Faith groups are the most numerous, ubiquitous and socially comprehensive of any voluntary bodies in Britain today, though are easily overlooked; but in any consideration of community cohesion, their importance should be recognised.

What faith groups contribute to community cohesion

(a) Faith groups value community

From a community perspective, one of the strengths of the churches is that because of their ubiquity they have personnel and plant in every locality. This is of great significance for cohesion because in each locality there will be clergy and lay leaders for whom the idea of community is regarded as valuable and who are used to thinking in community terms. In urban centres mosques play similar roles.

- Faith groups train, fund and sustain local leaderships.
- Faith group members are often willing to provide support for other (non-faith based) local groups and initiatives and will be supported in this by their faith community. Their networks are often extensive and well embedded.
- Faith groups have and maintain buildings in every locality that provide essential meeting spaces for many other groups.
- Faith groups can contribute towards embedding in every locality those values that are essential for cohesive communities but which can hardly be brought about by government even though public policies may depend on them: a sense of neighbourliness, concern for a place, civility, common courtesy. Faith groups are often at the forefront of promoting these values which are key to civic stability and renewal. They are 'moral communities' and communities of hope, used to imagining better futures. Without these values and commitments it is hard to see what government initiatives could do to make significant differences.
- Faith groups and their leaders are often prepared to stand for those values that underpin cohesive communities and to stand against those who would seek to undermine them or promote division.[12]
- Faith groups bring critical perspectives to bear. These perspectives have often been formed over long periods of time and reflection. Unlike many initiatives of government, both national and local, faith groups are not 'here today and gone tomorrow'; they are committed to areas over long periods of time. Faith groups may be critical of government schemes where they seem too cumbersome, too top-down, too short-term, or too related to national rather than local agendas. Where local faith groups are listened to, policies can be developed that are more 'grass-rooted'.

Faith groups make critical contributions towards the promotion and sustaining of those values that are essential for building, maintaining and safeguarding cohesive communities. They play a role out of all proportion to their numbers.

Anyone concerned with community integration or cohesion cannot ignore faith groups. It is clearly in the interests of government to encourage faith groups (though governments cannot support proselytising activities) and where these groups indicate that their

[11] See Alan Billings, Secular Lives Sacred Hearts (SPCK 2004)

[12] There is a significant history of churches opposing pre-war fascist groups in the East End of London and racial discrimination in post-war urban areas.

existence is threatened by public policies, local and national, that should be taken seriously.

(b) The importance and limitations of interfaith activity

As well as the various projects that each faith group pursues for its own members or supporters, faith groups can contribute towards integration through a variety of *inter*faith activities. Interfaith groups are active in most parts of the country, though not all.[13] Our research in Northern towns shows both the importance and also the considerable limitations of interfaith activity. For example, interfaith activity is important because:

- It brings together leaders of the faith communities and builds personal friendships and trust between them at different levels – national, regional, local (Building Bridges Burnley has done this to a significant extent).
- This mutual recognition and respect enables the more recent and less established communities (those associated with the post-war migrations) to feel affirmed and valued without being patronized, and to build their own capacity
- It enables the newer communities to be part of the extensive networking that local religious leaders build up
- When working well, interfaith groups create opportunities for different communities to get to know and understand one another better through shared social and cultural events
- It can provide channels of communication between the media and faith communities
- In times of community tension these friendships and channels of communication can play a valuable role, though they have to be fostered well before times of difficulty arise.

However, we should not exaggerate what interfaith involvement can do:

- Faith groups are only touching a small percentage of the community. Although this may be between 10-11% of the population as far as the Christian churches go, the White working and White non-working class is largely under-represented and untouched (in low single figures in many areas).
- Our best estimate for those who have significant contact with mosques in the North West is no more than 30% of the (Muslim) Asian community.[14]
- Only a small minority of congregations/faith groups/faith leaders are willing to be involved in interfaith activities or dialogue. For Burnley there are 17 Anglican, 7 Roman Catholic, 13 Methodist, 8 Baptist, 4 Independent, 1 Pentecostal, 1 United Reformed, and 3 other churches with over 50 church leaders – but only a handful involved in interfaith activities. Church attendances are 6.5% for Lancashire as a whole and 6.1% for Burnley[15]. There are eight mosques in Burnley, seven in one ward - in which there are no churches
- Interfaith groups need time to be able to develop the degree of trust necessary to broach with one another the issues that divide and the issues that disturb
- Interfaith activities largely appeal to first rather than second generation migrants, but it is the second generation that is most susceptible to radicalization.

Interfaith dialogue and activities can make important contributions towards social and community cohesion, though their significance should not be over estimated. If they are to become a key instrument for government the numbers engaged must be significantly increased. However, some church and mosque leaderships are hostile to the concept.

3. The efficacy of interfaith dialogue and faith cohesion activities

This leads to the question of what works. There are many interfaith initiatives in the Burnley and the North West region generally. We examined three different types of activity with a view to seeing the effectiveness of their contribution to community cohesion:

1. Faith cohesion initiatives in schools and colleges;
2. An interfaith project for young adults known as *The Spirit of the North*; and
3. Faith leadership strategies.

[13] Partnership for the Common Good: interfaith structures and local government Good Practice Guidelines (Inter Faith Network 2003) stated that there were 130 local interfaith groups. The Interfaith Network Annual Review 2006-2007 speaks of 270 interfaith organisations.

[14] Mosques do not keep records of attendance in the way that churches will record, for example, communicant figures.

[15] Figures from Christian Research

(a) Faith cohesion initiatives in schools and colleges

The last three decades of equal opportunities legislation have brought about significant changes in employment, in housing and in a range of legal and civil rights. But none of these changes in themselves produce religious and cultural *understanding*: respect for social diversity is an attitudinal requisite that can only be advanced through awareness-raising. In secondary and further education in East Lancashire, a number of opportunities have been used to promote faith/interfaith understanding: (i) at subject level, (ii) through cross-curricular approaches, and (iii) through outreach provision.

Faith cohesion at subject level

Some subject areas lend themselves more readily to faith/interfaith understanding than others. Teachers of the Arts, Humanities and Social Sciences are better able to promote integration because the syllabus content of these curriculum areas provokes interactive debates and discussions. Subjects such as Physics, Chemistry, Mathematics and Information Technology, on the other hand, presented fewer opportunities. In Religious Education and Religious Studies thematic and comparative approaches – topics such as pilgrimages and festivals - have promoted greater faith understanding while the study of Biblical and Quranic texts has enabled students and teachers to raise more contentious issues of doctrine and belief. This is very valuable work but it does require considerable knowledge and skill on the part of the teacher and teachers with the necessary experience and knowledge are in very short supply.

The cross-curricular approach

At the time of this research, two voluntary-aided Sixth Form centres in the Blackburn area (one Roman Catholic, the other Anglican) used faith-oriented material in their tutorial programmes. Like most post-16 institutions, the tutorial systems in these two colleges were compulsory, which meant that every full-time student spent an average of one and a half hours per week in cross-college tutorials. The chaplaincy teams have adopted an inclusive approach that reflected the cultural, ethnic and religious diversity of the student populations. They highlighted Christian values (rather than doctrine) and in so doing, were able to impart messages of inclusion. The non-liturgical themes of respect for others, self-empowerment and cultural diversity meant that students from all faith backgrounds as well as those from none were able to participate in the workshops. On some occasions, the tutorial periods were used for presentations (often in the form of a short film or role-play performance) and it was here that the ethical concepts of justice, equality, dignity, integrity, respect, human rights, freedoms and responsibilities were addressed. This is an approach that could be copied in other schools whether church sponsored or not.

Outreach provision

In East Lancashire, faith partnerships have taken their mission into a number of local junior and secondary schools with the aim of nurturing religious empathy among children of different ages.

Building Bridges Pendle (BBP) have been working in both junior and high schools since 2001 and its outreach provision for Year 6 and 7 pupils had attracted the interest of several local stakeholders. The main aim of the BBP team was to present a combined faith and cultural cohesion programme (Appendix C) to the whole year group of local schools with a view to raising awareness of social diversity. By the summer of 2002, the team had visited 24 schools in the towns of Nelson and Brierfield (that is, almost half the local primary and secondary schools in the Pendle borough) and by the end of the academic year 2003/4, more than 4300 pupils had completed the workshops. The BBP team comprised three outreach workers – a Muslim, a Christian and a Hindu – who sought to convey to the pupils the ways in which people from different faith traditions could transcend religious and cultural boundaries.

Although this approach is in its infancy, the current evidence suggests that it can make a valuable contribution to community cohesion in multifaith, multicultural localities and should be encouraged – and emulated.

(b) The Spirit of the North: An Interfaith Project for Young Adults

The Spirit of the North is an initiative that has been launched in East Lancashire with different degrees of success. The aim of the project – which is funded and directed by the United Religions Initiative UK - is to encourage members of different faith communities to partake in a range of interactive workshops. At the end of the project, the participants are asked to present their results (usually in the form of a photographic exhibition) to interested stakeholders including other faith groups,

local councils, schools, colleges and civic centres. By the end of 2005, the organisation had facilitated a total of eighteen workshops in urban locations throughout the north of England

In Burnley, the project took the form of a residential retreat for sixteen young people followed by an exhibition. The weekend residential included a series of debates, interactive workshops, culture and faith sharing activities and a joint Christian-Muslim celebration. At the end of the project, the participants divided into three groups to prepare their exhibition materials. The exhibition took the form of an interactive display, the presentation of a DVD and the production of an interfaith resources pack for use in local schools and colleges. Within a three month period, the participants had accepted invitations to present their exhibition at the Burnley Community Festival, the central library, the East Lancashire Together convention, three local churches and several community centres.

These events have a considerable impact on participants but they involve comparatively small numbers.

(c) Faith leadership strategies

At the time of our investigation, Building Bridges Burnley was represented on a number of local, regional and national bodies involved in the promotion of civic renewal. It was through this network of voluntary and statutory services that the organisation was able to contribute to the delivery of the town's Community Cohesion Strategy and to Lancashire County Council's Corporate Plan.

In the spring of 2006, BBB appointed its first ever Faith Leadership Officer to improve interfaith dialogue and to encourage collaboration between religious clerics. The Faith Leadership Officer helped to establish a committee of local clerics and an imams' forum. Since the summer of 2006, these new faith leaders groups have held three seminars, one of which was extended to lay members of both communities.

In the autumn of 2006, a faith centre was established in a new Sixth Form College. The Lancashire County Council funded a faith co-ordinator who, together with a team of volunteers, introduced a range of activities and events which brought students together and attracted the interest of local residents. A Volunteers Forum of sixth formers has also been established. The group prepared a series of seminars and workshops entitled *Christianity in the twenty-first century*, *Exploring Spirituality*, *The War on Terror*, *Women in Islam* and *Tackling Segregated Communities*; all of which were intended to activate discussion and raise the profile of faith in an interactive manner.

In 2005, the Anglican Diocese of Blackburn was allocated some funding from the Faith Communities Capacity Building Fund to support two schemes; both of which aimed to promote a better understanding of faith in Lancashire. The first of these was entitled *The Faith to Faith Exchange Series* - an eight week programme of open dialogue sessions hosted by the Outreach and Development Agency of Blackburn Cathedral. Phase one of the programme involved a Christian priest engaging in dialogue with a local female Muslim from the Lancashire Council of Mosques; while phase two extended the dialogue to include the Jewish, Hindu, Sikh and Buddhist communities. The dialogue revolved around theological tenets, religious observances, rituals, pilgrimages and, most important of all from the point of view of community cohesion, religious unity. The size of the audience ranged from fifty to approximately one hundred and thirty attendees.

The second scheme comprised six bi-monthly seminars entitled *Looking Back at Anger*, all of which were held in different churches in Burnley, Blackburn, Preston, Lancaster and Blackpool. Each seminar (approximately three hours in length) was led by two or three guest speakers and facilitated by a representative of the Development Agency. The seminars included guest talks, question and answer sessions and plenary periods for reflection and comments. The speakers addressed issues of community cohesion and relayed strategies that had been deemed by local stakeholders to have had a positive effect on public relations. Like the Faith to Faith series, the most popular of these seminars attracted around one hundred and thirty attendees.

Challenges to interfaith initiatives

Throughout the period of research we encountered a large number of interfaith initiatives. However, their effectiveness was hindered by a number of constraining factors:

- Apart from the work in schools, the numbers of people involved in interfaith activity is very small
- The members of some religious groups refuse to participate in interfaith activity. In Burnley and Blackburn, these groups include the Jehovah's Witnesses, the Church of Jesus Christ of Latter

Day Saints, the Seventh Day Adventists and a small number of Spiritualist churches. Collectively, they number about two thousand. More seriously, religious exclusivity also exists within mainstream Christian churches (particularly of Evangelical and Pentecostal orientation) and mosques. The significance of this should not be underestimated as Evangelical and Pentecostal congregations are almost the only type of Christian congregation that are currently showing signs of growth (other than those Roman Catholic churches receiving migrants from Eastern Europe)

- There is large scale religious indifference among members of the indigenous White population - evidenced in eroding church attendance and verified (albeit on a small scale) in our school questionnaire survey. In crude terms, this raises the question of whether interfaith groups are able to preach to many other than the converted
- There are variations in faith conviction within as well as between communities. Although Muslims of all ages, for example, continue to hold relatively strong religious beliefs in East Lancashire, our research findings suggest a weakening of faith adherence among younger generations, demonstrated most notably in mosque attendance and in the failure to follow religious rules on a daily basis. Within Christianity, these disparities are even wider. This makes the facilitation of interfaith projects especially difficult
- The failure of faith partnerships to win the support of secular stakeholders. At the time of writing, Building Bridges Burnley and the Blackburn Interfaith Forum were attempting to address this through the formation of community-based alliances and through membership of voluntary networks.

Opportunities for interfaith activity

There are, however, a number of strategies that faith communities can deploy in order to capture the interest of prospective recruits and to maximise their capacity building potential. The following principles suggest themselves:

- Setting realistic goals. With clearly defined, realistic goals, small interfaith groups can contribute something of value to society more widely.
- The promotion of faith unity through annual civic events. In Burnley, this was achieved through the Burnley Arts Festival, cultural awareness days (hosted by a number of local high schools) and the East Lancashire Together Convention. More generally, the additional representation of Building Bridges on committees such as the Burnley, Pendle and Rossendale Council for Voluntary Service, the New Schools Working Group, Burnley Action Partnership, Burnley Community Network, and New Era Enterprises provided further opportunities for recruitment and publicity.
- Media publicity can contribute to the success of interfaith initiatives. In Burnley, local newspapers such as *The Burnley Express* and the local civic newspaper *Burnley Now* have publicised interfaith feasts, educational projects and faith awareness events. Newspaper editors and radio presenters accept that they have a moral responsibility to inform the general public of events and initiatives that advance the common good and that in the northern towns where communities remain largely segregated, responsible reporting is imperative. (If this was not clear before the disturbances, it was after.) By the same token, faith partnerships need to find ways of presenting religious diversity in a positive light and of communicating this message to as wide an audience as possible through the media.
- Faith leaders have much to contribute to local communities where they are willing to enter into partnership with other voluntary sector organisations and local service providers. In a pluralistic society in which people of different faith, ethnic and cultural backgrounds live in close proximity, this is a challenging but critical endeavour.
- Links with the wider cohesion agenda. One of the greatest challenges to faith partnerships is how to engage with the wider society. Although this raises important issues about the relationship between the public and the private sectors, the community cohesion agenda has provided new opportunities for faith partnerships to contribute to social relations. This is not to suggest that faith communities have never attempted to do this, or that they are somehow instrumental in engendering public disaffection; but the irony of civil conflict in segregated towns is that faith groups can, with sufficient will, contribute in ways that they may never previously have considered. The language of community cohesion and the concepts with which it has come to be associated -

regeneration, renewal, tolerance, bridge-building, collaboration and so forth - has sown the seeds for interfaith activity even though, paradoxically, *intra*-faith dialogue continues to take place in individual religious settings. From a local community perspective, the success of faith partnerships in the next few decades will be measured not so much by their ability to promote religious unity, but to forge links with other NGOs in the pursuit of common goals.

- Widening the appeal. If faith partnerships are to attract larger numbers than at present, they must find ways of appealing to wider audiences. Interfaith initiatives that focus *only* on theological/doctrinal issues are unlikely to attract anything other than small numbers. The first and probably most essential strategy is to adopt a language that will appeal to those who do not hold conventional religious beliefs. This will depend as much on the spiritual landscape of a given location as on the way in which the initiative is marketed; but there is always a risk that religiously-oriented literature will deter large numbers of young people. In East Lancashire, some of the most successful community cohesion initiatives have been launched by NGOs working in close consultation with local authorities. These include arts festivals, musical events, cultural awareness days, road shows, carnivals, celebrations, charity galas, summer extravaganzas, annual conventions and a large number of other events hosted in central locations. While most of these events are culturally rather than religiously orientated, local faith partnerships have participated by creating their own displays and distributing literature. Paradoxical as it seems, this means marrying the objectives of a faith-based mission with those of secular initiatives. In the last analysis, the success or failure of faith partnerships will lie in their ability to provide social spaces that can accommodate cultural, ethnic and religious diversity and that allow those who occupy them to define spirituality in their own terms.

4. Research among young people

Interviews of young adults

In addition to our research on interfaith activities, we have also explored the attitudes of young people towards faith, using two different methodological approaches.

First, we collected data from forty young people, aged 18-30 years, male and female, white and Asian, in the Burnley area by means of semi-structured, taped interviews of one hour. This has yielded a wealth of qualitative information on their attitudes towards and involvement with faith and interfaith activities, much of it yet to be analysed in detail. Second, we administered a questionnaire among 435 school children in Burnley and Blackburn. Our intention was to discover how far the young people embraced attitudes and values that were integrative – liberal, tolerant, humanistic – and vital for cohesion.

The forty interviewees were selected from several places of worship and from a number of secular organisations linked to the voluntary sector. They were white and Asian, male and female. Since the aim of this part of the investigation was to explore attitudes towards faith and its potential to create social cohesion, it would have been a mistake to target only those with religious convictions. The question we were concerned with was how far faith assisted cohesion and how far it was a source of division.

Of the two ethnic groups, it was the Asian interviewees who were most likely to express their identities in terms of faith (all describing themselves as Muslim) as well as ethnicity; but they demonstrated different degrees of religious conviction and varied in their attitudes towards interfaith dialogue. This suggests that we should be wary of defining people solely by religious membership and that the promotion of cohesion in segregated towns like Burnley and Blackburn is not necessarily best achieved by focusing on faith alone, but on other social dividers such as gender, ethnicity and locality.

The forty participants were interviewed individually and asked a series of questions about their lives as Burnley residents. At the beginning of the interviews, the respondents were asked to share their biographical narratives; that is, details of family relationships, childhood memories, educational experiences and personal and professional development since leaving school. The interviews then progressed to questions of an existential nature; at which point, the participants described their faith perspectives and, where applicable, provided details of their faith journeys. The interviewees were all asked about their perceptions of faith partnerships and about what they felt faith communities could contribute to social cohesion. Those with faith

convictions were asked to comment on other faiths and to identify any similarities that they felt existed between Burnley's two main faith groups. The most important questions concerned the amount of contact, voluntary or otherwise, that the interviewees had with members of other faith and ethnic communities. The interview data were then used to ascertain faith attitudes by a range of social descriptors including religious membership, occupation, gender, ethnicity and locality.

The degree of engagement with religious institutions – whether church or mosque – varied considerably among those who said they were religious. Even those who had no faith could appreciate the value of faith and the role it played in the lives of others where they had contact with people of faith. We have constructed a typology of these attitudes which may be of value to those involved in the facilitation of community cohesion initiatives that have a faith slant (Appendix D).

To date, attitudes towards faith have not been well theorized within the social scientific academy. Nor have policy makers or even faith groups themselves working in community cohesion contexts made any serious attempt to understand how faith perspectives come to be acquired or how they impact on social relations. In Burnley, young people's perceptions of faith and its potential to create a better society varied in accordance with locality and with the nature of interaction between faith and secular communities. But we have drawn the following conclusions:

- In the case of the White majority, even those with no religious faith were able to recognise the importance of faith in the lives of others as long as they had an appreciation of cultural diversity and had frequent contact with members of other ethnic/religious groups
- In most Muslim communities there is a delicate interplay between religious, cultural and national identity (influenced to a greater or lesser extent by relations with the non-Muslim population) that highlights the need for religious and ethnic communities to engage more positively with each other.
- People of no faith need to be more aware of those aspects of the various faiths that can be used to promote integrative and cohesive values and beat down prejudice.

Year 10 questionnaire survey in schools

This research was undertaken during 2006 and 2007 among Year 10 students in three types of community school (i.e. schools where the admission authority is the local council not the school or some religious foundation), one in Burnley and two in the comparative town of Blackburn. The three types of school were:

(a) Schools that were predominantly ethnically White
(b) Schools that were predominantly ethnically Asian
(c) Schools that were ethnically mixed Asian and White

We have recently followed that up with questionnaires in two schools in Sheffield – where there were no disturbances - to see if the findings are similar, though this is of limited usefulness given the small sample. In contrast to the interviews with young adults, the questionnaire collected data from the 435 pupils in their penultimate year of compulsory education in North West towns. The majority of these students were fifteen years of age at the time of the survey.

The principal reason for concentrating on young people is because those who took part if the disturbances of 2001 were mainly young men from the two communities, White and Asian. We wanted to examine the extent to which the perceptions that the two groups held of each other were influenced by perceptions of faith.

One of the key aims of the survey was to establish the relationship between faith tolerance and social group membership; hence, the schools chosen each recruited pupils from very different faith and ethnic backgrounds. This combination of quantitative and qualitative material and the relatively large number of young people involved in its production enhanced the validity and reliability of the data and made the findings more generalisable. Moreover, the adoption of both approaches allowed the overarching questions of the investigation to be systematically and rigorously addressed.

Findings of the Year 10 survey

The Year 10 questionnaire survey produced some of the most illuminating data on faith attitudes among teenagers in East Lancashire. The purpose of the survey was to explore the relationship between school composition and social group tolerance. The questionnaire contained 36 (mainly closed-ended) questions, all of were intended to elicit students' attitudes towards religious diversity, faith leadership, social integration and liberal democracy. The three

schools selected (referred to below as schools A, B and C) were similar in size, but very different in terms of their faith and ethnic group composition.[16]

School A (located in Burnley) was attended almost exclusively by White pupils from low income families living in wards in which there were notoriously high levels of crime and anti-social behaviour. Despite its unequivocal anti-racist/anti-bullying policy, this was a school in which racist attitudes among pupils were allegedly widespread and where there was a profound lack of understanding of and appreciation for cultural diversity. School B was located in a more affluent location in the comparative town of Blackburn, but attracted students from similar socio-economic backgrounds to school A. Unlike school A, however, approximately 96% of school B students were of Pakistani or Indian heritage - a consequence both of gradual Asian settlement in the area surrounding the school since the 1960s and of subsequent White flight. Of the three schools surveyed, this school drew students from the widest geographical area, many of whom travelled to school on public transport. School C (also in Blackburn) was in a similar location to school B and recruited students from wards with greater or lesser degrees of deprivation. This school was chosen because of its ethnic mix (73% of the pupils were White British while the remaining 27% were of Asian heritage) which made for a potentially interesting analysis of attitudes towards cultural diversity and social interaction. With the exception of only one other school (a school in Burnley which recruited equal numbers of pupils from both ethnic groups, but which had to be rejected because of its single-sex status), this school had the largest number of pupils from different faith and ethnic backgrounds sharing the same social space. It is in a school like this that one might expect to find the highest levels of interaction and integration.

The socio-economic profiles of the students were similar in all three schools. In school A, less than 8% of the students had at least one parent in a professional or semi-professional occupation. In schools B and C, the figures were 10% and 11% respectively. These professional groups included teaching, nursing and college lecturing. Of the more senior professions, one parent was a dentist, one was an architect, two were probation officers, two were accountants and three were police officers. As one might expect, the majority non-professional occupations varied hugely, but surprisingly few parents - only around 15% of the total sample - were employed in craft-based industries such as building, engineering, technological assemblance, electronics and car maintenance. Most of the parents were employed as retail assistants/supervisors, support workers, lower grade clerical assistants, care assistants, cleaners, dinner ladies, bar workers and factory workers. Around 20% of the parents were newsagents, sub-post officers, taxi drivers and landlords; and almost one third of the mothers of students of Asian heritage were housewives. Of the parents who were employed, it was unclear how many worked on a part-time basis and/or were divorcees with children under school age. Suffice to say that the socio-economic backgrounds of the students enhanced the comparability of the three schools.

It was clear from the questionnaire data that faith conviction varied considerably between the students, but it was the results of schools A and B that were by far the most illuminating. In school A, only 19% of the Year 10 population believed in God and only 16% had been exposed to religious influences by parents or other relatives. In school B, the results were 97% and 96% cent respectively. Not surprisingly, regular religious worship (prayer and mosque attendance) and the observance of religious rules in daily life were more evident in school B than in either of the other two schools.

The relationship between religious conviction and deference to faith leaders was consistent in school A and school B. In school B, over 81% of the Year 10 population attended mosque at least once a week (representing most of the Muslims in the year group) compared with only 8% of weekly church attendees in school A. The most important finding, however, was that over one quarter of the school B pupils claimed that the mosque was the most important influence in their lives while none of the school A students attributed this degree of influence to a church. The greatest influence in the lives of all the students was the home (45%, 41% and 33% for schools A, B and C respectively), although for school A students, friends were considered equally influential. So far as the influence of faith leaders was concerned, over 43% of school B students gave greatest deference to faith leaders compared with only 2% of students in school A and 11% in school C. There was clearly some contradictory evidence here among school B students over whether relatives were more influential than faith leaders.

The survey results also confirmed that exposure to religious activities outside school had a bearing on attitudes towards faith leaders. The high frequency of mosque attendance among school B students and their extensive religious socialization had a strong influence on how they viewed religious clerics. It is also worth

[16] The data were useful therefore for comparative purposes.

noting that 68% of the school B students were able to name an imam compared with only 41% of school A students who were able to name a Christian minister (attributable most likely to the fact that the local Anglican priest was a regular school visitor). While there was no doubting the considerable deference shown to faith leaders by school B students, further research would be required to explore exactly what kind of religious messages were being conveyed in the home and in the mosques.

There were a number of factors which helped to explain the relatively weak influence of faith leaders in the lives of the students in school A, the most significant of which were the level of general interest in religion and the importance attached to its social status. Only 13% of the students claimed to be either very interested or interested in religion, 19% claimed to be a little interested and 68% found it boring (compared with 91%, 8% and 1% respectively for school B). At the same time, 59% of school A students thought that religion was unimportant or did not care and, as already stated, only 50% were either very willing or reasonably willing to listen to other people's religious views (compared with respective figures of 10% and 86% for school B).

The efficacy of mixed schooling

Given the complexity of measuring faith attitudes and the large number of influences both in and outside education, it is difficult to establish the extent to which schools themselves promote or impair faith tolerance. The findings from our survey confirm that over 25% of the school A students believed that their school had not helped them to understand different religious beliefs (a failure most likely attributable to student disinterest than to teacher incompetence) compared with only 5% of the students in school B and 12% of students in school C. The school, however, was considered by far the most common provider of knowledge of different religious faiths of any institution among all three cohorts of students in the survey. This would suggest that even where levels of religious indifference are high, community schools are able to raise the profile of religiosity and in so doing, promote faith empathy. What is less clear is whether this is best done in mono or mixed schools.

The fact that only 8% of students in school A and 12% of students in school C expressed an interest in finding out more about other people's religious beliefs (compared with 42% in school B) suggests that it is those students who had internalized a religious code who were most likely to recognize the importance of understanding other religions. As far as this investigation is concerned, this highlights not only the potential for faith cohesion initiatives in schools, but the challenge facing *all* teachers in encouraging students to recognize the value of religious understanding, even (or especially) where religious convictions are weak.

The attitudes of the students towards other religions were also tested in a question concerning whether or not Christianity and Islam taught the same ways to be a good person. Only 40% of the school A students believed this to be the case while 21% said they did not know and 28% said they did not care. In stark contrast, the responses of the school B students to the same question were 83%, 3% and 1% respectively. School C was more comparable to school A than to school B with 41% of students responding in the affirmative, 17% saying they did not know and 26% saying they did not care. This would suggest that although schools are key providers of religious knowledge, it is those students with the strongest faith backgrounds who are most likely to digest the information and to reflect seriously on what they are being taught in classrooms. At present, it is uncertain whether dual-cultural/faith schools would be any more successful in capturing the interest of religiously indifferent students in segregated towns than mono-cultural schools.

It was clear from the questionnaire data that while the students from all three schools mixed with young people from other parts of their town on a regular basis, the contexts in which these interactions took place varied considerably. For the students of school A and school C, the streets provided the most common arena for mixing with people their own age while for school B students; it was sports centres, playing fields or parks. While it was beyond the scope of this investigation to ascertain the extent to which sporting activities across the two towns united young people from different social and cultural backgrounds, there was good reason to believe that sports centres provided an appropriate arena (and indeed one of the safest spaces) for social interaction. The greatest challenge, it seems, is that of how to entice young people away from street corners and into more structured, community-based activities that would make this interaction possible.

Undoubtedly the most disturbing finding of the survey resulted from a question concerning race. Approximately three quarters of the students from all three schools believed that there were different races, but it was the school A students who were most likely to believe that

one race was superior to another (almost 30% of the year group believed this compared with 11.3% in school B and 18.5% in school C). The greater degree of racial tolerance in an overwhelmingly Asian/Muslim populated school again calls into question the common sense assumption that mixed schools represent the most tolerant environments. It is reasonable from the results of this survey to conclude that it was the Asian/Muslim students in both the mixed and the mono-cultural schools who were, in fact, the most tolerant of all. The key question is whether White non-Muslim students who attend mixed schools demonstrate a greater degree of religious and ethnic group tolerance than their counterparts in mono-cultural institutions.

Attitudes towards the importance of faith coherence produced data consistent with those above. The fact that only 29% of the school A students were in favour of different faith communities working together compared with the 76% of School B students highlights the need to find more secular ways of promoting integration. School C students occupied the middle ground with 34% supporting faith unity, 15% opposing it, 22% expressing uncertainty and 29% claiming indifference. Further analysis confirmed that only 3% of the Muslims from across all three schools were opposed to the formation of faith partnerships compared with 26% of Christians and 16% of those with no religious affiliation. These findings do, however, suggest that levels of faith tolerance and the willingness to mix with people from other religious groups were, among these Muslim students, exceptionally high.

Despite the negative impact of events such as 9/11 and 7/7 on ethnic group relations in the UK, the survey confirmed without doubt that Year 10 Muslims living in East Lancashire were comfortable with their Islamic beliefs and, by the criteria adopted in this investigation, well integrated. Although 56% of the Muslim students in school B and 62% of those in school C expressed strong attachment to their Asian homelands, the overwhelming majority of Muslims in both these schools supported liberal democratic values such as showing respect for others regardless of social class, ethnicity, gender and religion; freedom of speech even if it caused offence, being friendly to people from other religious and/or ethnic groups, tolerating those with different views and, most interesting of all, showing loyalty to the UK. Perhaps the most surprising result was that around 90% of the Muslim students in school B and 95% in school C believed the value of finding one's own way in life rather than depending on others to be either important or fairly important. This would suggest that although the Islamic faith places great emphasis on surrendering to the will of Allah, an increasing number of young Muslims are finding their own ways of embracing self-reliance and of incorporating this into their personal religious identities. There would be much mileage to be gained from testing the generalisability of these data in other Muslim communities both locally and nationally.

While the responses of the Muslim students to questions of liberal democracy were largely positive, the data culled from the majority White students in school A had comparatively negative implications for community relations. Almost one half of the school A students felt that respecting others regardless of gender and religion was unimportant and almost one third felt the same way about cultivating friendships with people from different faith and ethnic groups. Around 66% of the students believed in free religious and political speech even if it caused offence and almost one quarter felt that it was unimportant to show tolerance to those with different views. The responses of these school A students to the values of self-reliance (approximately 95% felt this to be important or fairly important) and showing loyalty to the UK (around 87% supported this) were comparable to those of the majority Muslim students in school B and the smaller number of Muslims in school C. Despite the consensus between the Muslim and the non-Muslim students on these issues of free speech, national loyalty and self-reliance, the much higher levels of intolerance among the school A students towards people from different faith and ethnic groups along with their widespread belief in racial superiority reflected an insular, parochial outlook and a relatively illiberal social and cultural perspective.

5. From liberal integration to forms of extremism

A thesis: the roots/routes of extremism

These research findings are beginning to suggest to us some of the mechanisms whereby some young White people become extremist and why some young Muslims embrace violent extremism – and perhaps a link between the two.

The most worrying result came from the type A schools where young White people have few or no relationships with those of other ethnicities, cultures or faiths (though as a matter of fact as few as 8% seemed to have any contact with organised Christianity). What this means is that prejudices are never put to the test; friendships across the boundaries of race, faith and culture are never made; the values and attitudes of parents are internalised

and never challenged, other than theoretically by the school. These young White boys and girls from relatively poor backgrounds may then find in the ideology of the extreme right a coherent account of the world. It goes like this: 'Despite the fact that your forebears made Britain prosperous and powerful, you are not sharing that prosperity. You are compelled to live underprivileged lives. Why? Because people of another ethnicity and religion, only recently settled in the country, are allowed to take jobs and houses and to do at least as well and sometimes better than you. Moreover, the public bodies will fall over to help them, though not you – which is why education and working hard brings few rewards.' This account makes sense of their lives and in a strange way enables them to retain some dignity: their misfortune is not their fault (which would be an alternative account). It feeds resentment and no amount of teaching on citizenship or the values of neighbourliness will overcome these perceptions from the enclave.

The first result of enclavisation is white racism with all its smouldering resentments and discontents.

The results from type B schools, however, pose a more difficult question about Muslim extremism. How and why do young people (principally men) lose these liberal, humanistic and integrative values that they clearly have at school and become radicalised?

We think that what happens is that pupils in predominantly Asian schools absorb the values and attitudes of their parents which are broadly liberal, humanistic and integrative. In other words, the enclave is not the source of illiberalism but, on the contrary, nurtures liberal values. (Their parents, who have come to Britain from Pakistan, tend to be the more entrepreneurial and attracted by western society; in some instances they come to get away from a more tightly controlled theocratic society, though without completely breaking their links.) These liberal values are reinforced in the mosque and the school and not seriously challenged or tested until the young people leave school. However, when, as older teenagers, they leave the comparatively safe environments of home, mosque and school for work, college and the social life of the town-centre, they begin to encounter for the first time at first-hand White prejudice and racism. This leads them to reflect more widely on the position of Muslims in contemporary Britain. Unlike their parents, who may have come to Britain with lower expectations, these young Asian people have grown up here and have similar expectations and aspirations to their White peers.

Racism is encountered in many ways and contexts: taunts and comments; physical attack; the perception that jobs or promotion are influenced by ethnicity; the belief that while protection is given under the law to Christians (blasphemy laws) and Jews and Sikhs (race relations) no such protection exists for Muslims; the perception that Muslims are badly treated across the world (the Gulf Wars fall into this category); stop and search by the police; sense of suspicion and hostility; and so on. Most of it is fairly 'low level'. Even so, it can create a profound crisis of identity: 'If I can be treated this way in my own town and country, is it really possible to be British and Muslim?' The underlying anxiety is that it calls into question the understanding of Britain as a community of equal opportunities – which is what the home, the school and the mosque have taught. The danger lies in the fact that at this point in their lives these young people may not have anyone on hand to help them think through the issues and their experiences - they are not in school, they may not be comfortable turning to family, they may have little contact with mosque leaders who may in any case not appreciate the problem and what needs to be said, and if they are within the criminal justice system there may be little understanding of what may be happening to them and quite possibly no check on who is saying what to them.

Young Asian people respond to this crisis of identity and the tension it creates in different ways. Some continue to hold to liberal values, recognising White racism as disfiguring British society but not endemic or fundamental to it, and live with the tension of belonging to a minority that can sometimes be discriminated against. Some seek to dissolve the tension by assimilating into the wider community, abandoning their Islamic traditions. Others find a new sense of identity, meaning and self-worth by adopting a more conservative expression of Islam, sometimes more conservative than their parents. For some women this may mean adopting forms of Islamic dress, such as the *hijab* or *niqab*. For both men and women it means worrying much more about what in modern British life is *haram* (forbidden) and what is *halal* (allowed) according to Muslim law – as questions to Muslim internet sites show. **In other words, there can be radicalisation without extremism.** Indeed, these pious young Muslims are determined to follow the *sunna* of the Prophet by being model husbands and wives, neighbours and citizens. While they may describe themselves as Muslim first and British second, they are nevertheless committed to this country, though they regret that many of its standards –

the immodesty of women, for example - fall way below what the Quran expects. They can live with the tension implicit in the question, 'Can I be Muslim and British', because they realise that multiple identity is possible.

A few take a different route as a result of meeting travelling teachers (not the local imams) or joining certain societies or searching the internet. They have another theology available that has real allure: this extreme form of Islam also makes sense of the experiences of young Muslims. Racism and disappointment is explained as the failure of British society to live by the Quran. The world-wide Muslim community is idealised as the universal *umma* but greater emphasis is placed on the time when Britain (and the whole world) will be part of a Muslim caliphate – a theocracy. Moreover, in the struggle – *jihad* – to bring this about, violence is permissible. All of this has the potential to give the young Muslim a sense of real worth and importance as an agent of the future Islamic realm. It also dissolves the tension implicit in the question, 'Can I be Muslim and British?' by suggesting that one cannot be both; multiple identity is impossible; a choice has to be made. From the moment that this extreme strain of Islam is embraced, the adherent ceases to have loyalties to this country and to fellow Britons, even to members of his own family or local community. His loyalties are only to the idealised fiction of the *umma*.

A second consequence of enclavisation (where it results in mono-ethnic schools) is that a few young Muslims will be not only radicalised but also drawn into extremism if the only theology available to them as young adults to explain their experiences – including their negative experiences - is that of the extremist groups.

Our research suggests that most young Muslims have little contact with their local mosques and their knowledge of Islam is not very profound. This means that as they begin to wrestle with the question of identity in their later teens – 'What is it to be Muslim and British?' – they have few **theological resources** to help them. In any case, unlike Judaism, which has had longer to work out how to be Jewish and British, there is little Islamic theology to resource them and few teachers with the necessary skills to do the necessary work. Imams and religious leaders may need help in working on such a theology – which needs to detail what is permissible and what is not for Muslims in British society and to explain that in the modern world, most of us are going to have multiple identities. (There is a contrast here with the more extreme forms of Islam – the *Salafi* and *Wahabbi* traditions – that have any amount of written material, funded largely by Saudi Arabia). But theology is not something that governments can do and this is a real and urgent challenge to the Muslim community.

There is an urgent need for the Muslim community to produce fresh theological expressions of how one can be both British and Muslim that is at least as comprehensive and coherent as the ideology of the Islamic extremists. This is an urgent task not only for imams and others who exercise leadership at the local level. It is an urgent task for universities and colleges and for teacher-training.

In contrast, young Asian pupils in mixed schools – school C - encounter racism earlier in life and have to learn to deal with it in the playground. When this happens, parents and school teachers are on hand to be supportive and to reinforce the commitment nevertheless to integrative values.

Our supposition is that the earlier young people are exposed to the kind of low level ethnic prejudice that may always be a feature of any racially mixed society, the better. They not only need liberal values; they also need to develop early skills in dealing with racism and prejudice without losing faith in liberal society.

In passing we might note that this would suggest that if an over-riding policy goal of the school system is to contribute towards community cohesion, every effort should be made to prevent mono-cultural/mono-ethnic schools from developing. This raises an interesting point about schools that may become mono-cultural/mono-ethnic by being mono-faith – 'faith schools'. As with many policy options, different though equally desirable objectives may not be mutually reinforcing. Faith schools are wanted by parents. There is some evidence that they drive up standards. Moreover, the above results of the Year 10 questionnaires in predominantly Asian (Muslim) schools – i.e. their profile was almost that of a faith school - would lead us to suppose that faith schools are more likely to produce young people who espouse integrative values since faith schools take seriously and value not only their own faith but the faith of others. It was the type A schools – where few had any serious contact with organised (Christian) religion - that produced young people who were dismissive of other cultures and faiths. If faith schools are to be opposed it cannot be because empirically they produce young people less willing to integrate, because they probably do not.

It may be worth commenting here on a recent report from the think tank Policy Exchange.[17] Much was made of the report's finding that a majority of young Muslim people wanted to live under *sharia* law. We would suggest that this may not be all that it seems (it is, in any case, hard to know what was being asked since *Sharia* is not a simple and universal set of prescriptions and injunctions). What young Muslims may mean is that they want to live in a society that observes God's laws and mirrors the practice (*sunna*) of the Prophet. This is the correct answer of piety. In this respect they may be little different from young Christians who might say they too wanted to live 'under God's laws' – without necessarily being too clear what that might involve. But it needs testing. Young people need to be asked more specific questions about the actual content of *sharia* or other Muslim practices – government by clergy, submitting to clerical *fatwas*, multiple wives for men, discrimination against women in family courts, and so on - before we can be sure that this is what they want. When the specifics are made clear the enthusiasm may be tempered and the 'Yes' to *sharia* significantly qualified.

These results produce the paradox of the enclave. On the one hand, enclavisation is good. It nurtures young Asian people in liberal and integrative values through their early years. This bears out the findings of other qualitative research that suggests that enclavisation in most British cities does not adversely affect how Asian families feel towards British society.[18] They can live separate lives yet still feel that they belong. The enclave provides an oasis of liberal values. In doing so, however, it shields young people from issues they will subsequently have to learn to deal with, such as racial and cultural/religious prejudice. This is ameliorated if young Asian/Muslims attend mixed schools. If they do not attend mixed schools the challenge of racism occurs at the point where young people are entering wider society and struggling with questions of identity - What is it to be Muslim and British? – and where helpful adults are least on hand to give counsel and advice. This presents an opportunity for those with extremist ideologies/theologies to influence them.

On the other hand, enclavisation does have consequences for young *White* people. Illiberal and anti-integrative attitudes and values are much harder to challenge if schools are not mixed.

Enclavisation has a further consequence. The liberal state exists to protect the individual from the exercise of undue power by both the state itself and also by groups within the state, including cultural and religious communities. So, for example, a particular community may have traditional teachings about women or homosexuality that if acted upon would result in discrimination. The liberal state seeks to protect individuals from cultural or religious discrimination. But where cultural and religious groups live in enclaved communities, inevitably there is pressure from them to elevate the rights of the group – to teach and practice their traditions - over the rights of the individual not to be bound by them. We have already heard calls in some parts of Europe for *sharia*, for example, to be operated on a local basis where Muslims are in a majority. In so far as the doctrine of 'multi-culturalism' meant that all cultures and their practices had to be safeguarded above the rights of individuals to dissent from them, it operated against the liberal, democratic state. There are liberal values that challenge some traditional teachings and practices in all religions and those values must prevail.

The research among young people suggests to us that the overwhelming majority of Muslims are happy with liberal values and the institutions of the democratic state. But while they may as individuals want to live by liberal values the religious and cultural communities from which they come are not always or in all respects liberal. At this point, the British government and other public bodies need to be very clear that their commitment is to uphold those values in the face of pressures from more traditional community groups that do not share them.

6. Conclusions and recommendations

The purpose of this research was to consider the contribution that interfaith dialogue (broadly interpreted) might make to community cohesion. Our broad conclusions were these:

- First, faith groups are the most numerous, ubiquitous and socially comprehensive of any voluntary bodies in Britain today and in any consideration of community cohesion, their importance should be recognised. They make significant contributions towards the promotion and sustaining of those *values* that are essential for building, maintaining and safeguarding cohesive communities.

[17] Living apart together: British Muslims and the paradox of multi-culturalism (Policy Exchange 2007)

[18] See S Rizvi, News Cultures, Security and Transnational Belonging: cross generational perspectives among British Pakistani women (forthcoming).

- Second, while interfaith activities of many different kinds all make some contribution to community cohesion, the numbers involved are generally relatively small and the capacity to engage many others in a more secular age is probably quite circumscribed. There is much 'preaching to the converted'. More important than interfaith activity *per se* is the involvement of people of faith and their leaders in various community initiatives that are not faith-based. In any case, the most effective forms of interfaith activity will be where they are part of some wider secular partnership.

- Third, perhaps the most important interfaith work is done by the mixed school simply by virtue of its being mixed. Where teachers are ensuring that there is a place on the curriculum for raising awareness of other faiths and cultures and respecting differences, and where young people of different faiths and cultures are meeting one another in the classroom and playground, the school itself should be regarded as a form of interfaith dialogue.

- Fourth, in towns where communities tend to be enclavised and where mixed schools are not possible, every effort should be made to bring about contact between pupils from different faith and ethnic groups in early years of schooling.

- Fifth, our research findings are very clear about the effect of enclavised lives on the attitudes of young Asian/Muslim and White people. The young Asian/Muslim people have attitudes that are overwhelmingly liberal and integrative, whereas a sizeable number of young White people living in White enclaves and attending predominantly White schools have decidedly illiberal attitudes.

- Sixth, there is an urgent need for the Muslim community to produce fresh theological expressions of how one can be both British and Muslim that is at least as comprehensive and coherent as the ideology of the Islamic extremists. This is an urgent task not only for imams and others who exercise leadership at the local level. It is an urgent task for those concerned with teaching Islam in universities and colleges and for teacher-training.

These findings have implications for public policy if we want to see communities in towns like Burnley strengthened and made more cohesive. In particular:

- **Government should continue to support the 'little platoons' including faith groups**

- **Interfaith activities should be encouraged but especially where they are part of wider partnerships with secular groups**

- **Faith groups should be encouraged to draw more of their members into interfaith activity and interfaith activity should be supported.**

- **The 'mixed school' should be seen as a form of interfaith activity in itself and probably the most effective in ameliorating illiberal attitudes among some young White people and helping young Asian/Muslims to encounter and learn how to deal with racism and prejudice early in their lives – in the classroom and the playground - while they have helpful adults around them**

- **The mono-cultural school in towns like Burnley should be avoided whenever possible and when this is not possible, attempts should be made to bring young people together from the different communities as part of their normal school experience**

- **The Muslim community and those involved in education should be encouraged to develop an Islamic theology that deals with the issue of multiple identity**

It is undoubtedly the case with all empirical research that some key questions only become apparent after work has begun or can only be satisfactorily determined using more resources than are available. Nevertheless, we feel that some important questions have been thrown up by this research which do need answering:

- To what extent are White 15 year olds influenced by illiberal and non-integrative values?
- To what extent have Asian (predominantly Muslim) 15 year olds adopted liberal/humanistic values (which may or may not also indicate a degree of secularisation)?
- Is there a difference between the mainly Asian/Muslim school and the more mixed school for Asian/Muslim attitudes?

- To what extent have older siblings Asian/Muslim that have left the education system retained whatever liberal/humanistic values they had or have been 'radicalised'. If the former, how is racism in particular handled? If the latter, how far is radicalisation a consequence of 'fortress Islam' and how far a more secular 'gang' effect?
- Are women more or less likely to remain 'enclaved'?

The answers to these questions may prove critical for future community cohesion.

7. APPENDICES

Appendix A – Origin and evolution of Building Bridges Burnley

Appendix B – Faith cohesion opportunities in the school/college curriculum

Appendix C – Building Bridges Pendle School Outreach Programme

Appendix D – Typology of faith attitudes

Appendix E - Ward descriptions: Daneshouse/Stoneyholme and Rosehill with Burnley Wood

Appendix F – Main interfaith activities in Burnley 2005-2007

Appendix A

Origin and evolution of Building Bridges Burnley

Building Bridges Burnley was formed in 2001 in partial response to the disturbances. The committee of the Burnley Lane Fellowship of Churches (a local group of Trinitarian Christian denominations) wrote to express solidarity with representatives of Burnley mosques and to offer support to Muslim leaders who were trying to restore calm in areas of the town where most of the violence had occurred. Several weeks later, leaders from the Roman Catholic Church, the Church of England, the Methodist Church, the Free Churches and the local Islamic community formed a united group and the first Christian-Muslim partnership was born. Between the early autumn of 2001 and the spring of 2003, the organisation evolved from a handful of individuals to a formally registered charity with a constitution which read:

> The project…seeks to promote mutual understanding of the cultural, spiritual and moral ethos amongst people of faith and develop self-esteem, honesty, mutual respect and friendship, particularly amongst the different Christian, Islamic faith communities, by working with people of faith and different cultures to create opportunities to celebrate what they have in common whilst accepting, understanding and respecting difference.

Throughout the development of the partnership, BBB sought representation on a number of statutory and voluntary committees including the Council for Voluntary Service, the North West Forum of Faiths, Social Services, Inter Faith Network for the UK, Burnley Community Alliance, the UK Islamic Mission, Islamic Foundation Leicester, East Lancashire Together (the Community Cohesion pathfinder organisation for the boroughs of Burnley, Pendle, Hyndburn and Rossendale) and a large number of other bodies involved in interfaith and/or community cohesion initiatives. Some of these organisations offered financial as well as administrative assistance to the partnership and helped to create opportunities for the promotion of positive public relations. In the early stages, however, the primary objective of BBB was to assuage the tensions fuelled by the disturbances.

In May 2004, BBB appointed its first full-time project co-ordinator and a part-time clerical officer and an office was established on the ground floor of a local mosque. This mosque would become the official BBB centre. An adjacent room was made available some months later for committee meetings and for the performance of additional clerical duties. The available evidence suggests that this was the first (and the time of writing, the *only*) mosque in the North West of England to facilitate a Christian-Muslim partnership and to allow non-Muslims open access to its premises. In the initial stages of his appointment, the BBB co-ordinator spent most of his time attending local authority strategic planning meetings, preparing funding bids and developing a programme of activities. By 2005, the organisation had received funding from the Single Regeneration Budget, the Children's Fund, the Tudor Trust, Islamic Relief, the Methodist Church and several hundreds of pounds in donations from a number of small charities. While most BBB committee members were employed in the third and voluntary sector, those who were engaged in pastoral and/or community work (particularly religious ministers and youth officers) were becoming increasingly involved in the organisation's own initiatives.

At the time of the investigation, the BBB partnership comprised four committees - a management committee and three sub-committees. The management committee consisted of around twenty-five people (some of whom were auxiliary members) who met on a bi-monthly basis. The main purpose of this committee was to monitor the organisation's accounts and to preside over the three sub-committees. The first sub-committee was responsible for the facilitation of t*he Bridge Project* - an initiative for children between the ages of 8 and 13 years which became formally incorporated into BBB in April 2005. The second sub-committee, known simply as t*he BBB sub-committee*, played a key role in the planning and implementation of interfaith events and activities for adults in and around the town. The third sub-committee - *The New Schools Working Group* - was involved in the provision of faith activities in the town's five newly formed high schools and in an evolving Sixth Form centre. The Bridge Project, because of its mission to provide after school activities for children living in some of the most deprived wards of Burnley, attracted the lion's share of the organisation's funding. Between its formation in 2001 and the official starting date of my investigation in 2005, BBB had organised and successfully facilitated a series of Christian-Muslim seminars, several church and mosque visits, an interfaith feast and a tsunami appeal.

Alongside these activities and events, the Bridge Project contributed to community cohesion by providing a programme of activities for school children at risk from

social exclusion. The project officers (five in all) worked closely with schools and other agencies and had, in the previous four years, provided activities for several hundred children. The main aim of the project was to engage children in community orientated activities such as sport, drama, teambuilding and outdoor pursuits. The project targeted children from different social and cultural backgrounds with a view to averting some of the worst effects of social deprivation, especially educational underachievement and anti-social behaviour. Between 2002 and 2005, the Bridge team had delivered eleven after-school programmes, more than twenty free holiday activities and several residential workshops. By the end of 2005, there were ten junior schools and a small but growing number of secondary schools involved in Bridge activities.

The progress made by BBB was evidenced in the committee's own minutes and in the evaluation documents required by fundholders. What had begun as a largely reactive partnership in the months following the disturbances had become a proactive one within a four year period. The organisation had gained recognition for its work at local, regional and national levels and had received visits from interfaith groups in Sheffield, Leicester and Northern Ireland. It was also clear from the amount of funding that BBB had received and from the positive relations that it had established with other local agencies that it had made a positive contribution to community cohesion. The group had established strong links with the Local Education Authority, Burnley Borough Council, Lancashire Constabulary, Social Services, the Lancashire Council of Mosques, Lancashire Youth and Community Service, East Lancashire Together, Burnley Action Partnership, Burnley Community Network and several other local and regional partnerships.

Appendix B

Faith Cohesion Opportunities in the School/College Curriculum

Faith cohesion at subject level

The information collected during the investigation provided numerous examples of how faith cohesion can be included in a school or college curriculum. The examples in this appendix have been culled from materials produced by Burnley schools.

Religious Education (RE) is currently a core-curriculum subject in the secondary sector, but there is considerable confusion about its objectives. Much of this confusion derives from the failure to distinguish between religious *knowledge* (the dissemination of which is the main purpose of Religious Education and Religious Studies) and *collective worship* - a statutory requirement in secondary education and Sixth Form colleges. The delivery of RE involves the exploration, of issues such as the meaning of life (essentially a philosophical endeavour), the importance of religious identity to faith groups, the similarities and differences between world faiths, the changing nature of religiosity in modern societies, the causes of religious conversion, the study of sacred writings, the effects of religious behaviour, the legal status of religious organizations, the national and international influence of religious leaders and much more. The extent and the depth of this content varies depending on the syllabus selected by the school/college and on the level of study (AS/A Level Religious Studies syllabuses are, as one would expect, more demanding than GCSE), but whatever programme a student is following, RE does not, contrary to popular myth, involve students partaking in religious rituals such as prayer and meditation. Nor is it concerned with proselytising or fund-raising for philanthropic charities.[19]

Like many academic subjects, Religious Education and Religious Studies (and it should be noted that these are not the same disciplines) present opportunities to promote Christian-Muslim unity, whatever the level of enquiry. There are two particular syllabus areas that serve as good examples - the study of pilgrimages and festivals and the analysis of sacred texts. The first example was one that was used widely in East Lancashire at the time of our research. By establishing the common purpose of visits to places such as Jerusalem, Mecca and Lourdes, a teacher of Religious Studies is able to adopt an integrated approach to issues related to faith practice which should, if delivered in an objective manner, develop empathetic skills among religious and non-religious pupils alike. Similarly, the study of religious festivals such as Eid and Christmas is an effective way of developing pupils' appreciation of the concept of celebration and of raising their awareness of different religious events throughout the year. The second example - the study of biblical and koranic texts – presents rather different issues since it concerns religious beliefs rather than practice. Here, pupils can explore the similarities and differences between the Abrahamic religions and of why these traditions adopt adversarial positions on certain points of doctrine. Textual investigation is a key RS activity in many schools and colleges in the UK, particularly at the more advanced levels of study. According to the teachers, this presented one of the best opportunities for Christian and Muslim students to learn (perhaps for the first time) about the origin and evolution of their own and other faith communities. Moreover, it allowed those from other traditions or with no faith to explore the foundation of monotheism and to reflect more seriously on their own existential perspectives. In more general terms, the main benefit of an exercise of this nature is not so much to impart knowledge of sacred texts, but to equip young people with listening skills and with the ability to present an informed argument. Aside from the personal effort needed for the creation of a cohesive society, these skills lie at the heart of effective dialogue.

In addition to the didactic approaches employed by teachers and lecturers in the delivery of Religious Education and Religious Studies, the voices of the students themselves can also be used to impart knowledge of faith communities. While this was not, in our view, used to its full potential in Burnley, there were some excellent examples of activities such as student presentations and seminar style discussions in classroom settings. In one school, pupils were asked to prepare a short presentation of their beliefs through the use of power-point technology, images of religious symbols, family photographs of weddings and christenings, pictures of religious buildings and audio-visual resources such as video and CD Rom. Although the main purpose of the task was to develop skills of communication (using Religious Education and/or Religious Studies as

[19] In the light of this confusion, the time may have come to replace titles such as *Religious Education* and *Religious Studies* with something like *Cultural Studies* - a multi-disciplinary curriculum area that often features in Higher Education prospectuses and which could include the study of religion in all its forms.

an opportunity to do so), it did, in fact, raise awareness of different faith perspectives and encourage dialogue between pupils from different faith and ethnic backgrounds. For pupils who seldom engage in conversation with each other either in or out of school, an activity such as this can achieve more than its primary objective.

At post-16 level, programmes such as Health and Social Care and Humanities and Social Sciences provide some of the best opportunities for interfaith dialogue. In AS and A Level Sociology, for example, the study of religion appears as a discrete module on all the major syllabuses. In Burnley and Blackburn, the AQA specification was taught in all the post-16 centres; and, in line with the national trend, Sociology was one of the most popular A Level subjects in the area. Fortuitously, the subject recruited students from the towns' two main faith and ethnic groups. In the religion module, the syllabus content includes sociological theories of religion, the classification of religious movements, the impact of secularization on modern societies, the influence of the mass media on attitudes towards religion and the impact of religious beliefs on the construction of gender and ethnic identities. Since all these issues concern religion as a *social* phenomenon, they lend themselves to discussions about the importance of faith in people's lives. Although the main requirement of examination-based programmes is that students express their views within the academic framework of the syllabus (in this case, theoretically and conceptually), an innovative teacher can use this material to encourage dialogue between students from different faith communities.

Other Sociological issues such as the veiling of women, the representation of religious issues by the mass media, the high frequency of church attendance among Britain's Black population, the rise of religious fundamentalism and the attitudes of religious groups towards family issues such as marriage and divorce presents students with an opportunity to talk about their own beliefs and, at the same time, to challenge popular misconceptions propagated by television and tabloid newspapers. Two teachers enthused about the success of their work in raising awareness not just of religious beliefs, but of culture in general and of the fragile nature of identity. In classroom discussions about religious dress codes, for example, Muslim students would engage in dialogue about the meaning of the hijab and, more controversially, about whether veils should be worn in public places. In the Sixth Form in which these two teachers were employed, a sizable number of Muslim girls would often remove their headscarves on their way to school, sparking a debate among wider groups of Muslim students about the public demonstration of religious conviction.[20]

Issues concerning marriage and divorce can also lead to heated but informative classroom discussions. Large numbers of Sixth Form students experience first-hand the consequences of divorce in the UK, and although this is an event that can cause emotional distress, a Sociology or Citizenship workshop is one forum in which it can be debated. For people of faith, divorce is a moral issue (if not a religious prohibition) and it is here that Christian and Muslim students can identify common ground. Equally, there are opportunities for advocates of divorce (that is, students for whom divorce signifies little other than a practical solution to an unhappy situation) to present their secular antithesis. Students who reject religious perspectives will make frequent reference to the increase in divorce revealed in national statistics - a controversial argument that may lead to discussions about the sanctity of marriage and why marriages so frequently fail.[21] One lesson plan, the content of which made reference to differences in role relationships between ethnic groups, contained an exercise in which students were asked to distinguish between *arranged* and *forced* marriages - an issue which many Muslims believe is the source of confusion among non-Muslims and which presents a distorted picture of Islam. If facilitated skillfully, lessons such as these can be used as a vehicle for discussion and give students an insight into religious practices that they had previously failed to understand.

Vocational programmes present rather different opportunities for the raising of religious awareness than academic education. The essence of a vocational programme is that, unlike academic education, knowledge is acquired through student-centred learning - a defining characteristic of a National Vocational Qualification (NVQ).[22] Since much of this knowledge is skills-based, students are required to spend a certain amount of their time in a place of work where they are expected to gather evidence for their assessed portfolios. For students assigned to the public sector, the evidence

[20] Seemingly, this debate led to a political discussion about the concept of religious freedom - an issue that caused a political furore in France in 2004 with the banning of headscarves in state schools.

[21] Hence, the justification for arranged marriages in the eyes of some (though by no means all) Muslim students.

[22] Unlike academic programmes, NVQs are intended to enhance the student's ability to acquire competences for specific types of employment.

needed to complete coursework is obtained through the employment duties themselves (practical tasks, interaction with clients, general administration and so forth), all of which are intended to aid the development of interpersonal skills and provide opportunities for appraisal. Students enrolled on Health and Social Care programmes are allocated placements in hospitals, care homes or GP surgeries – settings that attract people from a range of cultural, ethnic and religious groups. It is in these public sector spaces that Health and Social Care students acquire knowledge of different faith communities and there are now several NVQ modules that address (either implicitly or explicitly) religion and ethnicity. One example of a written assignment from a sixth form establishment in Burnley that could be used to demonstrate this was a student investigation into why so few first-generation women of Asian heritage attend clinics for cervical smear examinations. Since the sixth form attracted a large number of Asian girls, this created a serendipitous opportunity for a group discussion about the relationship between religious beliefs and cultural practices.

The study of ethics is, as one would expect, central to health-oriented education and the issues that cause concern among faith communities are now well documented. It is only by allowing faith communities to explain their objections to practices such as embryonic research, abortion and euthanasia that different ethical perspectives can be fully understood.[23] At university level, medical students are required to study legal and philosophical issues in order to improve their awareness of the interplay between religion, medicine, law and politics. In the last three decades, health journals have given serious attention to issues that arise from the dissonance between medical practice and religious beliefs. At a much more basic level, awareness of some of these issues can be raised through vocational programmes in schools and colleges. In all the post-16 establishments in which our research was conducted, the wall displays in the Health and Social Care base rooms included visual images of practices that have come to be associated with particular faith and ethnic groups. At first glance, these appeared to be saying little about faith issues; but closer inspection of the syllabus content revealed the consideration had been given to the relationship between health and religion. Coursework topics also demonstrated this, among which were studies of sacred drugs in the Rastafarian tradition, the rejection of medical treatment among Christian Scientists, the prohibition of blood transfusions by Jehovah's Witnesses, the abstinence from alcohol among Muslims and the dietary laws of Hindus and Buddhists. While some of these issues present greater opportunities for faith based discussions than others, they all provide examples of how religious issues can be included in post-16 education.

To present a case for faith representation in every subject in a school or college curriculum would be an endless task, but it is worth commenting on two or three more examples. Subjects such as History, Drama and Literature frequently provoke religious dialogue and all three provide novel ways for teachers to raise awareness of cultural and religious diversity. The study of African slavery, for example, reveals a great deal about historical and political events (exemplified also in African music) which help to contextualize the social status of second and subsequent generation Black British communities for whom religion (particularly Christianity) continues to play an important role. Drama, too, offers an effective way of raising religious and cultural awareness. Role-play is a powerful learning resource that can act as a vehicle for the expression of social and religious identities. With sufficient sensitivity and insight, teachers of Drama can use theatrical performances to present hard-hitting messages about the consequences of extreme nationalism, racism, anti-Semitism, Islamophobia and other social and political ideologies that breed fear and prejudice. More importantly, stage-based settings provide one of the best forums for challenging deep-rooted misconceptions of religious communities and for presenting the positive influences of faith in people's lives. In this respect, fictitious dialogue can be used both as an anti-prejudicial device and as a means of encouraging pupils from different backgrounds to respect each other's traditions. Literature (rather than essentially *English* Literature) complements History and Drama in this endeavour. Since the introduction of the National Curriculum in the late 1980s, there has been a conscious attempt in the UK to promote knowledge of non-Western writing and this has proved an effective way for teachers of English to offer their pupils an insight into the dynamics of power. Texts such as *The Color Purple, To Kill a Mocking Bird* and *Othello* (not forgetting the poems and anthologies of a large number of Black writers) have played an instrumental role in challenging the ethnocentric bias of previous English Literature syllabuses and in presenting the lives of oppressed groups from their own perspectives. The inclusion of autobiographical literature is another way in which people whose lives have been affected by religious faith, be this as victims of discrimination or as human martyrs, could speak to large audiences of students. It is worth noting that in post-16

[23] All students entering the medical professions in the UK are now expected to have some knowledge of religious prohibitions as part of their programme of study.

education, subjects such as Film and Media Studies have created opportunities for teachers to promote religious and cultural awareness through visual genres.

It is clear from the examples contained in this appendix that if faith cohesion is to be promoted in the British education system, faith *empathy* must first be created. Although there is some reference to moral and spiritual development in most subject syllabuses, this seldom receives anything other than tokenistic attention from classroom teachers who are given precious little time to prepare innovative lessons. The above examples, however, show that faith oriented issues can be included in the curriculum and that this is one of the most effective ways of promoting religious diversity. Perhaps, therefore, it is time for *all* teachers, notwithstanding the constraints of examination syllabuses and the limited amount of time, to think more seriously about how they are presenting their subject content to their students and to consider whether they are making the best possible use of human and physical resources. At the same time, senior managers and policy makers need to devise flexible curriculum models to ensure that all students in full-time education (especially those in the post-16 sector who show little interest in Humanities or Social Science subjects) have sufficient access to knowledge of faith and cultural diversity and that teachers and lecturers are given sufficient support to build on existing practice.

Cross school/college provision

In addition to subject knowledge, a considerable amount of learning takes place through a *form* or *tutorial* system in most schools and colleges. The main purpose of the tutorial system is to enable teaching staff to impart information that is not necessarily knowledge based, but which, none the less, needs to be delivered if the education system is to function effectively. Tutorial sessions (usually one or two periods of a weekly timetable) have always been used by teachers and lecturers to carry out administrative duties such as student registration, form filling, announcing messages from Senior Management, electing school representatives, distributing reports, monitoring performance, assisting students with action plans, reviewing achievement, collating feedback, following up absences, arranging additional learning support, liaising with parents and a whole host of other responsibilities that fall outside the subject timetable. This system of administration has changed little since the early 1970s, save for the fact that a great deal of its content is now driven by Government policy.

The quality of the tutorial system has come to be seen, along with examination results, as an indicator not only of an institution's ability to meet targets, but of the student's educational experience. The efficiency with which tutors (the majority of whom are also subject teachers) carry out these tasks is, along with academic teaching, subject to the rigors of Ofsted. In post-16 education, tutorial periods are used for the delivery of non-examinable curriculum content and for college administration. Most Sixth Form centres and colleges of Further Education in the UK offer a range of academic and vocational programmes and at present, students tend to select one of these two routes (though it is possible to select components from each). Like the secondary curriculum, some Further Education programmes provide opportunities for debating faith and cultural issues while others do not. In the Arts, Humanities and Social Sciences, for example, faith perspectives can be introduced with little difficulty as demonstrated in the previous section. The natural sciences such as Physics, Chemistry, Biology, Maths, Computing, Electronics and Information Technology, on the other hand, rarely address cultural issues other than in a tenuous fashion. Consequently, students who opt for science programmes are seldom involved in classroom discussions and this limits their opportunity to engage in interfaith dialogue. Cross-college tutorials are one way of addressing this imbalance.

The second reason for including faith issues in the tutorial system relates more to the general philosophy (or 'mission') of institutions themselves. Since the early 1990s, schools and colleges have taken active measures to make their equal opportunities policies more explicit and most institutions now make reference to social and cultural diversity in their mission statements. While most schools and colleges have always had systems in place for dealing with anti-social behaviour such as bullying, racism and homophobia, the failure to address these issues through the curriculum can result in poor Ofsted grades and subsequent recommendations for improvement. Some post-16 establishments in East Lancashire have attempted to avert these criticisms by using the tutorial system as a forum for addressing human rights issues such as prejudice, discrimination, social inclusion and individual morality. In voluntary aided establishments such as Roman Catholic and Anglican Sixth Form colleges, religious and ethnic diversity are receiving renewed attention, not least because the institutions themselves are multicultural. The current evidence suggests that despite certain difficulties, the tutorial system is becoming the most

common forum for addressing issues that reflect the diversity of modern Britain.

The range of issues that can be addressed in tutorials is very wide indeed. Despite more Government intervention in recent decades, Sixth Form establishments are still able to offer a curriculum that reflects the social and cultural diversity of the wider community. At the time of our research, the two voluntary-aided Sixth Form centres (one of which was Roman Catholic, the other Anglican) used faith-oriented material in their tutorial programmes. Like most post-16 institutions, the tutorial systems in these two colleges were compulsory, which meant that every full-time student received a two year programme of enrichment as part of their weekly timetable. The students spent an average of one and a half hours per week in cross-college tutorials, although some of these sessions were reserved for year group assemblies. As one would expect, the content of the tutorial programmes differed between the two colleges and both establishments reviewed their provision on an annual basis. Since it was the Roman Catholic rather than the Anglican Sixth Form that recruited the largest number of Asian Muslim students, however, it is the Roman Catholic tutorial programme that will be considered here.

In the autumn of 2005, the Roman Catholic Sixth Form attracted over 1300 students (almost half of whom were non-Catholic) from local feeder schools. Around 25 per cent of the student population were of Asian (this is, Indian or Pakistani) heritage – a reflection not only of the ethnic composition of the town, but of the fact that the college had taken active steps to market itself as a community establishment with a strong Christian identity. Despite its Christian constitution, this was, to all intents and purposes, a multifaith/multicultural institution with an excellent record of recruitment and retention. It was surprising, therefore, to find little evidence of voluntary interaction either in or out of classrooms between Christian-Muslim (or in ethnic terms, White-Asian) students. While this was not something for which the staff could be held responsible, it seemed that the tutorial system provided the best opportunity for the promotion of Christian-Muslim relations and it was clear that this was something to which the college chaplaincy team had given considerable thought. In this establishment, group tutorials enabled students from different faith and ethnic groups to mix.

Two discrete 45 minute periods per week were allocated to the delivery of a rolling programme of topics to both year groups in the college. At the beginning of the academic year, the students were presented with a tutorial handbook containing articles, illustrations, newspaper extracts, quiz sheets, debating questions and a whole host of other student-centred activities. Despite the essentially Christian ethos of the college, it was clear from the content of these materials that the chaplaincy team had adopted an inclusive approach that reflected the cultural, ethnic and religious diversity of the student population. The introductory sections of the booklet highlighted the college's commitment to Christian values (rather than to Christian *liturgy*) and in so doing, the tutors were able to impart the college's all-encompassing message of inclusion. By focusing on spirituality rather than doctrine, the aim of the documents was to encourage students to think about their own religious beliefs when considering their relationships with others. Although some of the tutorial activities centred on images of God, the non-liturgical themes of respect for others, self-empowerment and cultural diversity meant that students from all faith backgrounds as well as those from none were able to participate in the workshops. On some occasions, the tutorial periods were used for central presentations (often in the form of a short film or role-play performance) and it was here that the ethical concepts of justice, equality, dignity, integrity, respect, human rights, freedoms and responsibilities were addressed. The main purpose of these presentations was to introduce spiritual issues to the whole year group in the hope that this would aid discussion in the next tutorial. Each tutor was then asked to facilitate the discussion with his or her tutor group while helping the students to complete the appropriate section of the booklet.[24]

Underpinning this tutorial programme was the recognition that while it is impossible to achieve a consensus of opinion on these issues, there is much to be gained from listening to others and from learning to respect religious and cultural diversity. The conceptual approach adopted at this college demonstrates flexibility in the sense that it was able to raise awareness of faith differences and at the same time, afford the students the privilege of reflecting on (or rejecting as the case may be) what they had heard. This reflective model is clearly only appropriate in areas of the curriculum that are free from prescriptive knowledge and/or in establishments where those in positions of leadership are not driven by their own political and ideological agendas. While this

[24] The workshop materials included multiple-choice questionnaire on faith and ethnicity in Britain, profiles of well known religious leaders, worksheets on racial and religious prejudice, scenario-based tasks on racism and intolerance and a large number of activities related to ethics and religious rights.

may pose some concerns to those favouring a more doctrinal approach, there can be little doubt that in a multifaith college such as this, a programme that focuses on ethical issues and common values offers a more realistic way forward. This suggests that the key to successful faith cohesion in education is to offer an inclusive programme that reflects a wide range of student perspectives.

Tutorial systems are by no means the only way of raising awareness of faith among young people. In 2002, the Labour Government's introduction of *Citizenship education* aimed to encourage school pupils to acquire a common sense of national identity and to provide them with skills that would help them on their journey into adulthood. This new concept signalled the Government's concern with fostering healthy social relations in an increasingly diverse and rapidly changing world. After some debate at ministerial level, the subject was introduced in August 2002 at Key Stages 2 and 3 and as an option in primary and junior schools. At the same time, the Government introduced a revised personal and health programme which became known as *Personal, Social and Health Education* (PSHE).

Much of the PSHE curriculum addressed issues such as tobacco, alcohol and drugs consumption and the more sensitive issue of sexual relationships in the hope that young people would acquire sufficient knowledge to handle situations that could have serious long-term consequences. The essence of the programme was to heighten teenagers' awareness of health risks and to improve their knowledge of sexuality, sexual relationships, sexually transmitted diseases and a whole host of other personal issues. Over the last two or three decades, provision of this nature has provoked a range of responses across the social and political spectrum. Traditional thinkers have long argued that sex education is likely to arouse the curiosity of young people and encourage promiscuity. The concern here is that increased knowledge of sex and drugs will exacerbate the social problems with which Social Services, the Police and local health authorities are already having to deal. Advocates of a more liberal perspective, on the other hand, defend what they claim is a more realistic way forward in a high risk, media driven society in which peer pressures (propagated by wider structural influences and reinforced by young people themselves) have reached an unprecedented level. According to this view, comprehensive PSHE is an attempt to manage behaviour attributable to modern youth culture and which, without responsible intervention, will only exacerbate the problems that the traditionalists fear most.

The Citizenship education programme had a rather different agenda. The aim here was to improve pupils' knowledge and understanding of western democratic societies with a view to fostering a positive sense of national identity. The Qualifications and Curriculum Authority (QCA) validated a large number of Citizenship modules for all four Key Stages despite the Government's decision to make the subject compulsory only in secondary schools. At Key Stages 1 and 2 (that is, in primary and junior education), the modules were intended to improve children's knowledge of public services, the legal system and civil life; examples of which included knowledge of the police, the media, children's rights and human diversity. At Key Stages 3 and 4, these issues would be studied in more detail, incorporating elements of law, sociology, social policy, economics, politics and basic social philosophy. It was hoped that by the end of Key Stage 4, secondary school pupils would have an elementary grasp of global issues and of the workings of the European parliament.

The introduction of these two curriculum areas (particularly Citizenship education) created opportunities for teachers to promote faith cohesion in British schools.[25] Between 2005 and 2006, the quality and extent of Citizenship provision in Burnley varied considerably. Interviews with Heads of Citizenship revealed significant differences in the amount of time allocated to the subject and to the curriculum content itself. By and large, the quality of the delivery depended on the general status that had been assigned to the subject within the school - a factor that was itself dictated by the suitability of the staff and the commitment of senior managers.[26] This echoes some of the main findings of the Annual Report of Her Majesty's Chief Inspector of Schools for 2004/5:

> …the story of the development of citizenship so far is one of qualified success. It remains the case that it is less well established in the curriculum than other subjects, and less well taught: indeed, some critics have seized on this as a reason for wanting to step back…Pupils' achievement in citizenship remains uneven. In general, schools have sought to establish pupils' knowledge and understanding about becoming informed citizens

[25] See www.qca.org.uk/7907.html for schemes of work for Citizenship education. Key Stage 3 units 3, 4, 11 and 13 and Key Stage 4 units 1 and 3 all lend themselves to faith oriented discussions that could be tailored to reflect the faith and ethnic profiles of a particular locality.

[26] It should be borne in mind that the subject is a relatively recent invention and that almost all the staff responsible for its delivery in Burnley were graduates of other subject areas.

> through discussion and short written responses, sometimes collaborative, sometimes using worksheets. More in-depth work, investigation and reflection, with substantial written outcomes, are less common. In some cases, the standards of pupils' written work in citizenship are lower than those in other subjects.

(OFSTED, October 2005)

The report confirmed that although Citizenship education was making progress in terms of its infrastructural development, it remained the case that most subject leaders were self-trained. This was offered as one of the reasons for the failure of many schools to devote sufficient attention to the learning outcomes of the subject and to the issue of how it should be assessed. In Burnley, the infancy of Citizenship education was patently clear. In most of the high schools, it was mainly teachers of Humanities (most notably, English, History and Religious Studies specialists) who had been appointed as Citizenship co-ordinators - a responsibility that had been imposed on them from their line managers, and for which the majority felt ill-prepared. This resulted in significant differences both in the amount of time allocated to the subject and in how it was delivered. In one school, the subject had been incorporated into the PSHE programme (a strategy which the co-ordinator claimed had been successful), while elsewhere, it was delivered as a discrete curriculum area. In another school, the Senior Management Team had taken the decision to involve all teaching staff in the delivery of the subject through the tutorial system – a decision which, according to the subject leader, had produced little success. These differences in delivery suggest that while there is much justification for the inclusion of citizenship issues in the secondary school curriculum, some serious attention needs to be given to the management of the subject with regard to planning, the use of resources and the involvement of pupils.[27]

Despite these difficulties, it would be unfair to suggest that the Burnley schools had not had some success in promoting religious, cultural and ethnic diversity through their Citizenship programmes. In almost half the schools, diversity events were planned during the summer term when senior managers took the decision to collapse the timetable on certain days (usually during the post-examination period) in order to enhance their Citizenship provision and/or to make their existing provision more tangible. There was one particular activity that is worthy of mention. The school concerned - a medium sized state comprehensive - was located in a deprived part of the town and had an intake of predominantly White pupils. According to the Head of Religious Studies, racist attitudes were widespread among the pupils, many of whom demonstrated an alarming degree of intolerance of anything other than their own very narrow concept of English culture. Above and beyond the management team's statutory obligation to include Citizenship education in the curriculum, this endemic nationalistic parochialism both in and outside school provided the rationale for the introduction of an annual Cultural Awareness Day.

The first of these took place on the school site and was made compulsory for all year groups at Key Staged 3. According to the materials produced by the school, the aim of the initiative was:

> ...to give students the opportunity to identify, investigate and celebrate their cultural heritage, encouraging them to value the contributions made to their society by people from diverse backgrounds. Better racial tolerance and qualities of citizenship are the desired outcomes.

The pupils from the selected year groups (that is, Years 7, 8 and 9) followed their normal timetable by attending their usual subject classes. Their teachers, however, had been asked to prepare lessons that were devoid of English content and to work as a team in order to avoid duplication. Year 7 pupils were told that throughout the day, their lessons would involve the study of Asian cultures, Year 8 would receive an African oriented education and Year 9 would follow an Eastern European curriculum. Heads of Department were given the freedom to invite guest speakers from the local community to help with the delivery of the lesson content and to enhance the authenticity of the material. Teachers were also encouraged to make use of multicultural resources, visual aids, IT and interactive learning aids. At break time and during the lunch hour, Asian and African music was played in the canteen while the pupils feasted on Indian food.

The day began with a whole year group activity in which the pupils were divided into small groups before being asked to consider human differences and similarities

[27] One possible solution to this problem would be to employ committed specialists with designated responsibility for its delivery. In the present climate, this could be achieved by allowing Social Science teachers (most of whom are employed in the post-16 sector since their subjects are not part of the national curriculum) to enter secondary education where their expertise could be of value.

(gender, hair colour, eye colour, interests, dress and so forth). The pupils were then instructed to separate these similarities and differences into the categories of 'heredity' and 'personal choice', the aim of which was to highlight the distinction between biological and cultural influences. This exercise was followed by an activity in which the pupils made a list of all the foreign countries they had visited and of the souvenirs they had brought home with them. In this way, the school was encouraging the pupils to consider the various physical items that first generation minority groups living in the UK had brought with them from their birth lands and how these came to be passed on to second and subsequent generation members. The list was then extended to include non-physical items such as music, language and religious beliefs, all of which constituted something that could be called a 'collective culture'. The aim of this exercise was to encourage the pupils to identify cultural similarities, and at the same time, to recognize differences *within* ethnic groups. These activities laid the foundation for the afternoon workshops.

In addition to the substantive issues, it was clear that the teachers had made every effort to ensure that different styles of learning (visual, non-visual, kinaesthetic and so forth) were reflected in the workshop tasks in order to maximize pupil participation. In Physical Education, for example (a subject that appeals largely to kinaesthetic learners), pupils from different year groups received lessons in karate and javelin throwing - activities that had been selected to represent South East Asia and Ancient Greece; while in Geography, power-point images of education in France were used to capture the interest of visual learners. Among the many other activities (too many to mention here) were a Chinese musical recitation, a interactive computer game entitled *Life in an Indian Village*, a mathematical exercise using a non-Western number base, a crossword containing non-English words, the design of a multicultural website, the preparation of an Italian meal, the production of a Russian folk dance and the creation of an African mural. Throughout the day, the pupils recorded their experiences on dummy passports which they used to gain entry into the various countries represented by different parts of the school. The passports were stamped by the teachers at the start of each lesson once the pupils had crossed the fictitious border. When the day drew to a close, the pupils were asked to prepare a short statement about which workshop they had most enjoyed. The statements were passed on to the Curriculum Management Team for evaluation.

These examples support the case for cross-curricular initiatives that promote social diversity. Like most other educational models, however, cross-curricular strategies are unlikely to succeed without meticulous planning. Few would doubt that annual events such as Cultural Awareness Days are innovative and that they boost student motivation, but they are little other than tokenistic if no attempt is made to embed their outcomes into other areas of the curriculum. This requires teachers to be mindful of their own ethnocentricity and to make a conscious effort to reflect in their teaching the social composition of the wider community - an issue that deserves the attention of awarding bodies. At present, there is some call for schools and colleges to consider new ways of delivering compulsory subjects that support the community cohesion agenda. Citizenship education is a case in point.

Our findings suggest that while tutorial provision may be necessary for the dissemination of school/college-wide information, they do not always provide the most appropriate forum for the delivery of faith based education. Worrying though it might be, many full-time teachers and lecturers regard tutorial responsibilities as irksome and mundane, and their commitment to faith cohesion varies in accordance with their own religious beliefs and individual workloads. At present, it may be expecting too much of teachers to address faith issues in tutorial workshops. The suggestion that faith should be included in Citizenship education is equally problematic. At the time of our research, all but a very small number of teachers felt au fait with Citizenship themes and most were uneasy about facilitating discussions that required an understanding of sociological, political and religious issues. All things considered, it would seem that while the cross-curriculum model offers an effective means of broadening the educational horizons of students, the question of how best to achieve this remains unanswered.

Appendix C

Building Bridges Pendle School Outreach Programme

The Building Bridges Pendle (BBP) programme comprised six consecutive weekly workshops, each lasting around one hour. These workshops reflected the PSHE/Citizenship guidelines and contained implicit and explicit interfaith elements. Throughout the period of their delivery, the team sought to provide children with an opportunity to discuss controversial local and global issues in the safety of the school environment. If delivered successfully, the team believed that the programme would help local children to acquire a better understanding of faith and cultural diversity and of how and why Britain had become such a diverse society. The following excerpt from the BBP education mission statement demonstrates the team's attempt to link elements of the programme to other curriculum areas:

> The interfaith team carries the interfaith thread through all the PSHE/Citizenship work in schools. The interfaith team will ensure that social behaviour is related back to the interfaith perspective at regular intervals. Where there is sensitivity and conflict in faith matters, the team will propose alternative faith standpoints in a neutral manner, leaving the individual student to make their own commitments or solutions, using an interfaith, non-faith, or faith tool…The presence of interfaith teams clearly coming from different faith traditions, and patently coming from outside a school culture is a major and unique strength. The effectiveness of these teams is increased because of total integration of school staff in the delivery of the programmes…Each school year has its own programme which builds on the previous year's teaching. In each year, there will be an agreed set vocabulary to be taught and developed. It is hoped that primary schools will be able to incorporate this new vocabulary into their literacy hours, and secondary schools will do the same into their English teaching programme. The programmes aim to work in close conjunction with the schools' existing courses such as English and RE.

The team produced its own programme booklets for each year group. The booklets contained over 65 pages of materials including a copy of the above mission statement, the PSHE/Citizenship schemes of work, an overview of the six sessions, a selection of teaching guidelines, some workshop activity sheets, several tables of statistics, three street maps, a small sample of newspaper cuttings and a feedback questionnaire. The booklets were intended as a reference source for teachers and were posted to the schools long before the BBP team made its first visit. This gave the Citizenship co-ordinator time to peruse the document and to consider whether s/he wanted to assist the team in the delivery of the programme. In most of the schools, the team was given the freedom to present the workshops without the intervention of teachers, although teachers and classroom assistants often helped with the facilitation of activities.

The programme focused on social cohesion and placed particular emphasis on the issue of how different communities can learn to live together. The workshops were delivered in an interactive manner and contained four core modules; namely, *My World and Me, Conflict and Conflict Resolution, Social Behavioural Influences* and *Solutions*. Both year group programmes contained icebreakers, stories, scenario activities, empathy exercises and role play activities. The aim of the Year 7 programme was to build on the knowledge gleaned from the previous year, although the repetition of certain themes allowed for the fact that some of the pupils had not (depending on which primary schools they had attended) received any former BBP input. In a small number of the workshops, the team included video footage, talks by local police officers and parental participation. In the *My World and Me* module, the sessions revolved around issues of religious diversity at global and local levels, holy sites, personal identity vis-à-vis the wider society, social harmony, cultural difference and demography. The *Conflict and Conflict Resolution* module addressed the causes and escalation of conflict (including inner conflict and emotional distress), anger management, prejudice, discrimination, bullying, verbal abuse, and aversion strategies. The *Social Behavioural Influences* workshops addressed issues such as stereotyping, peer pressure, mob mentality, the role of the local community, and the influence of key agents of socialization. The final module - *Solutions* - aimed to promote understanding and respect through activities that focused on reason, knowledge, empathy and interpersonal relations. It was in this section that the issues of faith cohesion and interfaith dialogue received explicit attention.

The main strength of outreach programmes such as these is that much of their content reflects local issues (immigration and asylum seeking being key examples in the Pendle area) which aid young people's awareness of

the importance of positive community relations. In both the Year 6 and the Year 7 programmes, pupils were asked to reflect on the concepts of ethnicity, diversity, faith and identity as descriptors of the Pendle borough and to construct a list of local landmarks (places of worship, workplaces, restaurants, visitors' centres and so forth) that could be used as indicators of mono and multiculturalism. In the first two workshops, pupils were given street maps and tables of statistics indicating local settlement patterns and differences in ethnic membership in each of the 11 wards. This was accompanied by photographic images (presented in the form of a slideshow) of the local community. The team's own evaluation confirmed that the majority of White pupils were surprised to learn that although two-thirds of the occupants of one ward were of Asian heritage, the total number of BME residents for the borough as a whole was only 14 per cent. The team used these demographic trends to challenge local and national misconceptions about the ethnic group composition of the borough and to highlight some of the negative perceptions of Black and Asian communities in the UK.

The remaining workshops centred on the causes of ethnic segregation and of the undesirable consequences to which this can give rise. According to the BBP co-ordinator, the most effective way of building on the issues raised in the first two weeks was to use scenario material that would help pupils to understand the complexity of immigration and its impact on social relations. This strategy achieved positive results. Unlike the introductory sessions in which the pupils had been given textual data, the issues of immigration and settlement were addressed through a series of imaginary activities that addressed local issues. In one activity, a Year 7 class was divided into small groups and asked to imagine that they were about to leave their homelands in search of a better life. The pupils were told that the country into which they would be emigrating had initiated the invitation (for the benefit its own economy) by offering employment contracts to migrant workers. Each group was required to complete a set of questions related to the scenario and to record their responses on a flip chart. The pupils were asked to consider how they would handle the emotional wrench of leaving their loved-ones (many of whom were elderly and living in poverty), what practical difficulties this would pose, which particular elements of their culture they would want (and could reasonably expect) to retain once they had arrived in their new place of residence, what attempts they would make to establish positive relationships with members of the indigenous population, which civil activities, if any, they would want to avoid without causing offence, what steps they would take to ensure that they remained near to people who shared their cultural heritage, what they would do to help their children adjust to a different way of life and a whole host of other questions related to the hopes, fears, problems and solutions associated with economic migration.

The team members agreed that of all the workshops they delivered in the Pendle schools, this scenario activity provided the most powerful way of challenging some of the deep-rooted misconceptions that pervaded East Lancashire and of inviting young people to reflect on the attitudes that they had internalised. The team had chosen this activity in order to contextualize the history of immigration and to help the pupils to understand the significance of the demographic data they had examined in the previous sessions. This strategy of linking macro social and cultural events to the evolution of the local community offered an effective way of nurturing empathy and of improving the pupils' knowledge of historical and cultural development. By the end of the scenario exercise, the pupils were able to make sense of the settlement patterns that had occurred in their borough (an event that they now realised had its roots in the industrial revolution and particularly in the growth of the textile trade) and the effects of these on community relations. The pupils recognised that for people of Asian heritage (particularly first generation members), the issue of immigration in the 1960s had revolved around economic stability and the need to create a sense of belonging. Despite having lived in the Pendle borough all their lives, most White pupils were unaware of the life experiences of first generation Pakistani and Bangladeshi settlers and hence, of the reasons for the emergence of distinct ethnic and religious groups. Towards the end of the programme, issues such as housing tenancy, social and cultural relations, faith commitment and the establishment of BME family businesses were seen in a different light.

By presenting the process of immigration and settlement as a historical narrative, the team had unravelled a complex story that had come as something of a revelation to a large number of pupils. This imaginary immigration exercise was far more than a lesson in social history. The whole *raison d'etre* of BBP was to promote faith empathy and the workshop activities were intended to contribute to this objective. The team recognized that didactic approaches to faith cohesion were unlikely, in the current secular climate, to be successful. The failure of conventional religious knowledge to raise the profile of faith communities, less still to equip young people with an appreciation for religious diversity was an issue to which several RE

teachers in East Lancashire alluded. By drawing on the concepts of empathy, stereotyping, disunity and respect for difference, the team was able to strip away the various layers of prejudice and help the pupils to empathise with people who thought and acted differently from themselves.[28] In their attempt to promote a better understanding of immigration, the outreach workers had, in fact, raised the profile of faith.

[28] In January 2005, the team leader together with the Director of Evaluation Studies at the University of Huddersfield designed a pupil feedback questionnaire which they used to establish the extent to which the programme had achieved its objectives. The results of the questionnaire were encouraging. A comparison of the baseline and post-intervention scores revealed a marked improvement in attitude in 43.1 per cent of the respondents. The most significant changes were found in pupils who had attended more than half the sessions and who had entered the programme with the poorest baseline scores (Kazi and Eades, 2005). Although there have been few official studies on the effectiveness of outreach provision in British schools and colleges, these results suggest that faith partnerships can contribute something of value to the curriculum.

Appendix D

Typology of faith attitudes

While typologies are often criticized for their generalized and over-simplistic representations of social phenomena, they do, none the less, provide a starting point for the analysis of social attitudes. The typology below attempts to show different faith perspectives and to demonstrate the extent to which people from secular as well as religious backgrounds are willing to take part in discussions, events and activities that promote faith unity. The following types have been identified from the analysis of a wide range of primary source material including interview data, conversations with residents, evaluation questionnaires administered at interfaith events and the Year 10 survey. Teachers, faith leaders and project facilitators may find the typology helpful when planning religious and/or community-oriented initiatives. Policy makers, on the other hand, may prefer to use it as a template for the investigation of social and political attitudes or as a frame of reference when dealing with faith communities.

The participants who expressed their views of faith either in interviews or through the questionnaire survey could be divided into four distinctive sub-groups or 'types'. We have called these *religious inclusivists, religious exclusivists, secular cohesionists* and *secular aversionists*. Each type represents people who hold similar views of religiosity and who are equally supportive (or equally critical) of faith-based initiatives. Curiously enough, not everyone with religious convictions expresses a willingness to partake in interfaith dialogue or even to encourage activities that work towards faith cohesion. Conversely, there are a significant number of religious sceptics who, despite their agnostic or atheistic views, applaud the attempts of faith partnerships to unite segregated communities. Some of these respondents even express an interest in contributing to faith-oriented projects, so long as there is no inclusion of worship or an attempt by people of faith to proselytize. Our findings confirmed a wide variation of attitudes among young people and a complex picture of faith diversity within and between social groups. Transcriptions from the interview data have been included in order to demonstrate some of these differences and to allow the interviewees a voice.

Religious inclusivists

Religious inclusivists are, as the term implies, people of faith who are willing to engage in dialogue with members of other religious groups. Most religious inclusivists regard themselves as moderate in their religious behaviour, although the nature of their beliefs and the intensity of their convictions vary. As far as this investigation was concerned, this group represented the majority of those who held religious beliefs regardless of whether they attended a place of worship. Religious inclusivists lived in different localities and belonged, for the most part, to mainstream faith communities. Among the Christian denominations, inclusivistic attitudes were widespread among Roman Catholics, Anglicans, Methodists, Baptists and non-conformists. The Muslim respondents expressed an even greater homogeneity of faith attitudes and willingness to work with other faith groups despite their greater adherence to religious rules.[29] As one might expect, the Muslim communities of East Lancashire tended to regard conservative Christians as their closest allies, recognising similarities not so much in religious doctrines, but in ethical and moral principles. The following comments from four of the interviewees, two Muslim and two Christian, convey the perceptions that the two main faith communities held of each other and of their mutual willingness to engage in dialogue:

> I think that there are moral values that stem from people's faith and when this comes across, it's fantastic. I have seen a charitable spirit from the Christian community when the Tsunami happened…they were out in the town centre collecting with their buckets…always willing to give and I think that this is shared across the board with people of other faiths and even no faith as well...and I think that if people of different faiths come together, they can be a united force, because there's a push towards secularism in our society and a shift away from faith (female Muslim aged 24 years).

> Our religion does not block out other religions. In this society, the main religion is Christianity and we don't disrespect this in any way. Some of the things that are taught within Christianity, we believe in and can relate to…some of the things we relate to and accept, just like Christianity accepts some of the things that Islam has to offer and some things we might agree to…so my religion isn't just Islam, it's Christianity, Judaism and Islam. There are things in Christianity and Judaism that are exactly the same as Islam…

[29] A reflection clearly of the fact that Islam is a less diverse system of belief than Christianity.

people talk too much about differences rather than similarities (male Muslim aged 21 years).

I think that other faiths have a massive amount to offer. I really believe that different faiths can live together and share life together and share different concepts of their faith together and yet still hold strong in their own faiths. Muslims have offered me so much that has helped my own faith and I think it's very healthy to be with people who are different…Muslims have lots of things that can contribute to my faith. One thing is their commitment to prayer…I'm astonished constantly that they manage to pray five times a day and I think that Christians have got so much to learn from that. The Christian church and the Muslim community are working closely together in Burnley and I have seen amazing things happen. In lots of ways, I don't think we're segregated at all apart from different worship centres and so on where we have to be divided; but I think it's a race thing that divides people, not religion (female Christian aged 23 years).

It's nice to chat with Muslims about their faith. There are things that as a Christian I would object to about other faiths, but I also think that Christians could learn a lot from other people. It was fascinating for me to hear about some of the things that Muslims do during Ramadan and I think there are an awful lot of things we could all learn…I think that a lot of Christians eschew discipline and most Christians tend to see discipline as a negative thing. Christians seem to want a dedicated, but not a habitual relationship with God; but the Muslim concept of praying five times a day is something that Christians could get a lot out of. The majority of people don't find prayer easy and I think that if there's something to encourage you, that's no bad thing…I would say that the Bible is the truth, but that doesn't mean that we should shun other faiths. I think that we should embrace other faiths. As Christians, we should live in a way that is relevant to the world rather than be isolated from it. I think that I would struggle to pray with other faiths and worship with other faiths, but other than that, I think we have a lot to gain from each other both socially, and in some respects, religiously (male Christian aged 24 years).

Although there is little reference to doctrinal issues in these transcriptions, the interviewees clearly had respect for their religious counterparts and were eager to learn from other faith groups. The fourth respondent realistically acknowledges the difficulties involved in partaking in joint worship, but is none the less earnest in his belief that faith unity can only be beneficial. The first respondent suggests that charitable acts such as fund raising provide one of the best opportunities for people of faith to work together and that this can bring about spiritual unity without having to enter into religious dialogue. Practical initiatives such as these would, of course, enable faith and non-faith groups alike to engage in social interaction, even if it meant having to tackle the more difficult questions of faith differences at a later stage. In the last analysis, these initiatives are an effective way of uniting people who live in some of the most segregated parts of the country.

In addition to the challenges that faith communities face in working with each other, there is the equally difficult task of including people of no faith in faith-based initiatives. The evidence from our research suggests that the religious inclusivists were, for the most part, happy to engage with agnostics, atheists and secular humanists; but recognised the difficulties of achieving this through a liturgical agenda. Rather, the respondents emphasised the importance of showing faith by good example to those who did not hold religious beliefs. The most common suggestions included participating in acts of charity and playing an active role in community events that welcomed the contribution of faith groups. The general feeling was that while initiatives such as these were not driven by faith oriented activities, they did at least embrace values such as humanitarianism, social justice and self-sacrifice, all of which could earn the respect of religious sceptics and create opportunities for faith and secular groups to form closer alliances. The following comments from an interview with a Christian youth officer echo this suggestion:

> It's about having the chance to spend time with people who do not have a faith, but it needs to happen in the right setting. I went to an event recently at the Burnley Youth Theatre. It was an event that was about bringing people from different ethnic groups in Burnley together and I think this should happen a lot more. The people who took part spent the day together and they learnt a lot about community and cohesion and exploring those ideas. There were Christians and Muslims who also took part and they talked about their faith and how this helped them to make Burnley better. The whole day went really well and I think this needs to happen much more (female Christian aged 22 years)

This young woman was clearly in an area of employment that lent itself to the promotion of community cohesion issues and endorsed the view that faith perspectives could be included in secular events. There is, however, one other detail in her transcript that is worthy of consideration and that has important implications for the analysis of social segregation. The multicultural event to which she referred was aimed mainly at ethnic groups rather than faith representatives and this begs the question of whether, in fact, it was faith, ethnicity or some other social divider that was the root cause of division in East Lancashire. When asked to comment on the extent of segregation in their own town of Burnley, the majority of the interviewees claimed that it was social class and/or ethnicity rather than religion that divided their communities.

Social class has always been one of the main forms of segregation in every human society, but the fact that it cuts across other variables - age, gender, ethnic membership, religion, nationality and so on - makes it very difficult to analyse as a separate concept. In deprived areas of the country, class divisions exacerbate other social tensions that derive from the often negative perceptions that different communities hold of each other. The nature and extent of social segregation and its complexity in Burnley was expressed by several interviewees from the two main ethnic groups:

> I think Burnley is segregated in millions of different ways; but I don't just see it as a Burnley problem, I see it as a worldwide problem. People don't look at how they can relate to each other; they look at differences. I think that Burnley has territorial problems, religious problems and also class problems. Some people feel that they are getting less money from the council and the BNP tell people this…then there's racism which is another problem. Some people don't go into Asian areas because they think they'll get beaten up because they're White; and Asians won't go into a White community because they think they'll be beaten up by White people. I think that the riots have caused more and more segregation and there are areas that didn't have a problem with racism before, but they do now because of the riots (Asian male resident aged 22 years)
>
> I think that regeneration is a good thing but it's also a bad thing because people are shifting to other areas of the town. When they knock the houses down in White areas, White people won't move into an Asian area; they'll move into another White area. At the moment, Asian people are having their houses knocked down in the Daneshouse area and so what's happening is that they're starting to move into the more mixed area not too far away. But the people in that area are now starting to feel uncomfortable and they're moving away; so people are always shifting away because they're just not used to having different ethnic groups living near them (White male resident aged 19 years)
>
> When our parents moved to this country, they came here to work and with the idea of going back one day; but things have changed now because the second generation see Britain as their home and Pakistan as a visiting place; so we can't live there because we don't know how to live there. You see, our parents withdrew themselves from society when they moved here. They went to work and then came home and didn't really move out of the areas that they'd settled into and I think that caused a lot of problems. Even now, you get older people from our own communities who won't talk to White people. They'll talk to nurses and doctors and people like that because they have to, but they don't find it easy to make conversation; whereas if I see a White person I'll say "Hiya" and I think this is where it's getting better (Asian male resident aged 24 years)
>
> I think it was much more difficult for our parents when they migrated to Burnley in the 1960s because they didn't know the language and this cause fear on both sides; and because they couldn't speak the language, they couldn't mix and so neither party really wanted to mix and I think that this would happen anywhere. But it's certainly getting easier now. It's like asylum seekers who come into this country; they see us as another minority group that are already established and they can relate to us and they're picking up on how to get on with people because they can see that we're doing it. But our parents had no example to follow (Asian female resident aged 26 years)

These four residents seemed acutely aware of the segregation that existed in their town and all commented on its various manifestations. The issues of insularity, White flight, fear of difference and language barriers to which the interviewees referred were well known to local council officers and community leaders. At present, the greatest challenge for faith groups is how to make their mission meaningful and applicable to those for whom faith is unimportant and who feel that their

localities are divided not so much by religion but by ethnic membership. While it is not the job of faith communities to tackle economic deprivation, faith leaders can certainly provide personal and pastoral support to those who have experienced some of its worst effects. More generally, faith communities can, with sufficient funding, act as capacity building agents in segregated urban boroughs in which tensions run high and where people regard ethnic diversity as a hindrance to public relations. It is here that the religious inclusivists can offer some of the most productive ways forward.

The perceptions of the above interviewees highlight the need for strategies that will address a range of complex social divisions. The support for faith cohesion expressed by the respondents can help assuage fear and suspicion and so reduce the potential for civil unrest. If the religious inclusivists are to be successful, however, they must address the main sources of these divisions and attach their own faith-oriented objectives to the community cohesion agendas of their local borough councils. In the north of England, faith partnerships have made every effort to promote religious tolerance through race relations initiatives and through Citizenship education. The educational outreach work in Burnley, Pendle and Blackburn provides one of the best examples. Activities such as team building, role play, empathy workshops and cultural awareness programmes in local schools enabled the facilitators to incorporate their inclusive philosophy into a range of initiatives for young people. In 2001, the Pendle group created its own Citizenship programme for Year 6 and 7 students in the Nelson and Colne area while in 2002, the *Bridge* team (a sub-group of BBB) introduced a range of after-school activities for younger children. These cultural and ethnic diversity programmes demonstrate the attempts by religious inclusivists to address faith in a secular liberal fashion and through a range of human rights issues rather than as a moral duty. While religious traditionalists regard this as an altogether too subtle approach to faith ministry, it is, in the current climate, the most realistic way of engaging with young people whose attitudes towards faith vary enormously and who seldom see religious division as the underlying source of discontent.

Religious exclusivists

Unlike religious inclusivists, religious exclusivists are people for whom interfaith dialogue carries theological risks. While belief in the certainty of one's own doctrines can vary even among religious moderates, exclusivists regard faith cohesion initiatives as indicative of weak conviction and an attempt to undermine existential truth. The most exclusive organisations are those that espouse fundamentalist teachings and that use these as the basis for renouncing the world. This is not to say that exclusivists live in closed communities (most, in fact, do not) or that they are unwilling to converse with people who hold different views to themselves; but rather, that they are inclined to keep voluntary contact with outsiders, religious as well as secular, to a minimum. From their perspective, this separatism is a manifestation of spiritual cleanliness and of the desire to show the rest of the world that they are a people set apart. Millenarian movements (that is, movements that prophesy the end of the present world order and/or an impending Day of Judgement) fall into this category. Millenarian devotees regard exclusion as a necessary requisite for the inauguration of a New Kingdom or for their own salvation.

Religious exclusivity can be found in all the major world faiths. At their most extreme, exclusive ideologies can act as a catalyst for religious violence (as in the case of Holy Wars or suicide bombings), though most are expressed in less radical forms. While we found no evidence of religious radicalization (certainly not the kind associated with acts of terrorism), it would be wrong to suggest that religious exclusivity did not exist. In every main town in East Lancashire, there is a small but significant number of exclusive religious organisations including the Church of Jesus Christ of Latter Day Saints (the Mormons), the Watchtower Bible and Tract Society (the Jehovah's Witnesses) and a cluster of Pentecostal and house fellowship churches, all of which extolled the virtue of religious separatism to their own members. These movements are renowned for their dualistic *weltanschauung* (that is, the view that the world comprises the warring forces of good and evil) and for their condemnation of other faith communities. The following two quotations from Jehovah's Witness publications exemplify some of these characteristics:

> Satan has used verbal and physical persecution to turn individuals away from true worship. But he has also employed more subtle means – cunning acts and sly devices. He has cleverly kept a large proportion of mankind in darkness by means of false religion; letting them think, if they so desire, that they are serving God. Lacking a genuine love for truth, they may be attracted by mystical and emotional religious services or be impressed by powerful works (Watchtower Bible and Tract Society 1983: 64).

> Thus, by what they have taught and what they have done, the religions of Christendom have demonstrated that their claim of believing in the Bible and of being God-fearing and Christian is a lie. They have betrayed God and the Bible. In doing so, they have disgusted millions of people and caused them to turn away from belief in a Supreme Being (Watchtower Bible and Tract Society 1993: 19).

It is rather surprising, given their scathing attack on other faith communities and unequivocal renunciation of the world that exclusive groups such as the Mormons and the Jehovah's Witnesses should endeavour to engage with outsiders by knocking on doors. The key purpose of this public ministry, however, is not so much to develop interfaith dialogue, but to proselytize. This monopoly over truth and tendency to dismiss all other faiths as errant prevent exclusivists from entering into activities that encourage participants to celebrate religious diversity. Unlike the religious inclusivists who feel they have something to learn from other faiths; the exclusivists' main motivation for conversing with people who hold different beliefs is to win recruits.

It would be wrong to suggest that as ecumenical chaplaincy starts to become part of the faith landscape, religious exclusivists will demonstrate a willingness to partake in interfaith initiatives. There are two main reasons why this is unlikely to happen. Firstly, those who propound exclusive doctrines express their allegiance to a universal message that is impervious to social context. Exclusive movements, be they fundamentalist fringe groups or puritanical sects, are in pursuit of a theocratic mission across time and space regardless of their own popularity or of the alleged benefits of religious unity. It is this conviction that theirs is the *only* version of truth, accompanied by the certainty of their own salvation that prevents exclusivists from forming faith partnerships and (in their own eyes) entering the realm of the devil. The second reason is more concerned with social change than with theological validity. Those with an exclusive outlook argue that it *because* the world has become so diverse and amorphous that real truth has been lost and God's purpose for humanity obscured. According to this view, divine revelation has been shadowed by individualistic ideologies, material wealth and the pursuit of power; all of which have resulted in existential anxiety and uncertainty. In the West, religious exclusion can be seen as an escape from intellectual mayhem and from a world on the brink of chaos, while in less economically developed parts of the world, it is a response to social and economic deprivation and to the absence of strong leadership. Whatever the analysis and whatever form these movements might take, religious exclusivity and community cohesion are, it seems, irreconcilable philosophies.

Secular cohesionists

It would be a mistake to assume that people with secular views are unable to recognise that religious beliefs can be an important part of a person's identity or that faith communities can make a positive contribution to society. Religious scepticism is complex and multi-faceted and its relationship with religiosity often simplified. Non-believers constitute a hugely heterogeneous group whose attitudes towards faith are shaped by a number of social and psychological factors. Strange as it might seem, secular thinkers are sometimes more willing to partake in faith-oriented initiatives than members of religious organisations (most notably, religious exclusivists) - an issue that is worthy of analysis.

Secular cohesionists are people for whom integration and social well-being are essential requisites of liberal democracy. Though they are not themselves people of faith, secular cohesionists respect the rights of others to bear witness to religious beliefs and practices without prejudice. The two general riders that they add to this are firstly; that faith communities should avoid proselytising (based clearly on the principle that religious beliefs are a private matter) and secondly; that faith leaders should always seek the consent of participants when administering acts of worship. There is, of course, a whole philosophy about the relationship between religious practices and human rights (particularly where peripheral and/or vulnerable groups are concerned) and there is little agreement on the point at which the former could be said to impinge on the latter. Suffice to suggest that every scenario is unique must therefore be judged on its own merits.

Although they are often people who hold ethical rather than religious values, not all secular cohesionists espouse the same degree of religious scepticism. The extent to which they support or reject religiously motivated initiatives depend on a large number of factors; some personal, some environmental. The interviewees included here were unanimous in their support for people to practice their faith and in their appreciation of what faith organisations could contribute to community cohesion. Moreover, some of these secular cohesionists were happy to work with faith

groups in promoting humanitarian values and campaigning for social justice. A smaller number were even prepared to express their commitment to the community cohesion effort by taking part in religious rituals and by attending faith-based festivals. The following excerpts demonstrate the high levels of faith tolerance among these young people:

> There are people who are religious and you have to understand that. I mean, my grandma doesn't go to church, but she sends them money and I think that's a good thing cos they help her when she needs it. People who are strong in their faith can support other people and do good things for Burnley. I'm even friends with a lot of them (White male atheist aged 25 years)

> Some people are scared of faith cos they don't know what it is and they back off. We do different things at our youth club related to diversity and this can include faith; but if you preach to people you'll burn them off. Younger people are not into faith now cos times have changed. A lot of younger people have never known it. Don't get me wrong, some people do live by religion and that's what they need (White female agnostic aged 22 years)

> I've got friends outside work who are Muslims. I don't see them daily, but I do see them weekly. When I first went to secondary school, it was mainly White; but by the time I was in Year 9, it was becoming increasingly Muslim and that didn't bother me at all cos I live in a mixed area…faith is something a lot of people look up to. A lot of the things people do is for their faith and some people need that in their lives and you've got to respect that. I think there's a fine line between culture and faith, and even though I'm not a person of faith, I know it's important to some people (White female atheist aged 23 years)

> I work in a primary school where there are a lot of Asian kids and I always take part in Eid and Christmas festivals. I even fasted once during Ramadan for a bit of a joke cos my Muslim mates told me I'd never be able to do it! Everyone has something good to offer whatever faith or ethnic group they belong to. It's a lot to do with not knowing. In some schools in Burnley, like the Catholic schools, for example, there are still no Asians; so some children are going through their whole school lives without any integration and I think that's terrible. A lot of the kids at the school where I work take part in the Bridge project and that's faith based. It's managing to bring children from different backgrounds together. We take the children on visits to Catholic churches, mosques and Hindu temples; but it boils down to finding things that the kids are interested in (White male agnostic aged 24 years).

Despite their religious scepticism, these interviewees recognised the importance of faith in the lives of other people. Their comments also support the view that healthy scepticism requires a willingness to listen to views that they, the religious sceptics, find unconvincing. Most were generally supportive of interfaith initiatives and all believed that faith communities could maximise their contribution to civic renewal by working together. Two of the interviewees expressed this succinctly:

> …I do have religious friends, but we don't talk about religion much. I've done some voluntary work with Building Bridges Burnley, and I've also done some work with the cubs. It doesn't matter to me whether you're a person of faith or not. Muslims do a lot for their community and so do Christians; but I think if Christians and Muslims worked together, they could do it a lot better (White male agnostic aged 21 years).

> I know they are places of worship, but why can't churches and mosques come together more? Different faiths should go and visit each other's places of worship and talk about their own faith; and faith communities should welcome each other and encourage each other to do this. So many Christians know nothing, absolutely nothing about other faiths and they tend to believe everything that their own faith teaches…it's all about making an effort (White male atheist aged 25 years).

All but one of the respondents were in favour of publicly-funded faith projects, as long as participation was optional and that the projects themselves made every effort to unite people from different faith and ethnic groups. This demonstrates an ability on the part of some secularists to leave aside their own religious indifference when being asked to comment on faith-based initiatives that have the potential to promote social harmony. It should be borne in mind, however, that most of the respondents in this sub-group were employed either as youth and community officers or social development workers in the public sector; hence their support for cohesion projects. It is also worth noting that more than half these interviewees lived in mixed wards -

an experience which no doubt accounted for their appreciation of faith and cultural diversity. The following comments provide a good example:

> I remember when I lived in Bellington Rd, I lived next door to Muslims and Indians; and me and my mum and dad got on perfectly well with them. They used to make us food and invite us to their weddings which we always went to; and then when my cousin was christened, they came to the christening. Anyway, all the White people who lived on the same street slowly started to move away and more and more Asians started to move in until eventually, we were the only White family left. But we got on with all of them…there wasn't one family that we didn't get on with…but then my mum and dad split up and we had to move because the house we lived in had three bedrooms and an attic and a cellar and it was too big for just me and my mum (White female atheist aged 23 years)

While it would be impossible to introduce a policy of compulsory mixed settlement on the White and Asian communities of East Lancashire, it is highly likely that this young woman's respect for Muslims derived from her experience of living in an Asian-populated ward. This adds weight to the suggestion that racial and religious tolerance is improved when people experience personal contact with members of different faith and ethnic groups and/or by exposure to faith oriented initiatives. This will clearly depend on how these opportunities present themselves in secular contexts such as schools, community centres and workplaces. The key challenge for faith partnerships is to use these contexts to promote their work and to galvanise the support of secular project leaders. In areas that are blighted by segregation, this is an onerous task that requires perseverance and commitment. School outreach provision, pastoral and community support in the voluntary sector and neighbourhood renewal projects provide some such opportunities. Despite their religious scepticism, there is some consolation in the fact that the interviewees in this secular cohesionist sub-group saw the potential for faith groups to work together and to unite with civic organisations in assuaging social tensions.

Secular aversionists

The final sub-group – the secular aversionists – represents those who hold no religious beliefs and who are cynical of any attempt of faith communities to contribute to public life. Secular aversionism holds no social class boundaries. Academics on the intellectual left of the philosophical and political spectrum, for example, are as likely to berate religious initiatives as people from lower socio-economic strata either because of their own (usually negative) religious experiences or because they regard religion as a destructive force.

Secular aversionists are as resistant to interfaith initiatives as religious exclusivists, but for different reasons. Both the interviews and the school questionnaire survey revealed evidence of religious antipathy among a sizable core of young people. The main forms in which this antipathy was expressed included an unwillingness to listen to people who espoused religious views, disdain for religious practices, disrespect for religious leaders and indifference towards faith unity. The following comments from two young Burnley residents echo some of these views:

> I don't think the religions in this town have ever really mixed until recently, but even if they do, it'll never work…People like me just aren't interested. We don't want to know. If people started coming preaching to me, I'd tell em to p*** off. The power of the mind of non-religious people is too strong. People of no faith live their own lives and have their own things to worry about and that's all they're interested in. I've never believed in religion, even as a kid (White male atheist aged 20 years).

> I refuse to step foot in a church and if people get on the wrong side of me about religion, they regret it. It's all nonsense in my eyes. Even at the age of about five, I can remember thinking to myself: "What the hell's all this about?"; but at that age, you don't really have a choice. It was only in my teenage years that I finally turned round and told Christianity to kiss my butt! A lot of so-called religious people, including Christians, would rather see each other die than be friends! In any case, how can faiths come together when most of England is only Christian and Muslim; and even they are dying out? (White male atheist aged 19 years)

The religious aversion expressed by these two interviewees presents no small challenge to faith communities. Unlike the secular cohesionists who could at least see the potential for faith groups to avert social discord, these respondents dismissed all such possibilities, believing instead that all organised religion was divisive and that any attempt by faith partnerships to

combat segregation was bound to fail. Although it would have taken a different kind of investigation than this one to ascertain the reasons for these attitudes, it is worth noting that both these young men had lived in Burnley all their lives and were unemployed at the time of the interviews. It could be, therefore, that despite their rejection of religious beliefs in childhood, their experiences of growing up in a segregated town that offered little prospect of upward mobility and where expectations among large numbers of young people were generally low had had a strong impact on their cognitive development and existential outlook.

The Year 10 questionnaire survey also unearthed a large degree of religious adversity. These attitudes were far more pronounced among White non-Christian students than any other social group. In the school with the majority-White population, only 21 per cent of the respondents believed that the students in their school showed respect for each other's religious beliefs and only 50 per cent expressed a willingness to listen to other people's religious views. Even more discouraging was the fact that only 29 per cent of the students stated that they would like to see different faith communities working together.[30] These high levels of religious intolerance and indifference pose a considerable challenge to those keen to encourage young people to respect faith communities and to recognise that religious beliefs are an important marker of identity among many British citizens.

Needless to say, it is very difficult for faith communities to engage with young people who express these levels of religious resistance. Moreover, such attitudes do not bode well for initiatives that aim to unite all sections of society and that are working towards community cohesion. Faith partnerships will need to find new and innovative ways of reaching disaffected youngsters who hold entrenched secular views and whose prospects have been marred by economic deprivation if they are to help tackle segregation.

[30] Of the remainder, 22 per cent said they would not, 24 per cent said they did not know and 25 per cent said they did not care.

Appendix E

Ward descriptions: Daneshouse/Stoneyholme and Rosehill with Burnley Wood

The Daneshouse/Stoneyholme ward

Daneshouse and Stoneyholme is a central ward that lies directly north of the town centre. The ward is within one half mile of the main shops and is surrounded by several busy roads that link the town to the various M65 junctions. In 2005, there were over 6000 people living in the Daneshouse/Stoneyholme area, making it one of the most densely populated wards in the borough. A particularly striking feature of this ward is the exceptionally high number of young residents (due mainly to a high birth rate) and the very low number of people aged 60 years or over. In fact, the ward is home to the largest number of people in all the categories up to the age of 30 and the smallest number of older residents over the age of 45 years (Census 2001).

Of the fifteen wards in the borough, Daneshouse/Stoneyholme is by far the most deprived. Like many other wards in the other East Lancashire mill towns, it was once inhabited by a thriving population of local workers employed in the textile industry. Almost all the houses in this ward are Victorian terraces, divided at the rear by cobbled or concrete gangways. A small number of these properties have garden areas, but most are pavement fronted. According to the local authority, the overall collapse in the housing market began in the early 1990s, resulting in very low demand and a sharp decline in property value (Burnley Borough Council 2003). Between 2001 and 2003, there were around 550 empty dwellings in the Daneshouse/Stoneyholme area alone and the house prices in this ward remain among the lowest in Lancashire. At the time of writing, there were several streets of empty properties deemed unfit for dwelling and awaiting demolition. The ward also had one of the highest rates of arson and of domestic burglary.

The ethnic group composition of Daneshouse/Stoneyholme has changed considerably over the past four decades. Approximately two-thirds of the properties in this area are now occupied by Pakistani or Bangadeshi residents, the majority of whom are Muslim (Census 2001). Indeed, the biggest percentage of Muslims in Burnley now live in Daneshouse/Stoneyholme, making this the one ward in which the largest number of Christians and Muslims live side by side. Most of the Pakistani residents live in the Daneshouse half of the ward alongside a smaller number of remaining White people, many of whom are now elderly and have lived in the area for most of their lives. The Bangladeshi residents live mainly in Stoneyholme. Though there have, from time to time, been tensions between younger residents from these two communities, they tend, by and large, to live amicably. There are currently seven mosques in the ward, one of which is the official BBB centre. It is also worth mentioning that there is one mosque (in the Daneshouse part of the ward) that it used almost exclusively by the Bangladeshi community.

There are a variety of local shops and businesses in the Daneshouse/Stoneyholme ward owned by Asian proprietors and patronized by the Asian community. These include grocery stores, halal butchers, gents and ladies hairdressers, jewellers, hardware shops, clothes shops, newsagents, travel agents and many more. The ward is also served by two mixed sex schools for children aged between 4 and 11 years and one large secondary school for boys. Until the recent restructuring of secondary education, the majority of the Asian/Muslim girls living in Daneshouse/Stoneyholme attended Walshaw High School (situated on the east side of Burnley) when they reached secondary school age. In the last four years, youth workers, sports leaders and community development officers from the Daneshouse/Stoneyholme area have expended a large amount of effort in mobilizing young people into civic participation. An increasing number of these workers are of Asian heritage who have had a high degree of influence within their own communities and who are becoming recognized as role models among the young people with whom they are attempting to engage. Indeed, one of the most significant developments that has been supported both by Burnley Borough Council and the Council for Voluntary Service since the 2001 disturbances is the active recruitment of Asian males in their twenties and thirties into positions of leadership – an issue that has huge implications for the capacity-building agenda of central government.

The Daneshouse/Stoneyholme ward has a vibrant youth and a range of projects and activities in which young people are now involved (including, for example, *Youth on Unity* – a scheme that has attracted a large number of Bangladeshi males in their late teens and early twenties), most of which are based at the local community centre. Although these ward-centred initiatives are commendable in that they attempt to reach young people who have experienced social exclusion and whose aspirations are generally low, there are, as yet, few examples of projects in Burnley that have successfully

managed to unite people, young or old, from different religious and ethnic groups. There are two possible reasons for this. For one thing, the spatial segregation that has characterized the town for the last four decades has done nothing to alleviate the ignorance and mistrust that have been propagated both by the media and the local BNP. This is not to suggest that people cannot live as excellent citizens in areas that are heavily populated by those who share the same cultural traditions, but like many other towns and cities in the UK, Burnley still has some way to go before the *value* of diversity and the contributions that have been made by *all* ethnic groups to British society are fully appreciated. Secondly, it needs to be emphasized that there is a high degree of heterogeneity *within* as well as between ethnic communities. While there is no doubt that this adds to the cultural and demographic richness of East Lancashire, it poses an additional challenge to project leaders who need to be ever mindful of the complexities of social segregation.

Rosehill with Burnley Wood

Rosehill with Burnley Wood (the ward in which school A was situated) is a central ward situated South East of the shopping centre. Although the ward is similar in size to Daneshouse/Stoneyholme (the most heavily concentrated Asian/Muslim ward in Burnley), its ethnic and faith group profiles are very different. Moreover, Rosehill with Burnley Wood is home to a slightly larger number of residents (around 6600 in total), the majority of whom are White. The 2001 Census shows that Rosehill/Burnley Wood is populated by a moderately high number of people in a wide range of age groups (only two other wards, for example, have a higher number of residents in the 0-4, 16-17, 20-24, 30-44, 45-59, 75-84 and 85-89 age categories); hence, it is a more disparately populated ward in age terms than Daneshouse/Stoneyholme (ibid).

Rosehill/Burnley Wood has a rather complex deprivation profile. Approximately one third of the ward – that is, the Burnley Wood rather than the Rosehill area – falls into the lowest 20 per cent of deprived wards in the borough, with approximately one third of this falling into the lowest 5 per cent (Burnley Borough Council 2003). As such, it is one of the principal areas identified in Burnley Borough Council's fifteen year urban regeneration programme, currently overseen by Elevate East Lancashire – a relatively new company working in close consultation with local authorities in the management and supervision of housing demolition and renewal. Like many other inner wards in the borough, a large number of houses (most of which are back to back stone-built terraces) in Burnley Wood are privately rented. Until recently, the area was characterized by high turnover rates, compounded by the constant movement of families and couples abandoning neglected properties (in 2003, for example, more than 350 houses in this part of the ward had been abandoned as a result of strained relations between unscrupulous landlords and tenants) and culminating in an increase in crime (particularly drugs related offences and arson). The destabilization of neighbourhoods in Burnley Wood is an ongoing source of concern to members of the Burnley Action Partnership and the Community Cohesion Unit who fear the long-term consequences of disenfranchisement. In contrast with Burnley Wood, Rosehill is much more affluent part of the ward, with more valuable properties, lower rates of crime and stronger health profiles. In socio-demographic terms, this would suggest a very mixed ward in which socio-economic/social class background has a significant effect on life chances.

The deprivation profile of Burnley Wood and the problems to which this has given rise have led to the formulation of some community-based initiatives in the area in recent years. The most successful of these include the S*treet Level Project* and a N*eighbourhood Learning Scheme*; both of which aim to involve disaffected young people in skills-based activities. At present, the bulk of the funding for these initiatives is provided by local enterprise groups, the Northwest Development Agency, the European Regional Development Fund and various other departments within the local authority. With sufficient funding, provision of this nature can be an effective way of bringing residents from previously divided communities together, and at the same time, improving the educational and employment prospects of those who are vulnerable to social exclusion. Most of these projects in the Burnley Wood area are co-ordinated at the local *One Stop Shop* – a Limited Company that offers a range of activities including a women's group, an art group and a lunch club. Among the facilities are a cyber café, a Credit Union and free computer use with access to the internet. The organization is staffed by a project co-ordinator and several community/neighbourhood development workers.

There are three main places of worship in the Burnley Wood half of the ward; all of Christian orientation. These include two Anglican churches and a Roman Catholic church. The two Anglican churches (St Stephen's and St Catherine's) are approximately 400 metres apart and their parishes extend to the neighbouring wards of Brunshaw, Bank Hall and

Trinity. In line with the national trend, there has been a sharp decline both in weekly church attendance and in other religious activities in these churches over the past three or four decades to the extent that their main support now lies in the hands of a few remaining but very committed parishioners. Sunday service attendance in each of the churches is now less than one hundred and with the exception of a handful of young families, most of these worshippers are elderly people who have lived in the area for many years and who lament what they describe as a gradual deterioration of this part of the ward. Among their gravest concerns are the increases in crime such as drugs offences and burglary, the serious neglect of property and a noticeable presence of anti-social youths. One of the church buildings (St Stephen's) is unaided by the fact that it is located in an area where there is generally poor surveillance and a large number of derelict houses. Like many churches in deprives areas, the windows of this church have been boarded with metal protection in order to deter thieves and/or vandals. In contrast, St Mary's Roman Catholic church is situated on a busy main road on the cusp of the ward and is thus more visible to onlookers. The church building is much older than the two Anglican churches; and its heavy doors and high narrow stained glass windows provides added protection from vandalism and/or burglary. Of all the Roman Catholic churches in Burnley, St Mary's represents the largest parish, the boundary of which extends far into the rural villages of Cliviger and Worsthorne on the South East side of the borough. For this reason, along with the fact that Burnley, in any case, has a considerably larger Roman Catholic than Anglican population, it has been able to attract more weekly worshippers (approximately 450 between the three Sunday masses) than its two Anglican counterparts. It should be borne in mind, however, that since St Mary's is the only Roman Catholic church in this part of the ward, it has complete monopoly of its parishioners; and even this church has seen a gradual decline in activity since the last quarter of the twentieth century.

Notwithstanding the relatively high proportion of Christian churches within an approximate one half mile radius, faith commitment in Burnley Wood is *prima facie*, rather nebulous. Whatever the methodological criticisms, if the secularization of mainstream Christianity in the UK is to be measured in terms of religious participation, there can be no doubt that in this parochial part of Burnley, it is exceptionally high. The apparent religious indifference along with a noticeable absence of Asian residents (and hence of mosques) in the ward accentuates its White, working class, monocultural landscape - a picture not unlike many other urban areas of East Lancashire where there are high levels of social deprivation and few prospects of upward mobility for the majority of young people. Be this as it may, there have been some recent attempts by the local Salvation Army to establish a charity shop in Burnley Wood in the hope that it will generate community-oriented activity among those most excluded and at the same time, distribute resources (clothing, furniture and household goods) throughout the borough.

Whatever success the efforts of the Salvation Army might bring, it would be unrealistic to suggest that the task of creating community cohesion in this ward is not a difficult one. Like Daneshouse/Stoneyholme, this neighbourhood bears all the hallmarks of a segregated community in which there is little interest in faith, and even less in entering into dialogue with other faith and ethnic groups. The high levels of social deprivation, widespread educational underachievement, strained landlord-tenant relationships and resentment towards the local authority management (particularly regarding the allocation of public resources, real or putative) that beleaguered the residents of Burnley Wood for a number of years made it a prime location for our investigation.

Appendix F

Main interfaith activities in Burnley 2005-2007

…initiated mainly by BBB – an interfaith group that has formed strong partnerships and/or working relationships with several local stakeholders.

ACTIVITIES FOR CHILDREN ONLY

- *The Bridge Project* (est in 2002) – after school clubs, holiday activities and residentials for children of junior school age
- BSF (Building Schools for the Future) links. Partnership with new Sixth Form (see below). Secondment of BBB Young People's Officer to the Sixth Form faith centre one full day per week in the Autumn term.

FOR ALL AGE GROUPS

- Church and mosque exchange visits (around 4 major and several minor of these since 2005). School visits are the most common.
- Tsunami appeal (2004??)
- Interfaith feasts – one held in the Ibrahim mosque in January 2005 (500+ attendees) and the other at St Peter's Anglican church in September 2005 (700+ attendees)

FOR YOUNG ADULTS

- *The Spirit of the North* initiative (launched in Blackburn and Burnley between 2005 and 2006) has been the only initiative for young adults between the ages of 18 and 30 years. The initiative is now being launched in Hyndburn.

FOR WOMEN ONLY

- Women's exclusive programmes (began in 2006) – 2 gatherings. Attracts mainly older women and those difficult to reach (eg non-English speakers)

FOR FAITH LEADERS

- Faith Leaders Forum – established by Dale Barton last summer.
- Seminar for faith leaders (Christian and Muslim) held last summer and open to the general public. Attracted around 120 attendees of all ages

FAITH COHESION INITIATIVES AT THE NEW SIXTH FORM CENTRE

- Establishment of Christian-Muslim Student Volunteers Forum (Autumn term 2006)
- Joint Christmas and Eid celebration at the end of the Autumn term 2006
- *Question Time* event (attracted 150 local residents) December 2006
- Interfaith charity information evening (April 2007)

2 regional initiatives launched by the Outreach and Development Agency of the Anglican Diocese of Blackburn:

- *The Faith to Faith Exchange series* – Dialogical exchanges between different faith representatives held at Blackburn Cathedral. Open to the general public. Ran for eight weeks between 2005 and 2006. Attracted around 100 attendees. Filmed by the Media Studies students from Blackburn College.

- *Looking Back at Anger Seminar Programme* – 8 lectures/seminars in total delivered by a number of guest speakers from around the North West. Attracted audiences of between 50 and 200 people. Audience participation.

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The East Lancashire Institute of Higher Education at Blackburn College

Academic Report: AR-08-02

Catalogue of selected works 2007

Stephen Pickles[1]

February 2008

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Catalogue of Selected Works 2007

Stephen Pickles

Academic Report AR-08-02. East Lancashire Institute of Higher Education, Blackburn, UK

Statement

Most of my paintings and drawings suggest narratives. As an example of this, the figure slumped in a chair in the two *King* paintings began as a photograph torn from a newspaper of a man, injured by a bomb and covered in dust, with a rescuer standing beside him. I was interested in the actual news story, but also in the peculiar resonanceof the image: because he was covered in dust he resembled a figure made of stone or marble; his hand resting on a bent, metal rod suggested a king holding a sceptre and he could have been a man who was dead, sleeping or dreaming as well as someone stunned by a bomb blast. I removed the figure from its context, and further distanced it from the original news item by replacing the rescuer with a more ambiguous figure, that of a woman wearing – or perhaps possessing – the head of an animal. I made these changes intuitively, and not by reframing them so as to fit in with a predetermined story. I felt that the juxtaposition of the two images had the potential to pose interesting questions: was the female figure a threat or a saviour, or simply indifferent to the man slumped in the chair? Was she in fact a separate entity, or some aspect of the man'spsyche? It is important to me, in making paintings, to allow the narrative to remain ambiguous. It seems to me that this elusiveness provides an opportunity to explore ideas that cannot be dealt with in a completely rational way.

The starting point for *Actæon* was the Greek myth of the same name, recorded in Ovid's *Metamorphoses* and depicted by Titian in a painting, in the National Gallery. In this story the hunter stumbles across the goddess Diana bathing. For his crime she punishes him by transforming him into a stag, and he is attacked and killed by his own
hounds. There is a terrible arbitrariness to the treatment of Actæon: his transgression was quite accidental and the punishment seems entirely disproportionate - it certainly
does not sit well with the concept of a just, merciful providence, that operates in a rational way to reward and punish.

I based the *Cave* series very loosely on a set of paintings by Goya which depict bandits attacking prisoners in a cave; the female figure in several of my *Cave* paintings is an approximate transcription of a female figure in one of the paintings in this series by Goya. I derived other figures from drawings I made in an exhibition of Aztec art at the Royal Academy several years ago and my own memories. I have used the music of the writer/musician Nick Cave as a background to much of my work for several years, and so the title of the series is a kind of pun on the word 'cave', and also refers to the dark interiors in which the 'action' of the paintings takes place.

A common element in all these sources is, I think, the sense that events in our lives do not always fit into a neat moral and just schema: a bomb blast does not discriminate in its victims; Actaeon is punished arbitrarily and disproportionately for what is, in effect, an unintentional and minor transgression; Goya's prisoners are innocent victims; in his music and writing Nick Cave has confronted similarly 'dark' and morally chaotic events.

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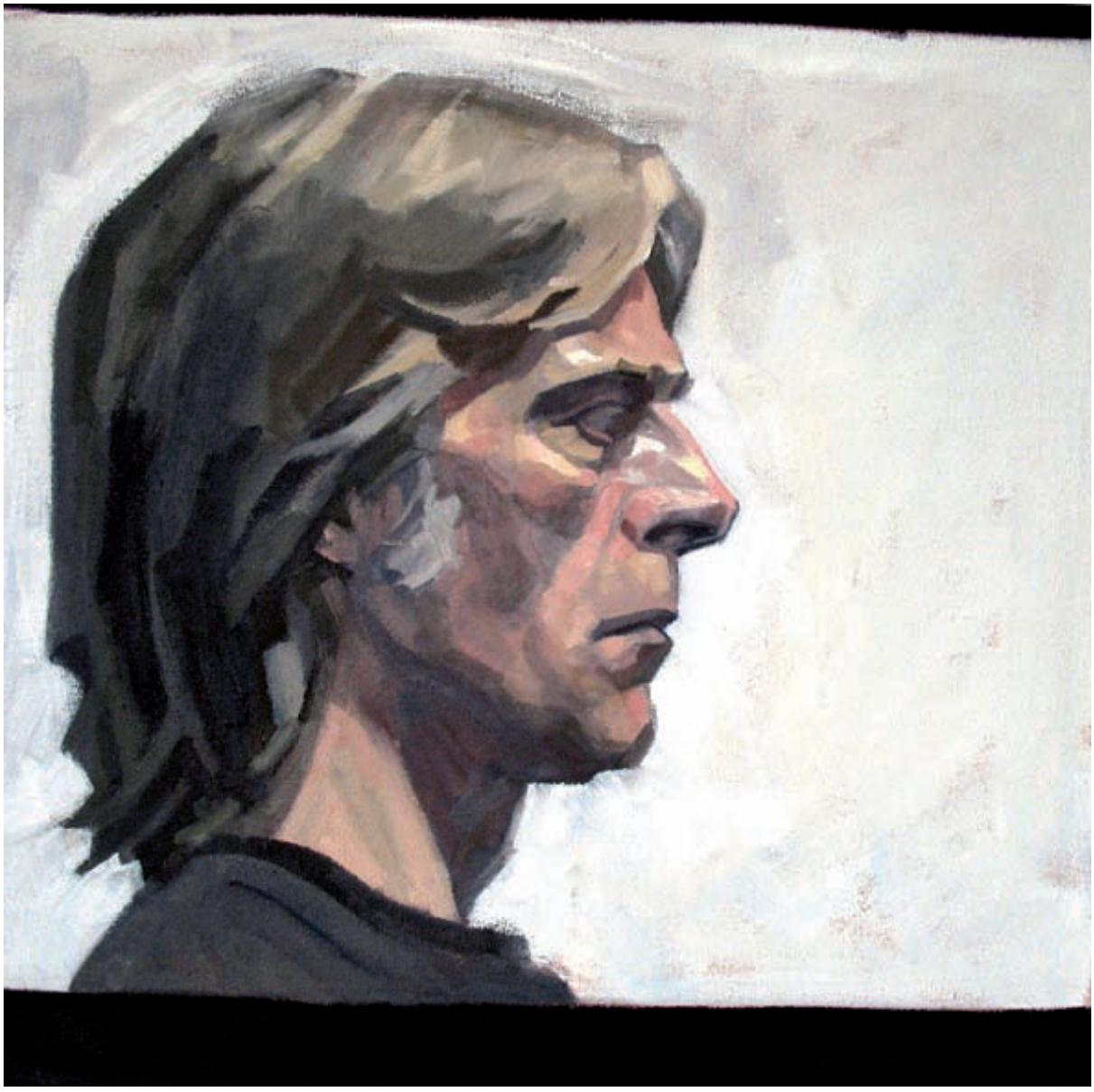
Self Portrait
oil on canvas, 20” x 20”

Self Portrait with Mask
oil on canvas, 20” x 20”

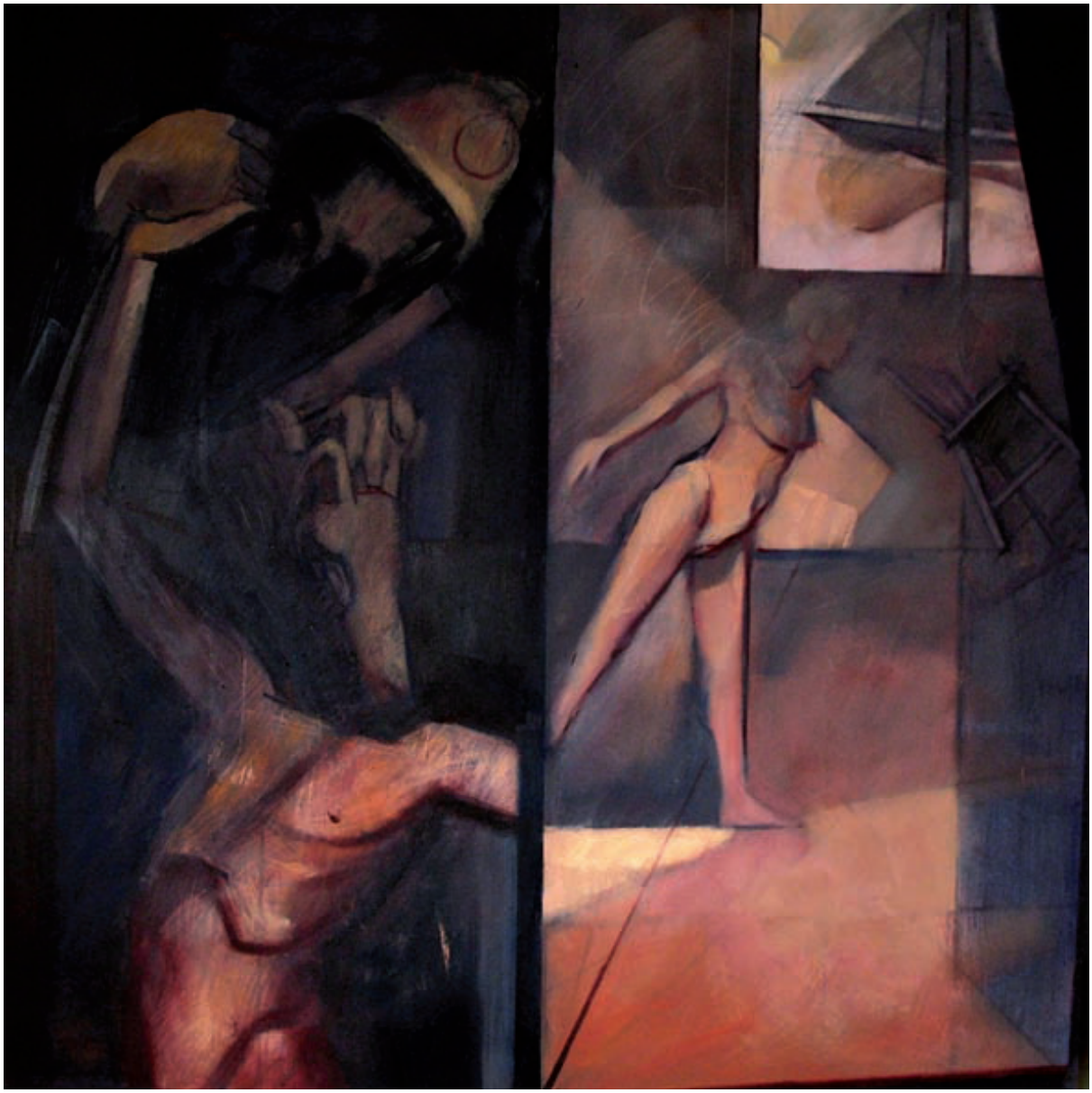


Profile
oil on canvas, 20” x 20”

Fallen King
oil on canvas, 50” x 50”

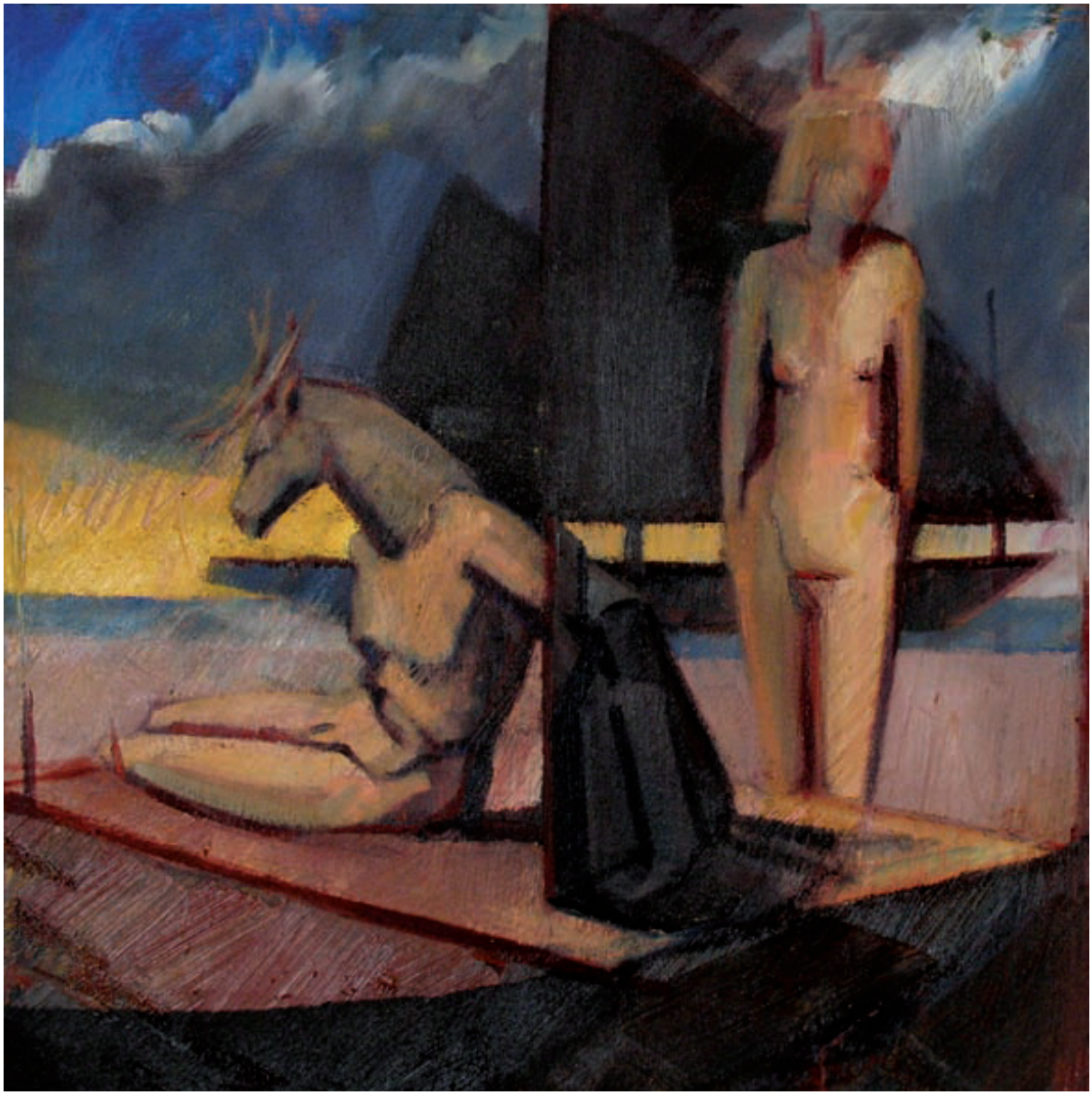
I Have Teeth
oil on canvas, 50” x 50”

Cave 1. Mary Bellows
oil on canvas, 50” x 50”

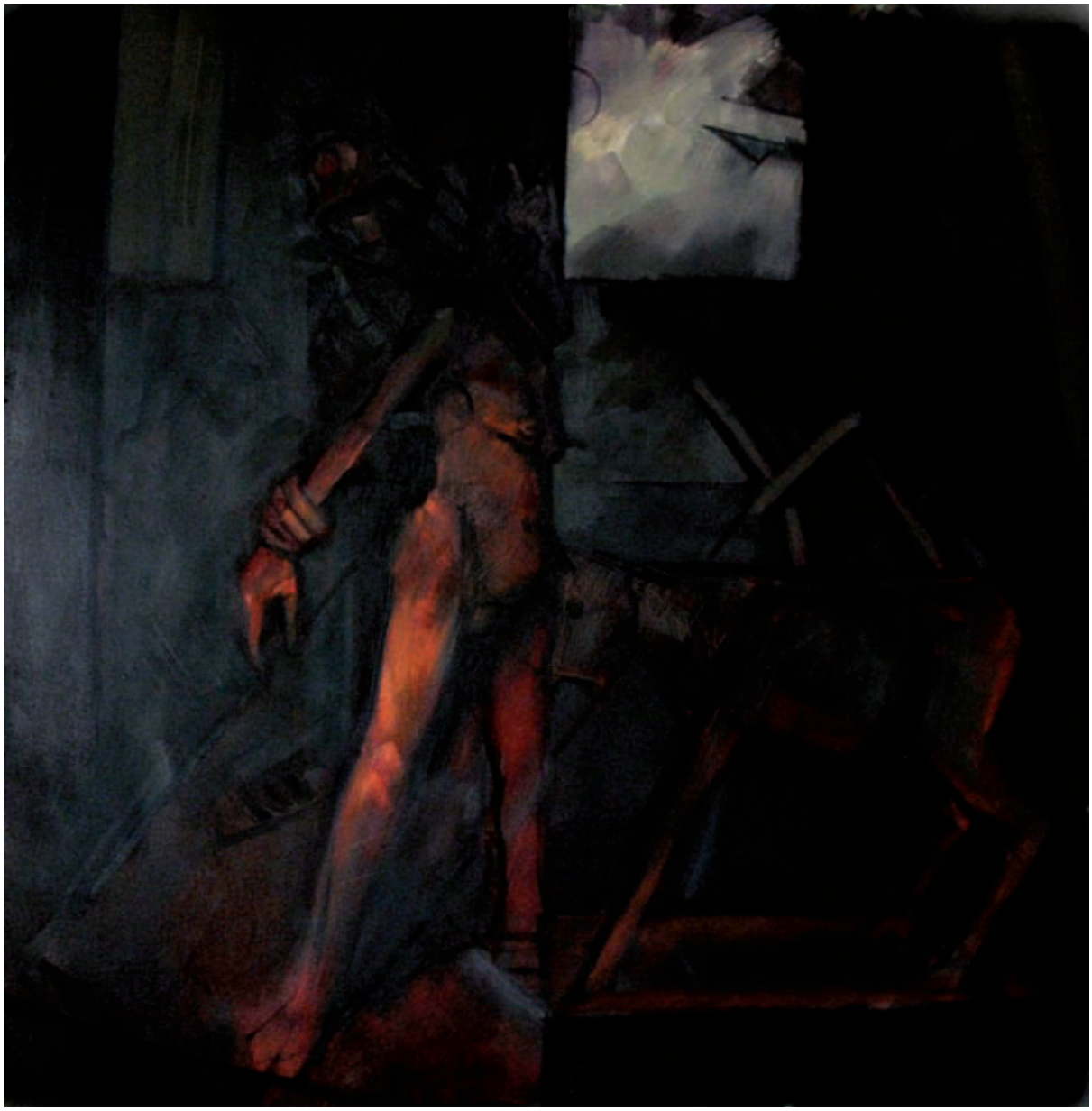


Cave 2. Mary Bellows
oil on canvas, 50” x 50”

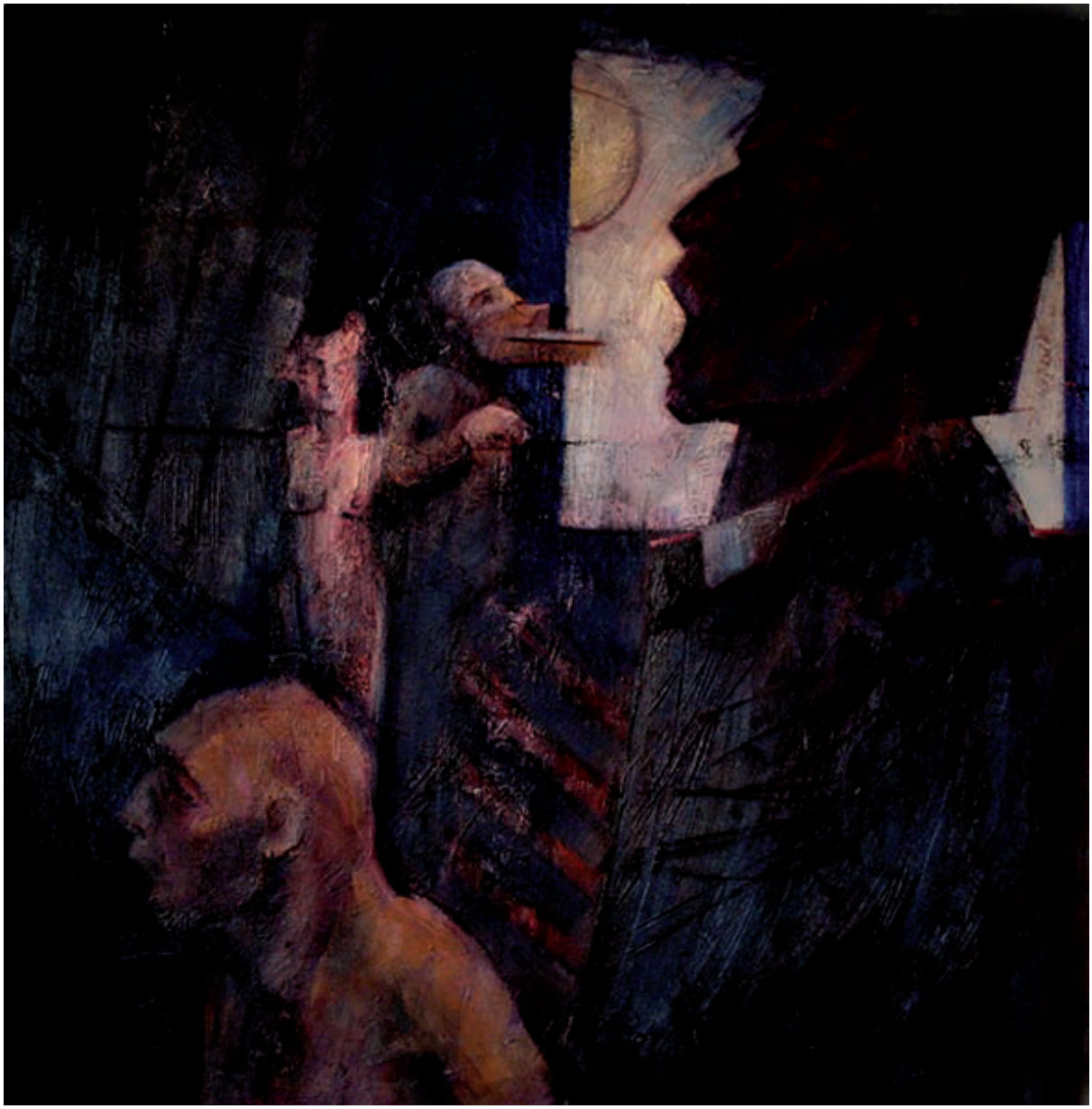
Cave 3. Mary Bellows
oil on canvas, 50” x 50”



Small Actæon
oil on canvas, 20” x 20”



Cave 4. Mary Bellows
oil on canvas, 50” x 50”



Cave 5. O'Malleys
oil on canvas, 50" x 50"

Actæon
oil on canvas, 50” x 50”

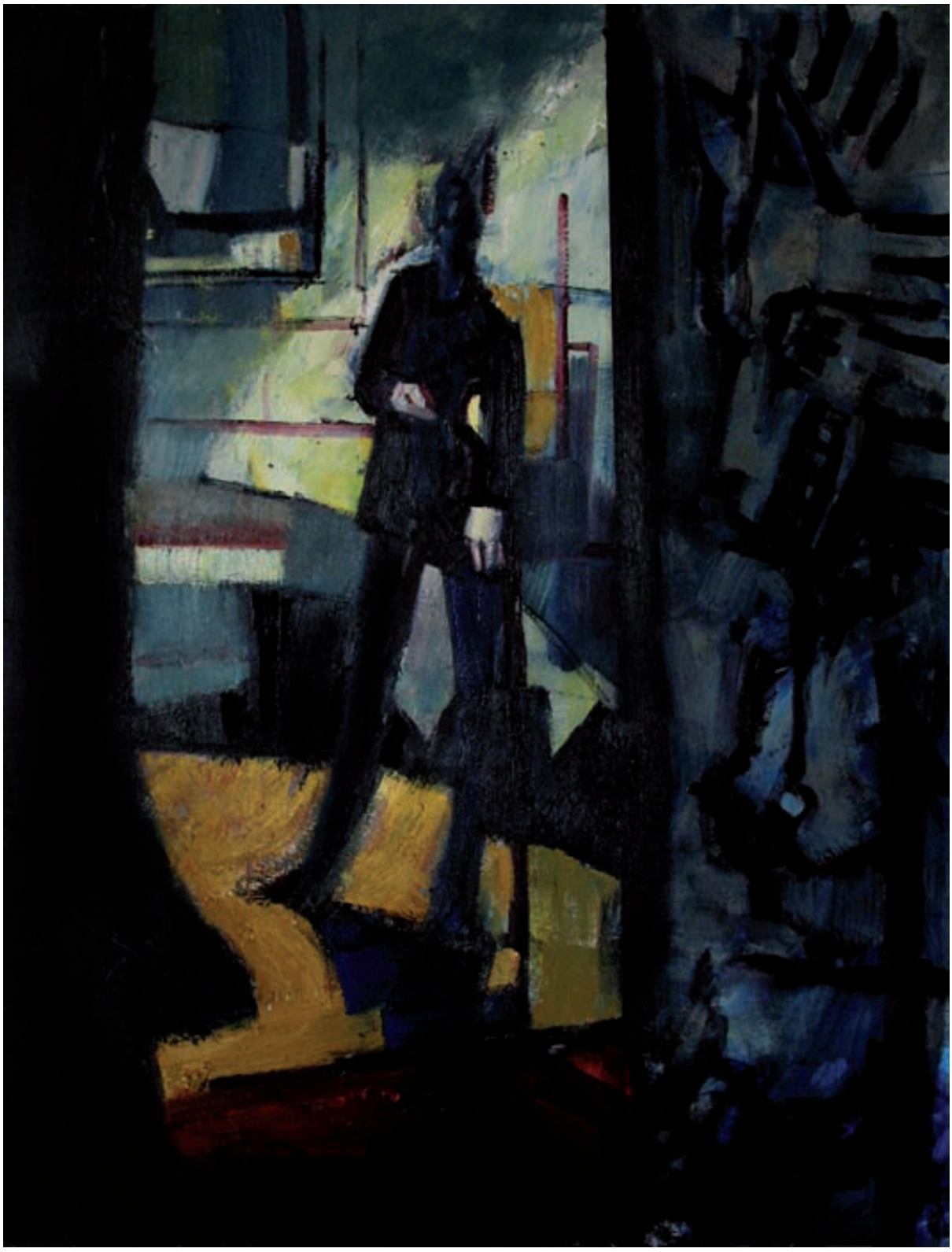
Actæon Drawing
mixed media, 42” x 32”

Fireman Drawing
mixed media, 42” x 32”

Wolfwoman Drawing
mixed media, 42” x 32”

Horse Head
oil on canvas, 65” x 38”

Departure
oil on canvas, 70” x 50”



Studio
oil on canvas, 70” x 50”

Fireman
oil on canvas, 70” x 50”

Gone into the Light
oil on canvas, 70” x 50”

Wolfwoman
oil on canvas, 70” x 50”

The East Lancashire Institute of Higher Education at Blackburn College

Academic Report: AR-08-03

True to thee ′til death: why Jehovah's Witnesses refuse blood

Dr Andrew Holden[1]

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Sociological Research Group

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True to thee ′til death: why Jehovah's Witnesses refuse blood

Dr Andrew Holden[1]

Academic Report AR-08-03. East Lancashire Institute of Higher Education, Blackburn, UK

It may seem paradoxical, given the advances in medical science, that those who hold allegedly rational religious beliefs would choose to die rather than accept medical treatment. This is, however, a decision often taken by the Jehovah's Witnesses – a puritanical religious group founded by a Pittsburgh draper, Charles Taze Russell, in the late nineteenth century. Although the Witnesses eschew mysticism (their beliefs are based on an 'intellectual', empirical interpretation of the Bible) and accept most forms of medical intervention, they remain steadfast in their refusal of blood. It is this more than any other doctrine for which the Witnesses are renowned.

Two weeks ago, the national press reported the death of 22 year old Emma Gough – a young Jehovah's Witness who refused a blood transfusion during childbirth. The story has provoked widespread discussion not only about the effects of biblical literalism on young devotees, but on the wider issues of religious freedom and the rule of law. While one school of thought advocates state intervention in a case such as this (a view held by conservative Christians whose ultimate concern is for the unborn child), the more liberal democratic argument defends the right of the pregnant mother to follow her religious conscience. The fact that Mrs Gough had already given birth to twins at the time of her death makes this a less contentious ethical and legal matter than might otherwise have been the case. Be this as it may, it is important to understand why the Witnesses believe what they do and to offer some analysis of their heterodox religious code.

The Witnesses' refusal of blood transfusions has undoubtedly earned the Watch Tower Bible and Tract Society (the official name of the Jehovah's Witness organisation) a fair amount of criticism from the outside world; yet surprisingly, the issue is seldom discussed at the Witnesses' weekly meetings. Nor is it selected by Witness proselytisers as a topic for their doorstep sermons. The Witnesses believe that blood transfusions are strictly forbidden since blood is a life source sacred to Jehovah. The Society's publications also warn against the risks of bacterial infection, transfusion reactions and Rhesus sensitisation. Although Genesis 9:4 and Leviticus 17:11-12 are commonly used to support the prohibition, it is Acts 15:28-29 that is most frequently quoted in Watch Tower literature:

For it has seemed good to the Holy Spirit and to us to lay upon you no greater burden than these necessary things: that you abstain from what has been sacrificed to idols and from blood and from what is strangled and from unchastity.

Blood transfusions are thus regarded by the Society as physically and morally unclean. This belief demonstrates the strict purity code that characterises many Watch Tower teachings. The emergence of AIDS during the 1980s provided the Witnesses with secular if macabre confirmation of the virtue of the doctrine as well as a powerful justification to abstain from blood on health grounds. It is also worth noting that prior to the blood transfusion taboo in 1945, the Society objected to vaccinations and inoculations, although this never became an official Watch Tower edict.

The patriotic period of the Second World War (ideologically anathematised by the Society which regards itself as pacifist) provided fertile soil for the blood prohibition. The American population was regularly incited to donate blood for its injured soldiers; hence, blood transfusions became part of nationalistic manifestation along with armies, national anthems and flags. It could be argued, therefore, that the Witnesses' condemnation of blood transfusions constitutes a rule of pollution and purity that is instrumental in creating structural boundaries. In a period marked by state opposition to their doctrines between the 1930s and the 1950s (particularly in Europe and North America), the Witnesses needed to maintain their exclusivity in order to re-establish their universal collective identity and to detach themselves from orthodox Christianity. The blood prohibition enabled them to do just this. The Witnesses' refusal of blood is analogous with Jewish dietary laws - it affirms the view that

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sacrifice is part of the price of membership, thus strengthening the Society's internal cohesion. From a sociological perspective, blood is a powerful symbol of allegiance for the Witnesses simply because it is unimportant to other faith communities.

For the religious sceptic, the greatest difficulty lies in understanding how groups with such arbitrary beliefs continue to flourish in a so-called (post)modern age. The answer, it seems, is that they are able to offer certainty to those who are overawed by epistemological relativism, individual freedom and semiotic pastiche. While the evolution of capitalism and modern medical science has no doubt caused tension between faith and reason, it has not, if Mrs Gough's death means anything, destroyed our belief in an omnipotent creator.

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The ELIHE High-Performance Cluster

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The ELIHE High-Performance Cluster

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Academic Report AR-08-04. East Lancashire Institute of Higher Education, Blackburn, UK

Abstract

Clusters designed and implemented using open source software, based on the Linux operating system, are becoming increasingly popular. A variety of open source software, such as CLIC Mandrake, OSCAR, OSCAR-HA and KNOPPIX, has become available for setting up, administering and programming clusters. In this paper we will describe the design and implementation of three High-Performance Computing Clusters. Using our experience of building Linux clusters CLIC, OSCAR and KNOPPIX from the computers available in our School of Science and Technology we will evaluate their performance based on:

- Their suitability for meeting the educational and research needs for students and staff within the Higher Education institutions;
- The hardware platforms they can be implemented on – from the Institution's redundant Pentium 3 computers to the Pentium D processor modern systems;
- The programming environment they can support.

The development of the ELIHE clusters will provide us with an opportunity to take a *hands on* approach in teaching programming environments, tools, and libraries for the development of parallel applications, parallel computation, architectures and message-passing paradigms using Message Passing Interface (MPI) at both undergraduate and graduate level.

I INTRODUCTION

An increasingly popular dedicated high-performance computer system is a PC cluster, commonly known as a Beowulf cluster. Beowulf cluster systems exploit mass-market components – PCs & low-cost networks and integrate widely available and easily accessible (open-source) low-cost or free software. Clusters can be constructed from machines on desktops or dedicated racks of server blades.

A Beowulf cluster consists of numerous components of both hardware and software [1]. There are four major components to consider in Beowulf cluster systems:

- Hardware system structure;
- Resources administration and management;
- Distributed programming libraries and tools;
- Parallel algorithms.

The hardware of Beowulf clusters consists of low-cost PCs (nodes), networked by low-cost commodity Fast Ethernet or Gigabit Ethernet networking, to form a single system. Beowulf clusters are predominantly Linux based, with Red Hat, Mandrake and Suse operating systems variants. There is a variety of both commercial and research/academic software systems for assembling and managing cluster systems.

Commercial cluster systems include Sclyd [5], Platform Computing – Platform Rocks 4.0, VA Cluster; research and academic cluster systems are OSCAR, CLIC, KNOPPIX, and Rocks. The predominant programming model for these systems is explicit message passing, typically via a standard interface such as Message Passing Interface (MPI), implemented in a wide range of applications.

The functionality of these systems may vary, but they all address important issues in building high-performance systems from commodity components: configuration management, scheduling, single-system image and shared file system. The software components of Beowulf clusters enable a cluster of PCs to be viewed as a single resource with a single point of access, to manage parallel resources,

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and to enable development of parallel application programmes and software environments. A typical Beowulf cluster system can consist of 8 to 128 nodes, but usually between 16 and 64 nodes.

Beowulf commodity cluster systems offer powerful, scalable low-cost computing systems, and for many applications provide an alternative to high-cost supercomputers and Massively Parallel Processors (MMP). The implication of this is that the computer clusters provide high-performance computing for applications in industry, commerce and research, for users who would otherwise be unable to afford supercomputing. However the cost of building, maintaining and operating these systems can be significant because of the range of open source software and systems involved.

The biggest hurdle in building a cluster is getting through the initial installation and configuration of the software. The vast majority of Cluster middleware consists of pure open source projects that have little or no documentation, no technical support, no integration with the various components, no intuitive graphical user interface (GUI) and using command line interface. The operating system (OS) and the cluster tools are often installed separately with little coordination and, in many cases, the post-installation configuration of the nodes to act together in a cluster is left as a manual exercise for the user. This means the user must configure the naming service, user and host authentication configuration, network and file server configuration, etc. In some cases logging into each and every computer node, to manually to set up the various aspects of a cluster, is an excruciatingly slow process.

The motivation for our investigation is to shed light on the suitability of a range of available computer cluster open-source software for meeting the educational and research needs for students and staff within Higher Education institutions; the hardware platforms they can be implemented on – from the Institution's redundant Pentium III computers to the Pentium D processor-based modern systems; and the programming environments they can support.

II. ELIHE CLUSTERS

In developing computer cluster systems in our institution, we undertook to build, compare and contrast three variants of cluster system middleware- CLIC, OSCAR and KNOPPIX based on different hardware and software platforms and programming environments.

Our investigation initially required selection and assembly of:

- The components of cluster nodes;
- The network hardware that converts collection of PCs into a single system;
- The operating system platform;
- The cluster middleware (with parallel libraries and programming environments for MPI, C, C++, Fortran, and Java).

CLIC Mandrake Cluster

Initially CLIC Mandrake cluster - ELIHE HP was implemented [6,7]. CLIC, which stands for "Cluster Linux pour le Calcul", was originally a project sponsored by the French government. Its aim was to popularise the use of clusters with an easy-to-install General Public Licence (GPL) clustering suite. To meet this requirement, CLIC combines Mandrake Linux expertise, for easy installation and High-Performance Computing specific hardware support, and a set of tools developed by researchers. In building our first cluster we have utilised CLIC open-source version 2 cluster software.

The hardware acquired for ELIHE High-Performance cluster included 12 of the Institute's redundant Pentium 3 machines that were LAN boot compatible. The Desktop PC hardware
consisted of:

- 3/4GB HD
- 128 MB RAM Minimum
- Pentium 3 440MHz CPU
- Node Screen Resolution 1024*768
- The Master node had a 6GB HD

The network was built from:

- A Dynamic 24-Port Hub RJ45
- 10 Direct CAT 5 UTP Ethernet cables
- 10 3/com NIC, Preboot Execution Environment (PXE) enabled Ethernet 10/100

The outcome of the hardware reconfiguration produced the ELIHE HP Cluster that consists of 9 Computational Nodes and a Master Node. The nodes are connected into Ethernet LAN using CAT5 UTP direct RJ45 cables, and a 24 port Superstack2 Dynamic Hub (PS-hub50 compliant with IEEE 802.3 ISO/DIS8802/3). The NICs are PXE 3Com Fc. The hardware was tested using a RAM test program,

Hard Disk test software and crossover cables, patch cables and Hubs on the NIC.

All the nodes in the cluster are commodity systems - PCs, running commodity software – Linux, and CLIC Mandrake cluster middleware. CLIC is monolithic software intertwining Mandrake operating system with the cluster middleware software; hence this cluster did not require separate installation of an operating system. This simplified installation and configuration of the software. The installation of the cluster software involved installing server software on the head node, and creating a "golden node" image for client worker nodes. The "golden node" image was used to create a boot floppy disk for the worker nodes.

When configuring the cluster, each individual worker node had to be booted individually from the floppy boot disk – a time consuming process. The GUI provided some support at the beginning of the installation process. However, laborious command line input was required for most of the software installation.

ELIHE-2 HP Cluster

OSCAR Clusters

Open Source Cluster Application Resources (OSCAR) is cluster software stack providing a complete infrastructure for cluster computing [10]. OCSAR is a framework for cluster installation configuration and management. It consists of the following components:

- Administration/Configuration
- High-Performance Computing (HPC) services/Tools with parallel libraries such as LAM/MPI, PVM
- Maui and OpenPBS schedulers, Ganglia
- Core infrastructure management such as System Installation Tools
- Cluster command and control and OSCAR Database.

OSCAR supports wizard-based cluster software installation for an Operating System, Cluster environment administration and operation; it automatically configures cluster components, and reduces time to build and install a cluster.

OCSAR 3.0

For ELIHE OCSAR Cluster hardware we initially acquired 3 of the Institute's redundant Pentium 3 PCs - LAN boot compatible.

The PC's hardware consisted of:

- 20GB HD
- 256 MB RAM
- P3 440MHz CPU
- Node Screen Resolution 1024*768

The network was built from:

- A Dynamic 4-Port Hub RJ45
- 4 Direct CAT 5 UTP Ethernet Cables
- 3 3/com NIC, PXE enabled Ethernet 10/100

OSCAR 3.0 cluster software was installed on top of Linux Red Hat 9 operating system. After the server and client images were created, the client image was propagated to the worker node via the network enabling the node software installation dispensing with time-consuming boot disks.

Subsequently the node hardware failed and final evaluation of the cluster could not be completed on available hardware. Due to the age and instability of the hardware the cluster
installation could not be completed. This investigation had to be abandoned uncompleted, until more redundant machines of the similar hardware profile are available. At this point the decision was made to install OSCAR 4.2 (the latest available version of the open source cluster software) on the new Pentium Dual Core Hyper Threading machines.

OSCAR 4.2

The hardware for second OSCAR cluster – ELIHEII HP consists of 16 Intel Pentium D machines with the following specifications:

- 500 GB Sata HD
- 1 GB RAM
- Intel Pentium Dual core processor 2.85GHz
- Node Screen Resolution 1024*768

ELIHE-2 HP Cluster

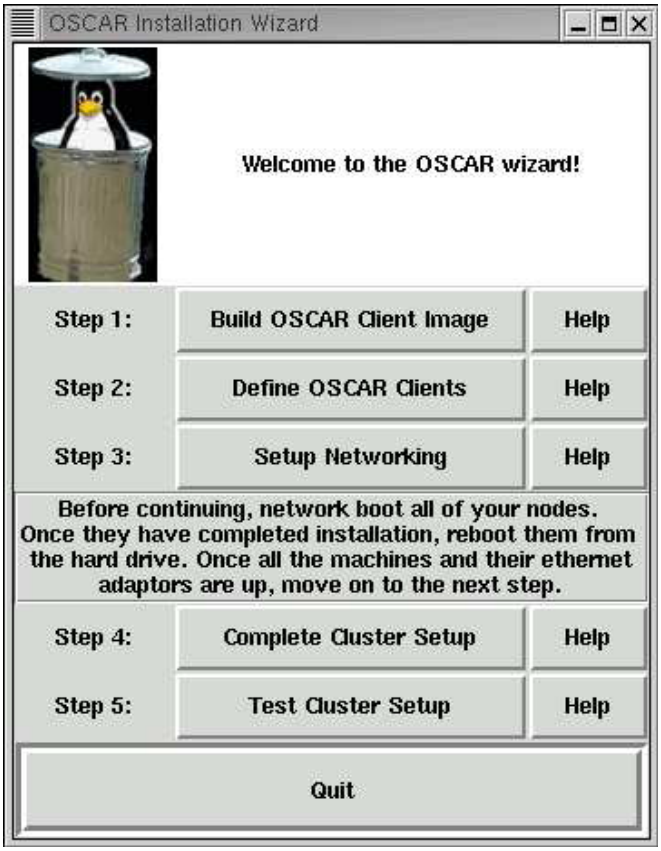
The network was implemented using:

- D-Link DGS-1024D Gigabit Switch
- On board Gigabit LAN – Broadcom 5789 chip Ethernet (10/100/1000 MBit/sec)
- CAT 5 UTP cables OSCAR 4.2 was installed on top of Fedora Core 2 Operating System. Fedora Core 2 does not support on board LAN chips hence the tg3 driver had to be downloaded and installed using command line interface for running the script.

After the command *./install_cluster eth0* was executed from the command line the OSCAR Wizard was displayed. The OSCAR Wizard provides a GUI to assist with cluster installation. It comprises a set of screens that guides a user through the process of creating an image – Server and Client, defining the number of nodes, configuring the network settings, and confirming the cluster setup was successful. Another set of screens lets users add and remove nodes from the cluster. There are number of steps to follow during the installation:

- Select and Configure OSCAR Packages
- Install OSCAR Server packages
- Build OCSAR Client image
- Define OCSAR Clients
- Setup Networking
- Complete Cluster Setup
- Test Cluster Setup

To provide for scalability, there are options to add/delete OSCAR clients and to install/uninstall OSCAR packages. Once the steps of setting up the cluster have been completed, the software utilises RARP (Remote Address Request Protocol) to collect the MAC addresses. The MAC addresses can be allocated from a text file if the machines are not network bootable.



After the Client image was created, during the Network configuration step the client image was propagated across the network to all the worker nodes in the cluster. The nodes are then rebooted and the steps to build and test the cluster are selected from the GUI in sequence, greeting the installer with a 'successfully installed' notification. As outlined earlier, the Fedora Core 2 operating system does not support on board LAN chips - tg3 device, hence the client image, propagated to the worker nodes during the network configuration step in the installation, did not incorporate the necessary tg3 driver. Thus, the communication between the server and the worker nodes failed, resulting in a failure to configure the cluster. The Fedora Core 2 is not a suitable OS platform for the hardware profile of our new computers. To overcome this problem, an attempt was made to utilise Linux distribution that supports onboard LAN chips by installing another Linux OS - Mandriva (ex Mandrake) 10.1 (3 CD pack) on our nodes. The installation of this operating system resembles the CLIC installation (Mandrake based). The similarities in the interface between this O/S and CLIC were obvious.

Since CLIC was built around Mandrake. Setting up the Domain Name Server (DNS) name was a slight problem at first; however the following directions were followed:
File */etc/hosts*: always contains the localhost IP address, 127.0.0.1, which is used for interprocess communication. It sometimes contains addresses of additional hosts, which can
be contacted without using an external naming service such as Domain Name Server (DNS).

A sample hosts file for a small home network is as follows:
Do not remove the following line, or various programs
that require network functionality will fail.
127.0.0.1 localhost
192.168.0.1 elihe2.net'

File /etc/resolv.conf: configure access to a DNS server. This file contains our domain name and the name server(s) to contact:

search elihe2.net

[2] http://www.tldp.org

Mandriva 10.1 supports the 3g drivers, and recognised the on board LAN chip and the 3g driver that will be mirrored across the nodes on PXE boot. This is anticipated to resolve the problem with the client image support for our hardware encountered when installing OSCAR on Fedora Core 2 OS.

Cluster KNOPPIX

Knoppix was developed by GNU/Linux consultant Klaus Knopper and gets its name from **Knopp**er L**inux**. KNOPPIX is a Debian Linux distribution running on a CD. It is not installed on the hard drive, thereby avoiding installing any permanent files onto it.

ClusterKnoppix is a modified Knoppix distribution using the OpenMosix kernel. OpenMosix is a free cluster management system that provides single-system image (SSI) capabilities, e.g. automatic work distribution among nodes. It allows program processes to migrate to machines in the node's network that would be able to run that process faster. It is particularly useful for running parallel and intensive input/output (I/O) applications.

ClusterKnoppix has the following features
- OpenMosix terminal server - uses PXE, Dynamic Host Configuration Protocol (DHCP) and Trivial File Transfer Protocol (TFTP) to boot Linux clients via the network. No CD-ROM drive, hard disk, or floppy is needed for the clients.

OpenMosix Autodiscovery - new nodes automatically join the cluster (no configuration needed)
- Cluster Management tools - openMosix user and openMosixview

Every node has root access to every other node via Secure Shell SSH/RSAkeys MFS/DFSA support.

This openMosix-based clustering system requires the system to have the following hardware
profile:
- Intel-compatible CPU (i486 or later),
- 32 MB of RAM for text mode, at least 96 MB for Graphics Mode with KDE (at least 128 MB of RAM is recommended to use the various office products),
- Bootable CD-ROM Drive, or a boot floppy and standard CD-ROM (IDE/ATAPI or SCSI),
- Standard SVGA-Compatible Graphics Card

OpenMosix has been described as turning a cluster of computers into a virtual SMP machine, with each node providing a CPU [3]. This system sits in the kernel and provides the perception that it is a multiprocessor with no master node allocated, allowing the software utilisation from any node. This enables the cluster to automatically detect each node in the self load balance processes that are distributed, sharing power and hard drives. This provides a portable instant CD-ROM cluster.

ClusterKnoppix can utilise heterogeneous clustering, something that CLIC and OSCAR do not offer; they only support homogeneous clustering.
Our KNOPPIX Cluster was implemented on the machines in the computing laboratory and consists of 8 nodes connected with an Ethernet network. The nodes' hardware profile is as
follows:
- Intel Celeron D 2.6 GHz,
- 256 MB RAM,
- 40Gbyte HD and
- 10/100 onboard LAN chip.

The KNOPPIX cluster was successfully implemented on the computer laboratory system that is normally used to teach computing subjects. The ClusterKNOPPIX, as an educational tool, has an advantage compared to CLIC and OCSAR. It can utilise an existing system, providing the

additional functionality to the resources in teaching institutions, without interfering with its "normal" use, whilst CLIC and OSCAR require dedicated computing resources.

III. Parallel Application Execution

All three cluster systems provide the support for parallel algorithms and application execution. To compare the performance of KNOPPIX and CLIC clusters, the *PI* constant calculation program, the "Hello world" of parallel computing, was executed on both systems.

The program run was repeated three times to determine the lowest time to return, utilizing various number (power of two) of computing nodes. The following results were obtained for CLIC cluster when running MPICH 1.2.4 version of cpi.mpich with number of nodes ranging from 1 to 8:

[terence@enterprise user]$ mpirun -np n ./test_cpi.mpich

- 1 Server running /home/nis/student/cpi.mpich on 1 LINUX ch_p4 processors Created /home/nis/student/PI9152
  Process 0 of 1 on server.enterprise.net pi is approximately 3.1415926544231341, Error is 0.0000000008333410 wall clock time = 0.002132
- 2 nodes running /home/nis/student/cpi.mpich on 2 LINUX ch_p4 processors Created /home/nis/student/PI9066 Process 0 of 2 on server.enterprise.net pi is approximately 3.1415926544231318, Error is 0.0000000008333387 wall clock time = 0.00185 Process 1 of 2 on node1.enterprise.net
- 4 nodes running /home/nis/student/cpi.mpich on 4 LINUX ch_p4 processors Created/home/nis/student/PI8721
  Process 0 of 4 on server.enterprise.net pi is approximately 3.1415926544231239, Error is 0.0000000008333307 wall clock time = 0.004658
  Process 3 of 4 on node250.enterprise.net
  Process 1 of 4 on node1.enterprise.net
  Process 2 of 4 on node240.enterprise.net
- 8 nodes running /home/nis/student/cpi.mpich on 8 LINUX ch_p4 processors Created /home/nis/student/PI7755 Process 0 of 8 on server.enterprise.net pi is approximately 3.1415926544231247, Error is 0.0000000008333316 wall clock time = 0.010239
  Process 6 of 8 on node244.enterprise.net
  Process 4 of 8 on node248.enterprise.net
  Process 3 of 8 on node250.enterprise.net
  Process 7 of 8 on node242.enterprise.net
  Process 5 of 8 on node246.enterprise.net
  Process 1 of 8 on node1.enterprise.net

The KNOPPIX cluster was tested using an OpenMosix version of *PI* calculation – Mospi.
Running the Mospi program run requires parameters such as the number of processors and processes specified similarly to the *mpirun* command on CLIC cluster.
PI was calculated on:

- One node, recording the lowest time of 27.68 seconds per node.
- Two nodes, returned a value of 6.5 seconds, 32 processes per node.
- Eight nodes, retuned 11 seconds, 32 processes per node.

The above findings show conclusively that CLIC's dedicated systems scalability and resource manager is far superior in executing a parallel program such as *PI* calculation. Although, there is a generation difference in the two types of hardware, due to the nature of OpenMosix sitting on top of the OS in a virtual mode, its independent setup configuration has an administrative effect when compared to CLIC or OSCAR. Hence the time for calculating *PI* constant on the KNOPPIX cluster is up to 1000 times slower than using CLIC dedicated HPC system.

IV Summary

The objective of our investigation was to explore a variety of open-source cluster software and hardware platforms for designing the cluster system and evaluate their suitability for meeting the educational and research needs for students and staff within the Higher Education institutions. Our findings are summarised in the following table:

Cluster Middleware	Architecture	Operating System	Ease of installation	Performance (Based on MPI pi calculation)	Utilisation
CLIC Mandrake	Low-spec machines, Pentium 3	Mandrake 9	Difficult - Command line interface	0.001852 s	Dedicated system used for delivery of various modules in ELIHE
Knoppix	Any spec machines with CD-ROM	Any	Easy to install - GUI	11 s	Suitable for use along other laboratory activities
OSCAR 3.0-5.0	High-spec machines	Mandriva 10.0/2006 FC 2/5, Red Hat 9	GUI and command line installation	-	Currently in development

We have implemented three cluster systems software on 3 different hardware platforms.

The Cluster systems software CLIC, OSCAR and KNOPPIX, were implemented on Linux operating system variants Debian, Mandrake, Red Hat 9, Fedora Core 2 Mandiva 10.0 and 10.1. The clusters' hardware platforms varied from Pentium 3 to Pentium D dual core processors based machines, with RAM from 64 MByte to 1 GByte, Hard Discs from 4 Gbyte to 500 Gbyte, 10/100 Ethernet network and 1 Gigabit Ethernet.

The CLIC Mandrake software could be implemented on the very low-spec redundant Pentium 3 nodes, enabling utilisation of old machines in our School. The CLIC ELIHE cluster is currently used to deliver various modules on our Computing programme. However, the installation and configuration of the system required many hours of work, often manually configuring worker nodes in the system via command line interface. The system provided evidence that the dedicated HPC system can be implemented using a low-cost hardware and software, providing the platform for running MPI applications.

KNOPPIX cluster software was implemented on similarly low-spec machines, already in use as part of the computer laboratory. The system was relatively easy to install, and did not interfere with the normal use of the machines, as part of the teaching activities, yet providing a powerful tool for running parallel applications. The performance of this system was inferior to that of the dedicated CLIC and OCSAR cluster. However, it supported the heterogeneous hardware profile rather than homogenous required by CLIC and OSCAR.

OSCAR cluster software required higher spec machines (which are more expensive) than KNOPPIX and CLIC. A drawback of this system is that most existing Linux OS distribution required for OCSAR 4.2 installation does not support modern PCs hardware platform that incorporates a networking device on a motherboard. However, the advantage of OSCAR Cluster software is the ease of cluster installation provided by incorporated GUI wizard. The server, client nodes and network were configured automatically, greatly reducing the installation time. With the Mandriva 10.1 distribution that supports the hardware of the newly acquired machines, this cluster software would be our software of choice for the dedicated HPC clusters with a large number of nodes.

All three Cluster systems are an asset employed in the delivery of our computing programmes and this new paradigm of computing technology, and used to provide a hands-on practical experience for our students. They also provide a resource for research in engineerin simulation and modelling for staff and students. We are planning to install MATLAB for distributed and parallel computing on our dedicated rack of Pentium D based machines.

V. Future Work

Our research in cluster computing is an ongoing project that will involve the design, implementation and testing of cluster technologies over the oncoming months and years. The clusters implemented in the ELIHE will eventually be incorporated into a Grid Infrastructure - ELIHE Grid. The clusters are a valuable resource, and will be made available to the consortium of colleges and universities in East Lancashire, UK via the Open Grid Service Architecture technology.

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The East Lancashire Institute of Higher Education at Blackburn College

Language, literacies and learning: A proposed case study of an online discussion forum on an English Degree programme

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Language, literacies and learning: A proposed case study of an online discussion forum on an English Degree programme

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Abstract- Learning online is increasingly a component of many courses, whether that is a fully distance learning model, one that offers some form of blended delivery, or the more 'traditional' model where some form of online element complements face-to-face provision. The discussion forum is often a crucial element of this online provision, as it allows learners to potentially collaborate, to learn from each other, to engage in critical thinking and knowledge construction. However, whilst a great deal of research has already been done in this area, both quantitative and qualitative, it often doesn't explicitly acknowledge the socially and culturally situated nature of the practices involved. Unpacking the technologies, social contexts, communication practices and constructions of identity which exist in specific examples is vital to our understanding of how education is shaped by and is shaping those who participate in it. It is clear too that the intersection between face to face and electronic practices in online learning spaces is complex; how students negotiate home and academic literacies, dominant and vernacular practices, clearly needs to be the focus of more research, in order to enable us to guide and support them more effectively.

This paper will outline the theoretical frameworks which underpin a proposed study of an online asynchronous discussion forum situated within a higher education context in a UK College, making a case for a 'literacies' perspective.

I. Context and focus

I am part of a small teaching team who deliver a successful English language and literature degree programme at a large, mixed economy further education college. Our student cohort is relatively small (40-50 students per year), with the majority coming from 'non-traditional' higher education (HE) backgrounds. Most live locally and most have commitments outside the academic sphere, including varied family and work responsibilities. Opportunities to study together or to socialise tend therefore to be limited, especially as the nature of English as a subject means that a substantial amount of study time outside timetabled lectures and seminars tends to be focussed on independent reading and research.

With all of this in mind, in October 2005 we introduced an entirely voluntary online asynchronous discussion forum to provide students with a social and educational space to encourage interaction both between classmates and across each year of the programme. We chose a domain outside the more established institutional VLE (virtual learning environment) in order for students to more easily access the forum from home (http://www.college-life.com/baenglish) but made the site password protected for security. Although it is not a compulsory element of the course, students *are* strongly encouraged to participate; a scheduled training session in year one of the course provides information and technical help. To further encourage take-up, we decided that students would be more likely to contribute if they could opt to do so anonymously; some students chose to adopt some sort of pseudonym, whilst others used their given names, or some recognisable version of it. Additionally, whilst the forum is mainly for students to access when, where and how they want, they are aware that it is regularly read and used also by staff, to provide an occasional online extension of seminar activities, to develop learning relationships with students, and as a means of relaying various messages and information.

The decision to develop the forum wasn't one necessarily informed by existing research and pedagogic

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principles, beyond a recognition of the broad benefits of 'collaboration', the acknowledgement that learning is inevitably a social process, and the desire to provide further effective and engaging learning opportunities for students; rather it was a more organic process that grew out of discussions with a colleague who could provide the necessary technological support, and was perhaps the result of feeling that without such an opportunity, our students may be disadvantaged. It was also, and indeed continues to be central to the institution's teaching and learning policy that students are offered opportunities to develop IT skills. It is also the case that throughout their programme of study, students are introduced to the concept of the socially situated nature of language and therefore literacy, culminating in a module in year three which problematises the nature of 'electronic literacies'.

The response from the start appeared in many respects to be very positive, with some students using the forum regularly and enthusiastically, with many others 'lurking' and perhaps making an occasional contribution. However, it was also clear that some just didn't use it at all; this pattern continues to be the case. Yet even for these students, there has undoubtedly been *some* impact as a result of the existence of the forum, not least because it has become embedded within the discourses, spoken and written, that surround them within this educational context. For those who *do* use the forum perhaps there has also been some impact on their 'student' identity – some of their contributions have been wonderfully engaging, expressive, and where the topic is subject related, at times subtly different from comments and observations within dominant academic genres such as essays.

On both a personal and a professional level, I am particularly interested in the concept of literacy as a socially situated practice, the role of language in the construction of identities, and in the concept of widening participation in HE. The Government suggests that 'considerations of economic and social justice both argue for ensuring that the opportunity to enter higher education should be open to anyone who has the potential to benefit from it, regardless of background'(www.dfes.gov.uk/hegateway/uploads/ ewparticipation.pdf - accessed 3/1/07). In her study of student writing in HE, Lillis (2001:2) also refers to access, but expands the concept to include access to the 'language and literacy resources for meaning-making that are available in higher education'. For the HE Academy (http://www.heacademy.ac.uk/4211.htm - accessed 3/1/07), widening participation is *also* about facilitating student success; 'successful diversity depends not on 'normalising' students to fit into existing practices, but rather on building on different backgrounds, experiences and interests to develop HE within this dynamic context' – a crucial differentiation.

II. AIMS

For Green and Bloome (1997:191) the research agenda of ethnographic studies 'in' rather than 'of' education, by practitioners and researchers located in classrooms, can be broadly viewed as framing a series of dialectics 'related to equity and effectiveness'. They suggest that questions of access, of how students perceive, understand and participate in learning, and of what counts as knowledge and learning to teachers *and* students should be central. For Goodfellow too, (2004) researching learning in virtual communities should focus on 'questions of empowerment, marginalisation and exclusion', and the role of wider institutional and social practices in shaping the experience of participants. With all of this in mind then, my research will focus on the following questions:

1. How has the online discussion forum affected individual literacy practices?
2. What is the link between these online practices and student identity?
3. How can participation in the forum be used to further enhance the student experience and encourage the development of learning relationships?

III. LANGUAGE AND LITERACIES

The view of language and therefore literacy which underpins my research begins with the ideas of Norman Fairclough (1989, 1992, 1995, 2003) whose approach to critical discourse analysis and the idea of critical language awareness complements The New Literacy Studies' concept of literacy in practice (I return to this in more detail later). Fairclough (1989:22) takes a discourse view of language as a 'form of social practice':

- Language is part of society, not somehow separate or external to it
- Language is a social process
- Language is a socially conditioned process, conditioned that is by other (non-linguistic) parts of society.

Discourses are ways of 'being' or operating in the world, linked to particular groups at particular times, determined

by conventions and governed by relationships of power. Fairclough (2003:14) believes that the texts which are part of these 'orders of discourse' or particular configurations of language (from Foucault), can have 'social, political, cognitive, moral and material consequences and effects in a range of different spheres of social life' – we can construct our own 'identity' in texts, and in turn, position potential readers or consumers of our 'texts'. Clearly, there are 'alternative and competing discourses associated with different groups of people in different social positions' (Fairclough 2003:17). Analysing the texts which are 'products' of these discourse practices may reveal something of the social relationships and identities which underpin them.

For Ivanic (2005:1) however, the concept of identity itself is 'misleadingly static' – she suggests thinking about identity as a continuous process of 'identification'. 'Identity' is therefore continuously evolving, situated in time and place, processual and relative. In terms of discourse, identity is an amalgamation of how we are positioned by different forms of address, by how others refer to us, and by how we see ourselves in interaction with others. Crucially, Ivanic (Ibid: 9), like Fairclough, sees discourse as 'configurations of practices, including multimodal communicative practices, which have inscribed in them a particular view of some aspect of social reality'. Participants in the forum will employ a range of analysable linguistic resources to 'texture' their identity, as well as choosing how much or how little to contribute at all.

Ivanic also suggests that one of the main objectives of any newcomer to a particular social practice is to quickly become 'one of them' (2005:15) - a recognised member of the community. For someone 'outside' a particular discourse practice however, it may be very difficult to unpack exactly how things work on the 'inside'; teachers and learners, for example, are involved in inter-related discourse practices both in the classroom and beyond, with often specific roles assigned to each, shaping social relations and possibly even the world outside the institution. Often learning how to be part of a particular discourse community involves tacit and implicit forms of knowledge and understanding, rather than overt and explicit forms – this can be particularly true of learners trying to work out the 'rules' of particular discourse types. Within specific academic literacy practices (Lillis 2001:164) for example, there may be challenges to personal identity, as students try to unpack these often implicit 'rules' associated with particular disciplines and practices (Lea & Street 1998:159).

The concept of communities of practice (Lave and Wenger 1991; Wenger 1998), which views learning as participation in a socially situated process, is clearly salient. Wenger here refers to active participation in the living practices of a social community and constructing identities in relation to those communities; in other words, 'a kind of action and a kind of belonging' (Wenger 1998:4-5). Characterising this as a process of learning and knowing includes the following[2] dialectically connected components:

Wenger argues that education is and should be most closely concerned with opening up identities, new ways of becoming and belonging, as opposed to training which is perhaps more concerned with specific new competences; 'education is not merely formative – it is transformative'(1998: 263). He suggests that part of the role of educational institutions must be to connect the experience of students to actual practice through 'peripheral forms of participation in broader communities beyond the walls of the school' (http://www.ewenger.com/theory/index.htm - accessed 3/1/07). From this perspective, the academy is not 'a self-contained, closed world in which students acquire knowledge to be applied outside, but a part of a broader learning system'. Goodfellow (2007:139) suggests Wenger's (1998) concepts of 'reification' and 'participation' may be particularly valuable here. To reify is to regard something abstract as a material or concrete thing, a fixed and tangible instantiation of a particular practice. From this perspective, 'both texts and technologies would present as different kinds of reification' (ibid), both forms of institutional practice.

[2] Image from

http://herkules.oulu.fi/isbn9514272463/html/graphic77.png.

Accessed 3/3/08

IV. LITERACY PRACTICES

The New Literacy Studies (Street 1984; Gee 1990, 2000, 1995; Barton & Hamilton 1998, 2000) is a general term for a predominantly sociocultural approach to understanding, researching and theorising literacy. Rather than seeing literacy as autonomous, as a decontextualised, discrete, coding and decoding skill, this approach sees literacy as 'ideological', or embedded within particular contexts at particular times. For Barton & Hamilton (2000:8):

- Literacy is best understood as a set of social practices; these can be inferred from events which are mediated by written texts.
- There are different literacies associated with different domains of social life.
- Literacy practices are patterned by social institutions and power relationships, and some literacies are more dominant, visible and influential than others.
- Literacy practices are purposeful and embedded in broader social goals and cultural practices.
- Literacy is historically situated.
- Literacy practices change and new ones are frequently acquired through processes of informal learning and sense-making.

How people use literacy, how it is valued, how literacies are patterned by relationships of power and shaped by culture are all issues central to this proposed study. For Maybin (2000:197), an examination of literacy practices is pivotal in unpacking the links between 'individual people's' everyday experience, and wider social institutions and structures'.

V. DOMINANT AND VERNACULAR LITERACIES

Given that different domains of social life support and develop particular literacy practices, that the social is permeated with differential power relationships, and that this clearly has implications for the identities of participants, the dominant realm of education must be of central concern. Within the social practice of education, as with other socially powerful institutions such as the family, the church or the law, dominant literacies (Barton & Hamilton 1998) are those supported and structured by the institution. Vernacular literacies, on the other hand, are those practices *not* regulated by the formal and informal 'rules' of dominant social institutions, and which have their 'origins in everyday life' (ibid: 247). The allied concept of 'academic literacies' (Lea & Street 1998: 1) refers to the particular discourses (texts, talk around texts, socially and culturally constituted and constituting linguistic forms) which form part of the social practice of education, and is part of a drive to better understand issues of student learning. Academic literacies, or uses of reading and writing can be discipline specific, institutionally specific, even departmentally specific; some are more generic, such as Lillis' concept of 'essayist literacy' (2001: 20), though even here what constitutes an 'essay' is by no means standardised.

Academic literacy practices involve particular configurations of text types, styles, access and appropriacy; they are about meaning-making, about what constitutes 'knowledge' within the academy. To be 'successful' students must negotiate this potential minefield of texts and practices, selecting appropriate forms, developing and employing a range of relevant linguistic resources to meet the requirements of particular settings. There are therefore clear implications here both for those who fail to understand or respond to the often subtle shifts involved, and for those for whom perhaps the impact on their identity may be too problematic. Implicit in the 'Literacies for Learning in Further Education' project, which focused on researching the use, refinement and diversification of literacy practices as students participate in Further Education courses (http://www.lancs.ac.uk[3] - accessed Sept 2007), is also the understanding that the demands of college literacy don't always relate to students' existing, often vernacular practices, and that creating a bridge between the two may enhance participation and make for more effective learning.

VI. THE ONLINE LEARNING CONTEXT

Wenger (1998:7) refers to groups of people congregating in virtual spaces, developing shared ways of pursuing their common interests as an example of a community of practice, a learning community, suggesting a very informal, almost organic process, However, within educational contexts, learning is a much more explicit goal. In her review of research into various models of *online* learning in higher education, Wallace (2003:371) summarises that the social space which is often created online, the perceived increased accessibility of tutors, the

[3] An expanded summary of the findings can be found at http://www.lancs.ac.uk/lflfe/findings/index.htm

changing roles and identities of those involved, all make for positive teaching and learning environments. However Kirkup (2002:194), in her exploration of identity, community and distributed learning, suggests that *wholly* virtual learning communities may conversely provide only limited kinds of participation in practices. She suggests that we need a clearer understanding of the strengths and weaknesses of a range of different models of online learning in order to ensure they are a valid and valuable component of any learning context. It is certainly the case that research into online learning has become something of a growth industry over the last ten years. It is therefore important at this point to briefly situate my proposed research within this broader field.

VII. EXAMINING CONTENT

Analysing the content of electronic discussion forums, using a variety of frameworks is a key area of research. Coffin and Hewings (2003) (see also Marra, Moore & Klimczak 2004, Littleton & Whitelock 2005) examined students' argumentation skills through a close linguistic analysis of the content of two interactive electronic conferences in a Masters level programme. They also compared this to the construction of argument in individual essays. Using an explicit set of codings to describe the functions of particular exchanges, Coffin and Hewings found that the electronic medium may enable students to engage with and reflect on particular positions in a set debate, though there seemed to be some reluctance to overtly challenge viewpoints of peers. Interestingly, this apparent ability did not always extend to the more traditional essayist literacy practices (Lillis 2001:20) which they also examined, though they acknowledged that in all cases initial task design by the tutor was a crucial factor. In this case, as with others, the discussion forum had an explicit pedagogical function within the course, and was a compulsory element of the programme for all students.

From a Faircloughian (1989, 1992, 1995, 2003) perspective, these researchers were interested in finding ways to interpret and further develop 'online learning experiences' through an analysis of some of the 'products' of the processes students were engaged in – the texts produced. In their research into VLEs (virtual learning environments), Jones and Cooke (2006) again made use of a coding system to analyse and interpret evidence of 'thinking' in two cases where tutors had again explicitly set tasks. However in this case, the researchers also analysed later student reflections on one of the tasks, which provided a 'qualitatively different insight' into their experiences than that which 'could be obtained from analysis of discussion content alone' (Jones & Cooke 2006: 270). They cite the example of a student who in their view 'appeared to engage happily and successfully' with the online task, who subsequently reported feeling that the process was more time consuming than face to face discussion and ultimately produced inferior results within the terms of the specific task they had to undertake. Clearly then, whilst content analysis is undoubtedly a useful analytical tool, it may be limited in scope when considering students' attitudes to and perceptions of their learning.

VIII. OFFLINE AND ONLINE?

Methodologically, research into online discussion forums has often itself been online in nature. However Browne's 'cyber-ethnography[4]' of another predominantly distance learning Masters level programme combined content analysis of online discussion and a 'structured questionnaire' focusing primarily on 'socio-demographic information' (2003:248), which students completed at a two week summer school. This questionnaire also included some qualitative responses in terms of 'a reflection on the learning experience' (2003:250). Interestingly however, whilst again the students were again engaged in specific tutor-led tasks, there was an additional focus on social identities within the online space. One of the tutors commented on 'the touchy-feely nature of the group', adding that the sense of group membership and support seemed 'stronger here than with students on traditional programmes' (2003:252). Whether or not a tutor can accurately assess such issues, given the nature of their role within such an educational context, is a matter for debate however. It may also be the case here that face to face interaction at the summer schools inevitably impacted on students' perceptions of the nature and functions of their online interactions.

In their case study of a campus based course, Light et al (2000) focused on the contribution of an online discussion forum to the more 'traditional' learning experiences of four groups of third year undergraduates. Again, discussion centred on a tutor-led topic, but in this case the tutor was absent from the debate itself. However the contributions

[4] The concept of 'cyberethnography' remains undefined in social sciences while, at the same time overlapping with the more well-known concept of 'virtual ethnography'. Teli, Pisanu & Hakken (2007)

were formally assessed and the marks contributed to the overall grade for a particular module. A content analysis 'inevitably offered only a limited perspective on what was happening' (2000:87) but formed the basis of semi-structured interviews with three of the four groups of students after the online session had concluded. Clearly then, the whole online discussion must also have been campus-based and therefore still part of their more traditional educational context in terms of both time and place. Targeted individual interviews were then carried out with two students who were selected because of the 'more aggressive' (2000: 88) nature of their online contributions. The virtual absence of the tutor meant here that some students were occasionally 'off-task', hopped about between groups and even became abusive, despite the knowledge that they would eventually be assessed. Again, the offline relationships within these groups of students as well as the particular circumstances of their online discourse must clearly have impacted on the 'results' of the research.

Online social worlds are undoubtedly complex places (Paccagnella (1997); virtual identities may be different, group dynamics may shift, patterns of online interaction may change in comparison to face to face. McConnell (2000:176 cited in Browne 2003) notes that intimacy and emotion are key components in online discussion. In their comparative study of online versus classroom based delivery of a pre-service teaching course, Perez-Prado & Thirunarayanan (see also Vonderwell 2002, Collings & Pearce 2002) focused on students' perceptions and attitudes and found that one of the most recurring themes was the importance of 'peer interaction and co-operative/collaborative group learning environments' (2002:197) in both offline and online contexts. There were some differences between the online and offline experiences of both students and tutor however; as a generalisation, more affective topics tended to be more effectively experienced in a teaching and learning context in a face to face environment. In this research, as with others discussed, the discussion forum was a compulsory element of their programme of study, forming part of a taught module.

Much research so far has centred on post-graduates or learners advanced in their academic careers, having presumably 'mastered' the specific literacy practices associated with the path to that level of study, and having been accepted into a particular 'community of practice'. However, in her study of adult learners on a range of introductory level courses, new to the internet and often new to computers, Attar found that students' often experienced 'dismay and disappointment' (2006:496) at their inability to 'read' the online contexts of some websites and negotiate the multimodal technology. There are clear implications here for such students in educational contexts where a particular facility with CMC (Computer mediated communication) or the Internet is assumed.

IX. Online learning through a 'literacies' lens

Such studies therefore often do not explicitly acknowledge the socially and culturally situated nature of the practices involved, whether they are online or face-to-face.Goodfellow (2004www.networkedlearningconference.org.uk/past/nlc2004/proceedings/symposia Accessed August 11, 2007) makes a strong case for a 'social literacies' approach to the 'analysis of interaction in virtual learning communities', rather than, for example, quantitative or content analysis (Marra et al 2004). He suggests that issues such as 'empowerment, marginalisation and exclusion' should also be a central focus, concluding that there is something of a research 'gap' regarding the unpacking of the technologies, social contexts, communication practices and constructions of identity which exist in specific examples, and which 'contribute to the broader social shaping of education in the virtual domain'. Crucially for Goodfellow too, access to *all* those potentially involved in a practice is a critical element of research of this kind; it is often easy to overlook the fact that some learners don't 'read' the institutional and technological context in the same way as others; they may be marginalised by the process, or even 'disappear from the community altogether' (2004: 396).

The literacy practices associated with new ttechnologies are still in flux, not least because the technologies themselves are constantly evolving. Understanding how the different literacy practices which texture our lives overlap, may lead to an enhanced understanding of how they may 'work' within an educaional context. In trying to understand the 'disconnect' (Levin & Arafeh 2002 cited in Ware and Warschauer 2006) between home and school literacies in order to create a bridge between the two, Ware and Warschauer (2006: 433) analysed multiple sources of data (surveys, observations, interviews test scores and texts) from groups of school age students in in-school and out-of-school contexts associated with what could be called electronic literacies. They found that students crossed 'traditional academic boundaries of genre, media and modality in the production of texts'(2006:434), all of

which presumably involved a range of new practices. Similarly, a case study of 'Darla', a senior at a US college, reveals her ability to simultaneously work on a History assignment on her laptop with text books spread out in front of her, answer her mobile phone, and type a response to a friend's instant online message. Clearly, as Wilber (2007:1) suggests, the contexts of literacy practices have changed in that 'the locations of production and participation have been transformed'. Wilber suggests that understanding these new practices, enabling students to re-locate their experiences of them to academic contexts, will lead to an enhanced ability to make connections between academic literacies and, for want to a better phrase, 'home literacies'.

In their article on supporting writing for assessment in online learning, Goodfellow and Lea (2005) report that the intersection between 'traditional' and new practices in online learning spaces is far more complex than current literature would suggest, and that in order to guide and support students more effectively, further research is clearly needed. In his examination of research at the intersection of academic literacies and new technology, Crook (2006:510) also sees reading and writing as a form of socially situated practice, involving not just skills and competencies, but also a matter of 'the novice recognising that the 'various possible designs of writing need to be crafted in relation to different social and cultural contexts of use'. As Crook confirms, such awareness is often tacit, and involves immersion in a particular community, whether online or not. Having reviewed some of the literature in terms of both theoretical and methodological concepts, Crook concludes that whilst much has already been revealed, further longitudinal research in this area would provide a way of 'capturing change within individual development' (2006:516), to identify how novices may move from the figurative outside to the inside, perhaps through 'stages of disorientation towards outcomes that may range from rejection to confidence and enthusiasm'.

Goodfellow's view that 'literacy has become a lens through which we can take a critical view of educational practice itself' (2004 www.networkedlearningconference.org.uk – page 1 in printed version. Accessed August 11, 2007) is one I endorse. For Lillis too, the social practices approach provides a 'powerful framework for defining the nature of institutional literacy practices' (2001:1) as well as for developing an understanding of what is involved and what it all means for the students actually engaged in these practices; something that is crucial both in a global pedagogic sense, but also personally within my own practice.

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The East Lancashire Institute of Higher Education at Blackburn College

COST-EFFECTIVE REGENERATIVE BRAKING: WIDENING THE PERSPECTIVE

Academic Report: AR-08-06

Martin Smith[1] and Steven Wright[2]

April 2008

Engineering Research Group

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COST-EFFECTIVE REGENERATIVE BRAKING: WIDENING THE PERSPECTIVE

Martin Smith[1] and Steven Wright[2]

Academic Report AR-08-06. East Lancashire Institute of Higher Education, Blackburn, UK.

Abstract **-** This paper presents the initial results in simulation of the Kestrel flywheel system fitted to a Sports Utility Vehicle. The simulation used is an extension of a verified model produced by the IVT manufacturer for the study of the same vehicle, modified by the inclusion of a model of the Kestrel system and managed by a CISBAS controller [Wright 06]. These models have been extended in this way in order to provide a reliable indication of the benefits available from the use of the Kestrel system.

The results demonstrate that Kestrel system has the potential to improve city fuel economy significantly without the cost or complexity of existing, particularly hybrid, technologies.

They also demonstrate the use of a CISBAS controller in the simulation and evaluation of a vehicle for which no conventional controller exists.

1 INTRODUCTION TO KESTREL

The problem

The predominant life-style in the United States, Europe, and increasingly in the rest of the world, features a growth in private personal transport. Vehicle systems have been finely honed over more than a century through millions of engineer-years of effort to optimise these modes of transport for the convenience of the buying public.

Petrol and diesel fuels are now widely available. The weight, cost and packaging of internal combustion engines have reached ever better targets. Customer demands for comfort and convenience have been met or exceeded in most instances.

Yet several endemic major problems remain. Conversion efficiency from the very rich energy sources of petrol and diesel fuel to kinetic energy to move the vehicles remain between 20% and 30% as a best average. Carbon dioxide and other vehicle emissions across the globe are giving increasing cause for concern because of the high probability that they are causing irreversible damage to the global atmosphere. Such concerns being are increasingly seriously by governments worldwide (e.g. [DTI 02], [DTI 03])

The Kestrel solution

The Kestrel system was born as an idea simply to avoid wasting the precious fuel that is used every time a vehicle accelerates from rest, and then slows down again. This happens across the globe billions of times per day. We have generally come to accept that this fuel energy, being used through a petrol or diesel engine to propel our vehicles can then, with impunity, be converted into heat energy in the foundation brakes as the vehicle is brought to rest, and thus be totally lost for any further useful purpose.

The Kestrel driveline uses a novel form of transmission to transfer the vehicle kinetic energy into an energy storage flywheel during a stop. The transmission is configured so that the vehicle can be at rest while the energy storage flywheel is at full speed.

The transmission (a full toroidal traction transmission) in itself provides a more efficient way to use current petrol or diesel engines than current transmissions do [Burke 03] because the engine can be kept nearer its optimum speed for the power demanded by the driver.

Torotrak (Development) Ltd have been developing the toroidal traction transmission to a level that meets the stringent performance, cost, weight and driveability targets rightly demanded by major vehicle manufacturers. The Torotrak IVT is used in conjunction with the Kestrel Flywheel in this evaluation.

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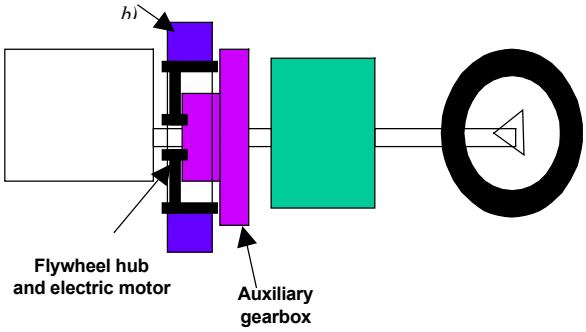
The Kestrel Flywheel



The Kestrel flywheel is fitted between the engine and IVT of the vehicle. When the vehicle is driving without exchanging energy with the flywheel, power is delivered directly from the engine to the IVT without significant loss.

Kestrel Schematic

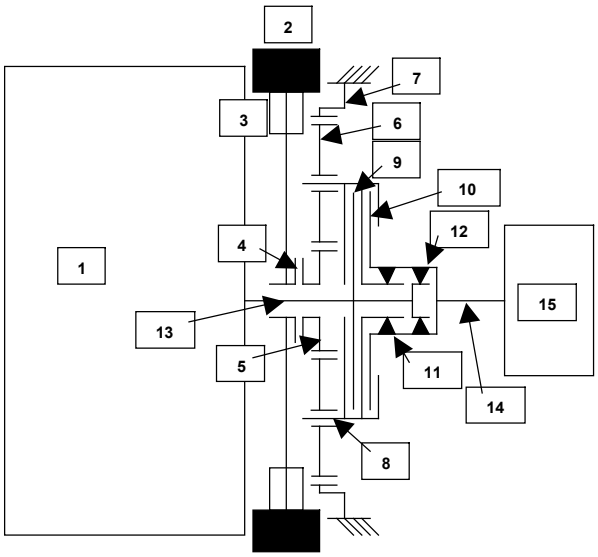


Figure 2 – Kestrel system schematic

Key

1) Prime mover engine
2) Energy storage flywheel
3) Electric motor/generator rotating member – this member is integral with the Flywheel
4) Flywheel disconnect clutch
5) Epicyclic sun gear
6) Epicyclic planet gears
7) Epicyclic annulus gear
8) Epicyclic planet carrier member
9) Flywheel top-up clutch
10) Flywheel charging clutch
11) Flywheel driving one way clutch
12) Engine driving one way clutch
13) Engine shaft
14) Transmission shaft
15) Transmission
16) Vehicle propeller shaft

Modes of operation

The Kestrel flywheel has multiple operating modes but in this preliminary investigation only the following mechanical modes of operation have been studied:

Engine driving the transmission

In this mode, the prime mover engine (1) drives the engine shaft (13). When the shaft (13) exceeds the speed of the transmission shaft (14), the one way clutch (12) transmits the torque from the engine shaft (13) to the transmission shaft (14), and thence into the transmission (15).

If the torque developed by the engine is reduced so that speed of the engine shaft (13) drops below that of the transmission shaft (14), the one way clutch (12) will over run freely.

Flywheel driving the transmission

In this mode, the Flywheel (2) drives the Epicyclic sun gear (5) through the Flywheel disconnect clutch (4). The Epicyclic sun gear (5) drives the Epicyclic planet carrier member (8) via the Epicyclic planet gears (6). When the speed of the Epicyclic planet carrier member (8) exceeds that of the Transmission shaft (14), the the one way clutch (11) transmits the torque from the Epicyclic planet carrier member (8) to the transmission shaft (14), and thence into the transmission (15).

If the speed of the Epicyclic planet carrier member (8) drops below that of the transmission shaft (14), the one way clutch (11) will over run freely.

Transmission driving the Energy Storage Flywheel

In this mode, the transmission applies a retarding torque to the Vehicle propeller shaft (16), the reaction of which generates torque on the Transmission shaft (14). With the Flywheel charging clutch (10) closed, the torque is transmitted via the Epicyclic planet carrier member (8), the Epicyclic planet gears (6), the Epicyclic sun gear (5) and the Flywheel disconnect clutch (4) to the Energy storage flywheel (2).

These are the operating modes typical of a Kestrel-equipped SUV without battery storage operating on a level-ground drive cycle.

2 CONTROLLER

The controller for this system is of CISBAS (Control by Intelligent Selection Between Alternative Solutions) type.

The principle of the CISBAS controller is to determine the range of possibilities open to the controller at any instant, and to make an intelligent selection from these alternatives rather than to follow any pre-determined heuristic rules.

The CISBAS controller has three distinct phases. In **Phase 1** the driver's instantaneous expectation is computed by a neural network from the position of the accelerator pedal, the current system state and a measure of recent history.

Phase 2 establishes a range of alternative solutions as nearly as possible capable of meeting the driver's expectations. This is achieved by means of a look-up table stored in memory that contains a previously calculated engine demand and transmission loading for every combination of wheel-force, engine speed and road speed the vehicle is capable of requiring.

The results of the look up table produce a list of alternative solutions at different engine speeds to meet the current demand at the current road speed. These are adjusted slightly to account for the effect of any implied acceleration or deceleration of the engine and the final list of alternatives is passed to the next phase.

These engine-based alternatives are supplemented by one flywheel-based option. There is only one alternative for flywheel operation since its speed is virtually constant over the time interval in use.

Phase 3 uses a simple fuzzy-logic tool to score the desirability of each of the alternative solutions.

An intuitive set of membership functions and rules is used in the scoring of these alternatives. The 'optimal' solution is selected from the alternatives presented on the desirability scores.

The potential to switch frequently between engine and flywheel when the fuzzy scores of the best engine-driven alternative and the flywheel alternative gives a potential source of instability in the controlled system. The controller used includes an override to prevent a change of prime mover when the size of the driver's wheel force requirement is small (<50 N) and for approx 2s after a recent change has been made. The override is achieved by removing any candidate solutions that are inappropriate at such times from the list of alternatives before the final selection is made.

3 SIMULATION

The engine – transmission – vehicle model used in this study was provided by Torotrak and is constructed in Matlab-Simulink. This model is used for all tests.

The CISBAS controller is also implemented in Matlab-Simulink and is used to replace those sections of the Torotrak controller involved in deciding the outcomes desired. The results of the CISBAS decisions are passed to those parts of the Torotrak controller responsible for implementing decisions.

The details of the Torotrak controller are commercially confidential and are not discussed here.

The model of the Kestrel flywheel system is new and was constructed for these tests.

4 TESTS & RESULTS

Tests

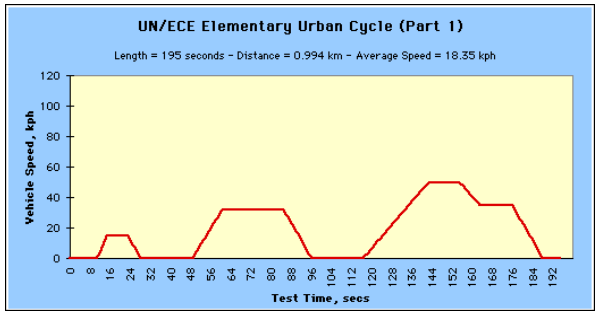
Full-throttle acceleration

Simulations of the SUV were run at 100% accelerator pedal depression for an initially fully charged flywheel and for a discharged flywheel.

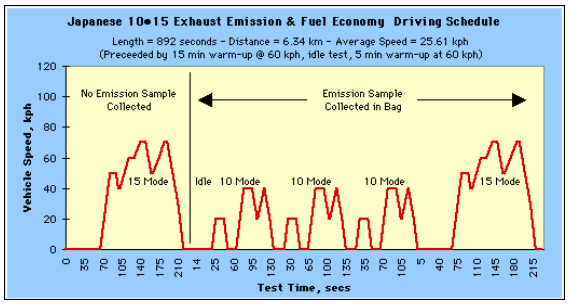
Fuel consumption

Fuel consumption was measured using cycles of accelerations, decelerations and cruising as defined by the European Urban and Japanese fuel economy drive-cycles. Each test cycle defines a velocity / time profile that must be driven.

The test cycles used are shown below:



European Urban Cycle



Japanese Cycle

The Kestrel flywheel allows the engine to be shut down during periods when the vehicle is stationary or when it is being driven by the flywheel. The inertia of the flywheel is such that the engine can be restarted very readily on demand without use of a starter motor.

The tests were conducted for two scenarios, firstly with the engine idling to provide power to ancillaries (alternator, power steering pump, etc.) when not in use, and secondly with the engine shut down when not in use and the ancillaries powered by the flywheel output.

Driveability

The velocity / time responses of the vehicle for fully-charged and discharged flywheel were plotted for:

A step change in pedal position to 100% from rest (Launch)

A step change in pedal position to 100% from 12 kph (Performance).

Results

Full throttle acceleration

Cycle	IVT only	Kestrel Half Charged	Kestrel Fully Charged
0 – 50 kph	4.9 s	4.1 s	3.3 s
0 – 30 mph	4.6 s	3.4 s	3.1 s
0 – 100 kph	13.4 s	13.8 s	13.6 s
50 – 110 kph	11.3 s	12.3 s	12.9 s
0 – 60 mph	12.6 s	12.9 s	12.8 s
30 – 70 mph	12.3 s	13.7 s	14.0 s

Fuel economy

Cycle	IVT only	Kestrel	Saving
European Urban - engine idling	0.5570 kg	0.4737 kg	15.0 %
European Urban - with engine cut-off	0.5570 kg	0.3198 kg	42.6 %
Japanese Urban - engine idling	0.5277 kg	0.4716 kg	10.6 %
Japanese Urban - with engine cut-off	0.5277 kg	0.3876 kg	26.5 %

Driveability tests

Raw Data

Assessment	IVT Only	Kestrel + IVT
Launch delay	0.12 s	0.02 s
Launch acceleration	3.48 ms^{-2}	5.19 ms^{-2}
Performance delay	0.12 s	0.02 s
Performance acceleration	3.47 ms^{-2}	5.59 ms^{-2}
Performance jerk	2.48 ms^{-3}	50.4 ms^{-3}

Driveability indices

Assessment	IVT Only	Kestrel + IVT
Launch delay D_{LD}	8.8	9.4
Launch acceleration D_{LA}	8.9	11.1
Performance delay D_{PD}	11.0	13.2
Performance acceleration D_{PA}	11.2	15.0
Performance jerk D_{PJ}	7.0	55.9
Total Scores	46.9	104.6

5 CONCLUSIONS

These initial results demonstrate that the Kestrel flywheel system has the potential to provide significant fuel savings in cycles containing significant urban driving. The cost of providing this benefit is comparatively small, particularly if the flexibility of the Kestrel flywheel combined with the Torotrak IVT is used to reduce the required engine size.

It is clear from the results that the full benefit of the Kestrel system will be realised only if the the burden of the vehicle ancillaries is transferred to the flywheel output and the engine is shut down when not in use.

The results also show that the instant availability of energy from the flywheel produces very significant improvements in driveability and significant improvement

in accelerations from rest to typical city centre driving speeds.

There is a minor penalty in accelerations from rest to freeway cruising speeds. This is the result of a decision taken for these initial tests not to artificially increase engine speeds above those of the flywheel output prior to a hand-over between the flywheel and the engine. An alternative strategy for harsh accelerations that brought the engine to a higher speed before a hand-over would be able to remove this penalty completely, if desired.

The study also demonstrates the capacity of a CISBAS controller to assist in exploratory simulation of a complex IVT-based system.

6 Further Work

The study of the Kestrel-equipped SUV is continuing, and a the simulation of a wider range of drive-cycles and the investigation of the remaining Kestrel operating modes is planned.

It is expected that a possibility of even greater fuel economy and driveability improvements exists for urban buses and trucks. The evaluation in simulation of a number of Kestrel-equipped commercial vehicles is planned.

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The East Lancashire Institute of Higher Education at Blackburn College

THE NEW AMERICAN EMPIRE AND THE ELECTRONIC REVOLUTION

Academic Report: AR-08-07

T. D. McDonough[1]

April 2008

Sociological Research Group

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THE NEW AMERICAN EMPIRE AND THE ELECTRONIC REVOLUTION

T. D. McDonough[1]

Academic Report AR-08-07. East Lancashire Institute of Higher Education, Blackburn, UK.

CONTENTS

ACKNOWLEDGEMENTS

The New American Empire and the Electronic Revolution took over nine months to complete and every second was an absolute pleasure. The project gave me the opportunity to combine my personal interests in global politics and social theory with my academic interests in critical linguistics and new technologies. The result earned me first class honours and the first *Lancashire Telegraph Award for Excellence*, as well as giving me enough 'cultural capital' to kick-start my teaching career. I now work at the ELIHE in both the School of Integrated Arts, the School of Humanities and Social Sciences, and also in Learner Support Services.

However, no task is ever completed alone and so I must thank those who provided support in turn. First of all, thanks must go to my project supervisor and tutor Cheryl Dunn for deciphering Norman Fairclough and for introducing the infinitely useful Critical Discourse Analysis in the first place; for being patient and supportive; for providing guidance when times seemed hopeless; and for giving an unemployed, hopeless 'hoody' a second chance in life. In fact, paragraphs could be written about Cheryl's commitment to learning, not just for being an exceptional teacher, but also for being an absolute inspiration.

Thanks must also go to course leader Dr. Val Lowe for deepening our understanding of linguistic analysis, for demonstrating how theoretical concepts can be applied to cyberspace, for being the most tolerant and understanding year tutor ever imaginable and for giving the aforementioned kick-start to my career in education.

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In all, the entire team, including Helen Wilson and Karen Coe, must be congratulated for providing a *real* education and most of all, for providing access to higher learning for those who would otherwise be left out in the cold.

1 INTRODUCTION

In the spring-time, orange flowers fill the dusty-terrain that surrounds the Afghan city of Jalalabad. The scent of their blossoms is said to fill the air and even to encourage poets, from across the region, into paying annual homage to the orange blossoms[2].

Assadullah, a 16 year old ice-cream vendor, enjoyed the spring-time. The heat made work harder, but the influx of tourists meant more customers and more money. In the winter-time, around October, the nights cooled and the dust seemed to settle down. Assadullah worked as long as he could, until the tourists drifted to bars and

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[2] Hatch-Dupree, N., 1977. *An Historical Guide To Afghanistan.*

dens, then he spent the evenings near the airfields, away from the shadow of the mountains, amongst friends, or even alone, enjoying the respite from the heat.

On one October evening, Assadullah came to sit by the airfield. The sky was overcast making the night darker, but the air was light and clear. He got to his feet when he heard a rumble in the clouds above, like the cargo planes that regularly landed, but much heavier, much noisier. Before long, he heard people shouting and crying in the distance, then the rattle of gun-fire, and beneath the commotion he could hear the whirring of tiny propellers and a faint whistling sound.

Days later, whilst being treated in a Pakistani hospital, Assadullah told a journalist[3] that the last thing he heard "was just a roaring sound and then I opened my eyes and I was in a hospital". Assadullah had 'lost' his leg and two fingers to a U.S. ballistic missile. He had unwillingly participated in *Operation Enduring Freedom*, a 'precise strike'[4] air campaign aimed at Taliban forces that were allegedly harbouring the elusive Osama Bin Laden. The War on Terror had arrived.

The course for the ballistic missile had been set years earlier and half a world away, in Washington DC, in 1997, when a group of influential academics, politicians and corporate executives gathered together to form a think-tank called the *Project for the New American Century* (PNAC). The PNAC drew together some of the sharpest neo-conservative minds in the United States, including key members of the current Bush administration, such as Richard Perle, former Chairman of the Defense Policy Board; Richard Armitage, who became the Deputy Secretary of State; John Bolton who acts as Ambassador to the U.N.; Richard "Dick" Cheney who is the current vice President and former Halliburton CEO; Donald Rumsfeld, the former Secretary of Defence and Paul Wolfowitz, the former Deputy Secretary of State and current President of the World Bank. Many of the other members, such as Thomas Donnelly, whose influence will be discussed, also moved into prestigious positions within the military-industrial sector and the energy industry.

The group immediately released a white-paper in December 2000 entitled *Rebuilding America's Defences: Strategy, Forces and Resources for a New Century*. However, the group never formally introduced themselves to the media or the public and the document was never officially released beyond predetermined, conducive groups within the Washington political circle. However, in an attempt to embrace new technologies, to appear transparent to interest groups, and, it would seem, in ignorance of the level of exposure that cyberspace would offer, the group launched a website (www.newamericancentruy.org) and made their documents available in the public-domain. What then took place will be the major site of examination in this investigation, as PNAC did not go quietly into the electronic night, but, on the contrary, fell prey to an unexpected internet phenomenon: the rise of the social network.

[3] The Guardian, October 9th, 2001. 'Taliban Says 20 Civilians Killed in Kabul'.

[4] Donald Rumsfeld: cited in The Guardian, October 9th, 2001. 'Taliban Says 20 Civilians Killed in Kabul'.

2 METHODOLOGY

Outline

This investigation will take a trans-disciplinary approach to social and textual research. The overall aim is to critically evaluate and analyse the conditions of production and the conditions of consumption of the PNAC document *Rebuilding America's Defences,* and also to quantify the effects and the responses to this document. This is a sizeable task and there are limitations - that will be discussed - which mean that this approach will aim to be wide-ranging rather than comprehensive. For instance, the PNAC document is too large, at 90 pages, to be analysed in extensive detail, so, for this reason, the focus of this investigation will be Chapter 2 of the text entitled 'Four Essential Missions'. This chapter represents the core 'message' of the document as it outlines the group's key concepts and contains many of the statements and ideas that are both interesting and disturbing at the same time.

Theoretical Approach

Marx and Engels (1848:3) famously argued that 'the history of all hitherto existing society is the history of class-struggles', but perhaps this is best reconceptualised as being the history of power-struggles, rather than class-struggles. It can be argued that 'class' as a form of social-status and positioning is the product of power. So, to put it simply, class is only one, albeit enormous, particular facet of societal power. There are many other power struggles that have taken place over time, which have contributed to and altered society, and that are still sites of struggle today. So, for the purpose of this investigation, the use of Marxist theoretical frameworks, will have as their precondition, the ultimate aim of

evaluating not only 'class-struggles' but also the power-struggles that continually occur. Power will be a recurring motif within this investigation.

With traditional Marxist theory, in a capitalist society, the economy forms the base: it is the dominant force which supports and determines the societal superstructures that rise out of this economic base. It is this interaction that gave rise to the concept 'economic determinism'. As Eagleton (1976.2002:5) explains: '(Marx believed an opposition existed) between the capitalist class who owns the means of production, and the proletarian class whose labour power the capitalist buys for profit.' He explains that an 'economic base' or 'infrastructure' is formed consisting of this worker/employer relationship. From this 'economic base' rises the 'superstructure': all the particular elements of any given society such as law, politics, religion, education, ethics, and morality. The effect of this superstructure is the creation of a society's particular ideology and so a strong level of control over members of that society. To enhance this model, Althusser (1971) provided a re-evaluation of Marx's social dialectic according to the tenets of structuralism. Althusser conceptualised these superstructures as being divided into Repressive State Apparatuses (RSA) and Ideological State Apparatuses (ISA). The difference, according to Althusser (1971:97), is that the RSA's 'function by violence' and the ISA's 'function by ideology'. Those that function by ideology are those that manufacture rule through consent - those that achieve a state akin to Gramsci's concept of hegemony. ISA's include religion, education, the family, the legal system, the political system, trade unions, communications and popular culture (Althusser, 1971:96).

Capitalism, like any hitherto existing political or economic ideology, must rely on the state's ideological apparatus in order to maintain socio-cultural norms and halt progression to foster economic growth and stability. Althusser (1971) argues that ideological apparatus are essential to any capitalist society in order to regulate and reproduce the productive forces. In general, ideology is essential to the continual reproduction of the 'labour power' that can, more importantly, when combined with 'wage capital', gives the 'labour power the means with which to reproduce itself' (Althusser, 1971:87). The capitalist society, then, is a site where the existing social order must be continually reproduced in order to fuel the reproduction of the conditions of production that give value to, and commodify, the means of production as well as the outcome of the production process itself. Similarly, the process of consumption must aim to reproduce itself in order to sustain the reproduction of the conditions of production and the means of production.

Jameson (1980) expands upon Althusser's rigid model and brings it more inline with Foucauldian organics with his rethinking of society as the totality - a social network - rather than a stiff hierarchy. In some sense the structuralists were engaged in deconstruction because they reduced the complexities of society and its inter-relations into measurable quantities.

Other theorists have also had a notable influence and serve as invaluable resources. Adorno's ideas (1972) about commodification, commodity fetishism, homogeneity and hegemony through cultural inculcation are also relevant, as is the influence of Bourdieu (1991).

Analytical Approach

Critical Discourse Analysis (CDA) is an analytically based approach to social and textual research and the methodology developed by Fairclough (1989.1992) will be the centrepiece for this approach. Fairclough's model is akin to a neo-Marxist framework for discourse analysis and so it is complemented and enhanced by cultural and literary theorists that have been discussed.

This approach will take the position that theory and practice are inextricably linked and that the two should never be disconnected from one another. In light of this, a further, though lesser, aim will also be to relate the linguistic features found within the text to the theoretical concepts that explore them, and also, to their wider historical, political, social and cultural contexts.

Fairclough views 'language as a form of social practice' (1989:20). Society is established and maintained through a complex series of agreements made by individuals. These agreements are created, upheld and given authority through language and so, in turn, language embodies society and society is embodied through language.

The framework for CDA moves through three spheres of analyses: analysis of the discourse practice, textual analysis, and finally the relating of the two to the social practices that they are embedded within. In terms of textual analysis, the CDA will focus upon Fairclough's (1989.1992) guidelines for exploring interdiscursivity, intertextuality, the conditions of discourse practice, cohesion, discourse representation, semantics, metaphor, presupposition and modality.

All in all, CDA is concerned with evaluating, analysing and critically interpreting the reproductive cycles of capitalism, the dynamics of power – specifically socio-political power - and the orders of dominance therein, at a discoursal level, with the higher aim of linking these findings to their wider socio-political aims

and effects. Fairclough (1992:50) argues that 'power is implicit within everyday social practices which are pervasively distributed at every level in all domains of social life, and are constantly engaged in.' He cites Foucault (1981: 86) as arguing that power 'is tolerable only on condition that it masks a substantial part of itself. Its success is proportional to its ability to hide its own mechanisms.' However, as Fairclough (1992:51) argues: 'power does not work negatively by forcefully dominating those who are subject to it; it incorporates them, and is productive in the sense that it shapes and retools them to fit in with its needs.'

Fairclough (2006) also adapts this perspective to the issues surrounding Globalization and the part that discourse plays in fulfilling the globalist agenda. Also from the same perspective, Van Dijk (1998) draws together the theoretical concepts related to ideology and power with Critical Discourse Analysis and provides an extensive framework for evaluating the representation of ideology in discourse.

Summary

This approach will be multi-tiered: the first stage will be to evaluate the historical context of the document by concentrating on the development of the Neo-Conservative ideology in the United States after the Second World War. This is crucial to understanding the text and the resultant impact in the public domain. Jameson (1980: ix) opens his argument with the slogan 'Always historicize!' meaning always critically evaluate history. This imperative will be the fundamental mandate for this investigation.

The second stage involves the critical analysis of the PNAC document, using the framework for Critical Discourse Analysis (CDA) as outlined by Fairclough (1989. 1992), in order to determine what caused such a reaction, at the discoursal level, amongst the 'internet community'. Although, it must be noted that the 'internet community' is representative of the real global community; it is composed of real people who are active members of their respective societies and not some dark cabal of anti-social misfits.

The third stage will involve researching the site of production and the site of consumption, and the text's resultant effect that. Of course, because the electronic medium is predominantly a storage-medium, it is possible to measure the reaction and demonstrate these effects.

Finally, the conclusion will aim to synthesise these three semi-autonomous strands of investigation to form a cohesive interpretation of the PNAC document, the group itself, and the wide-ranging social, cultural and political effects that followed their arrival.

3 Perspectives and Limitations

The methodological approach also intrinsically shapes the perspective of this investigation on many levels which, in some ways, could be seen as a limitation or a drawback; but, as with any approach, this is unavoidable. For instance, this research project is by no means objective: for all human beings, subjectivity is unavoidable. As Weber (1897) argued: 'There is no absolutely "objective" scientific analysis of culture or of "social phenomena"' that is 'independent of special and "one-sided" viewpoints according to which – expressly or tacitly, consciously or unconsciously – they are selected, analysed and organised for expository purposes'. It is though beneficial to at least acknowledge our inherent subjectivity and aim for the – albeit unreachable - position of objectivity, rather than ignorantly believe in our own objectivity and think that subjectivity is a malleable facet of conscious thought. It can be argued that objectivism is usually the worst form of subjectivism: namely the highly subjective belief that objectivity exists.

Politically, this is from a 21st century Socialist perspective that views capitalism as a failed political, economic and ideological system that has been imbued with too much autonomy and, as such, is completely out of control. As Marx (1845:29) rightly argued: 'the products of their brains have got out of their hands. They, the creators, have bowed down to their creations.' The United States is, first and foremost, the beacon of capitalism, and it is for this reason that it has been chosen as the site for this discussion.

Another important point is that, despite the fact that Britain and the United States share a common language, there are implicit cultural differences between the two nations. This entails the danger that will always loom when viewing another culture from the outside: the risk of misinterpretation and even ignorance to what could be culturally specific phenomena. It can be argued that phenomena that are culturally specific must also be ideologically bound, even implicitly hegemonised, and so must still remain thoroughly salient points for discussion, even though there is still the risk of misinterpretation.

4 HISTORICAL AND CONTEXTUAL EVALUATION

Historical Evaluation of the United States

In order to fully understand the current position of the United States and its perceived enemies, we must understand the conditions of production of the neo-conservative, or neo-liberal, ideology, and subsequently, the Project for the New American Century. It is absolutely essential that we, however briefly, examine the group's context and that we re-evaluate the historical record. The PNAC report and the group itself must be understood within this context, in order to make clear both its aims and its position within the historical continuity. The United States is by no means a totalitarian dictatorship, as in the early stages of the twentieth century; the United States is driven by an ideology that spans across many generations, that has become increasingly dominant over time, and that has become increasingly determined and favoured by the reproductive cycles of capitalism.

The United States emerged from the Second World War as the first global atomic, then nuclear, superpower. It acquired the status of Empire from the ailing British, who had been economically and militarily decimated by the war in Europe. The dropping of two atomic warheads over Japanese communities – Hiroshima and Nagasaki - was a testament to the United State's unprecedented new military power and their willingness to employ it against their 'enemies'. This trend continued as the United States faced off against the world's only other standing super-power in the Soviet Union. The middle-east also became a territorial battleground, with British forces gradually withdrawing from the region and American forces moving in. This also involved the creation of the state of Israel by the Anglo-American alliance. This was colonialisation on a large scale aimed at creating a new homeland for the displaced Jewish peoples. The subsequent 'intifada' resulted in the slaughter of the native Palestinian people as the new settlers, armed by the U.S. military[5], occupied Palestinian territories. This conflict set the fundamental pretext for the Islamic backlash in the 21st century, including the creation of the necessary conditions for an endless and very profitable war.

The other facet of the United States that aims to enhance its position in the world, aside from the military, is the Central Intelligence Agency[6] (C.I.A.) again created in the post-war era. The C.I.A. is, either directly or indirectly, responsible for numerous atrocities in Latin America and South America, Africa and South East Asia. This includes their repeated participation in terrorist activities epitomised by the Iran-Contra scandal in 1986 and other murders and assassinations carried out by the CIA in and around this period. This also includes their operations in Vietnam aimed at destabilising the region, the installation of the Taliban and the Mujahadeen in Afghanistan to fight the Soviets, and finally the continued armament of Israel to the detriment of Palestine.

However, the fall of the Soviet Union left the United States in the precarious position as the world's only nuclear superpower. The Project for the New American Century aimed to exploit this advantage. As the group's opening statement declares: 'At present the United States faces no global rival. America's grand strategy should aim to preserve and extend this advantageous position as far into the future as possible.' (PNAC, 2000:ii). The key phrase here is "to preserve and extend" which is within the same semantic range as 'to command and conquer'.

Contextual Evaluation

With the fortitude of hindsight, Fairclough (2006:8) argues that current US foreign policy, often labelled the 'War on Terror', can 'also be interpreted in a broader frame as the centrepiece of a longer-term shift on the part of the USA, with the support of a number of allies (especially Britain), from 'soft power' to 'hard power', in response to pressures on 'globalism' which began to build up from the mid-1990's (Steger 2005).' Fairclough (2006:8) notes that this 'shift from 'soft' to 'hard' power is a shift from persuasion and relatively discreet and indirect pressures to change, to open use of economic and military power.' In Althusserian terms, this represents a shift from reliance on the ideological state apparatuses to the overt use of the repressive state apparatuses, namely the military, invading sovereign states such as Afghanistan and Iraq, and the use of law enforcement, intelligence services and the judiciary to enforce consent both at home and also to enforce 'order' in occupied territories once control has been established. But, the distinction here is that the United States is using these RSA's on a global scale, not only to dominate its own population, but also to dominate other nations. As Fairclough (2006:8) argues: the 'American 'neo-conservativism' which is associated with this shift combines open and if need be unilateral use of US

[5] See Chomsky, N., 1992. Deterring Democracy. Pages 55-56
[6] See Chomsky, N., 2003a. Hegemony or Survival. Pages 89-111

military superiority to achieve its national interests, and a continuing commitment to neo-liberalism.'

It can also be argued that this correlates with the emergence of the corporation and the ideology, or perhaps meta-ideology, of corporatism. Corporations exist as individuals and act as autonomous entities, seemingly infinite, unreachable and untouchable. Although a passing CEO may have influence, the corporation will long outlive any individual. Capitalism implicitly supports corporatism and corporatism must reproduce the conditions of capitalism in order to reproduce itself and prolong its 'existence'. As such the social, cultural and political conditions must remain the same, the social order must be replicated through ideology, and it is this ideology, arguably one of nationalism and corporatism, which has expressed itself through the Neo-Conservative agenda represented by the PNAC and its members.

Obviously, the critical analysis of the PNAC document will reveal far more about the Neo-Conservatives ideological perspective through the discourse practices that they engage in and the language that they use. Discourse plays an important role in reproducing and empowering this ideology. For example, Fairclough (2006:8) points out that word 'freedom', in the context of US foreign policy, means 'economic liberty' as well as political freedom or democracy and 'open markets', and certainly not the complete freedom of the individual. Similarly, the word 'terrorism' 'is used by advocates of the 'war on terror' to lump together forms of violence which others see as morally different while excluding state violence' unless this involves 'nation-states which fail to accommodate to the globalist agenda' (Fairclough, 2006:8). Of course, any act of murder is morally indefensible but judgement should be based on the dynamics of the act itself and not the alleged or perceived intention.

Fairclough (2006:9) also argues that 'the 'war on terror' can be interpreted as an element of the USA's strategy to preserve its own hegemonic position, partly by responding aggressively to threats to globalization in its globalist form, which it sees as according with its interests.' American corporate hegemony is partly achieved through globalisation and the use of the state's apparatuses at an international level to regulate and influence world affairs. For example, institutions such as the World Bank, the IMF and NATO, are all regulated by the United States creating a global system of capitalist hegemony. This hegemony is manufactured and upheld through discourse. For instance, it can be argued that 'globalisation' is the sanitised euphemism that has replaced 'colonialisation' and this also marks the naturalisation of the colonial ideology as a seemingly inevitable, purely economic process, or even, as a progressive force that brings 'freedom' and stability. The fact that the U.S. is also a former colony itself, that it was built upon colonial ideas, and that the original European settlers have achieved complete dominance over the native tribes - who have been either exploited for their cheap labour-power, driven out of the continent or, in some cases, completely eradicated - is also a crucial factor in the development of the Neo-Conservative ideology and American Conservativism in general. Chomsky (1992) makes a similar argument and to summarise his position, he believes that the U.S. is a failed democratic state that must pursue a globalist agenda in order to sustain itself.

However, in conjunction with this increased aggression there has also been, as Fairclough (2006:9) points out: an 'emerging international movement in opposition to' this form of globalisation. Part of this 'opposition' has come on the crest of the electronic revolution, and in many ways the electronic revolution has enabled and empowered this opposition[7]. But, in any case, there must have also been something in the text itself in order to cause this reaction.

5 Critical Discourse Analysis: Rebuilding America's Defences (2000)

Macroscopic Analysis

It must bee first made clear that the text, included in *Appendix 1*, has been copied from an Adobe Acrobat PDF document and converted into the standard word processor format. The text has also been broken down into numbered paragraphs and sentences due to the large size of the extract and for the purpose of clear analysis and reference. For this reason, references to the text will be displayed as such: (23:106), meaning paragraph 23, sentence number 106 in the extract from the PNAC document included in *Appendix 1*. Apart from these editorial decisions, the text has not been altered in any other way.

The 'principal author' is named as Thomas Donnelly[8], who was then a 'research fellow at the American Enterprise Institute for Public Policy Research (AEI)' and who has been a 'Director at the Lockheed Martin Corporation on strategic communications and initiatives' since he left the PNAC. The Lockheed Martin Corporation is the dominant player in the military industrial complex and of course one of the corporations that makes substantial profits in technological warfare by

[7] See Chapter 6: The Electronic Revolution. Page 17.
[8] Wikipedia, 2006. Thomas Donnelly.

providing weaponry and defence technologies to the U.S. Department of Defence. The corporation's substantial economic growth demonstrates this:

(G-Stock.com, May 2007)

The exponential rise in profits since the publication of the PNAC document, and the subsequent continuation since the beginning of the 'War on Terror', clearly shows that, for certain agencies such as LMC, war is extremely profitable and beneficial. Since PNAC's inception, LMC's share price has increased, bolstered by the World Trade Centre incident and the declaration of war in 2001, then gradually rising to an all time high as more funds are poured into the invasions of Afghanistan and Iraq. This also shows, in the case of Thomas Donnelly, that the path between the state and the corporate sector is well trodden. Donnelly proposed, in the PNAC document, that it is essential that the Department of Defence invests in new military technologies in order to face the challenges of the future and maintain its super-power status; then, soon after, Donnelly switched to the corporation (LMC) that would provide those technologies. He has been both the consumer and the producer. In terms of the text he is writing for an audience that he is already familiar with, if not even personally affiliated with at some level. In any case, this clearly shows that the 'principal author' in 2000 had a vested interest in making the groups argument as lucid as possible due to the *overdetermined* clash between public interests and economic interests, with the latter being the determinant.

However, the site of authorship has further complexities as the 'principal author', along with the entire group, does not accept responsibility for the content of the document. There is a disclaimer at the end of the text which avoids any authorial responsibility:

> 'The report is a product solely of the *Project for the New American Century* and does not necessarily represent the views of the project participants or their affiliated institutions.' (PNAC, 2000: 90)

This is much the same as media agencies and corporations operate as individual entities, representative of collectives, but always acting in singular. In all case this is achieved, in part, through discourse. The group's title is a noun-phrase that has been nominalised, - a 'project' is a process - imbued with the cultural, symbolic and social capital of the group itself, and inevitably, upon inference, personified as an individual entity. The name of the group is also a categorical assertion making it seem imperative. The use of 'new' modifies the noun-phrase and adds a sense of freshness, although, as the historical record has shown, the ideology of the group is predominantly old rather than new. This approach is similar to the 'new' Labour revival in Britain under the Blair regime, with discourse being used to elevate the patchwork quilt of old ideologies. So, in this case, the process of production is not fully known and is quite ambiguous. Thomas Donnelly is cited as the 'principal author' but there is no indication as to the level of involvement of other members of the group and no insight into the editorial process.

The text has generic interdiscursive elements: the document employs various discourse types ranging from the dominant discourse types which are to be expected, such as political rhetoric, economics, the discourse of the military and the discourse of the media. These discourse types can be further divided into two groups: those that are dominant and appear most frequently and those that only appear occasionally. The most dominant discourse types which, for example, appear in a high frequency in the first paragraph are the discourse types of economics, globalisation and the marketplace: namely the discourse of capitalism. For instance, phrases such as 'guarantor' (1:1), 'potential' (1:1) and 'competition' (1:3) appear often throughout the document.

The genre is that of a government white-paper aimed at increasing the United State's defence budget and exercising their military advantage, although, given that the article is also distributed electronically through their website, it also belongs to the genre of hypertext, although the content is not fully hypertextual as it is fixed. However, the text also employs various discourse types that do not usually appear with this genre, such as the discourse of religion. For instance, they appeal for the need to formulate 'divine ways to control the international commons of space and cyberspace' (8:36). Overall, the interaction between these discourse types is congenial: they weave themselves in and out of the text using 'intertextual chains' (Fairclough, 1992:129) seemingly dependent on one another.

The tenor is formal, authoritative and official which creates a sense of authenticity. This is demonstrated in the complex syntactical configurations and the high frequency of non-modal statements. The rhetorical mode also reflects this sentiment: it is persuasive, and aggressive, whilst seeking to be informative.

The activity type follows a simple, linear structure and as a printed text it is obviously less dynamic than a spoken text. There are two subject positions although they are extremely ambiguous. There is the author, in this case Donnelly, who represents the various participants, and there is the reader, or readers, as the latter role may be occupied by numerous individuals at any one time, especially given the documents widespread circulation on the internet.

The delivery is well structured. It functions through repetition: the main points are introduced, repeated, expanded upon, repeated, then expanded upon again, and so forth. The entire document never deviates from its 'four core missions'. The text's structural integrity is clear as it is consistent throughout, although there are occasions were reported speech is used, and, given that this is infrequent, it can be considered as deviant to the internal consistency of the text. Although, this point will be returned to.

Microscopic Analysis

The text contains images throughout and in the chapter we have focused on there are several images interspersed with the text. They are used in a sensationalist manner to enhance the argument. For instance, the discussion of nuclear arsenals contains an image of a Chinese military parade, complete with fully loaded missile carriers.

As already mentioned, any overt form of intertextuality, in the form of references or citations, is rare in this text except for the instances where reported speech is used. This occurs in 9:38 and 17:74-77. In both casers the speakers are representatives from the former administration with liberal views on the level of funding provided to the U.S. military. The infrequency of reported speech indicates that a reply is not allowed to be given – the argument is therefore not balanced. The speakers are misrepresented and used only so that their arguments can be countered and their errors exposed. There are also many social-actors who are not named and backgrounded. Even the American public are barely mentioned and this signals that the consideration of their well-being is not high on the agenda. The well-being of the global population is even more arbitrary.

The 'United States' is personified in the extract. This positions the United States into the role of the 'client' or the consumer. This occurs in much the same way as the 'American people' are personified as one homogeneous mass. In respect of this and of particular interest is the frequency with which popular slogans, phrases, nations and individuals appear in the text, given the benefit of hindsight with regards to the 'War on Terror'. For instance, Saddam Hussein appears 3 times in the extract and 6 times throughout the entire document and Iraq appears 5 times in the extract and 19 times overall. Similarly, 'weapons of mass destruction' appears 5 times in the extract and 7 times throughout the entire text. Also of interest, 'terrorism' or 'terrorist' appears twice in the extract and 7 times throughout the entire document. Of particular interest is the syntactical arrangement of some of these noun phrases.

The text occasionally deviates into the realm of metaphor, and against the background of the predominantly 'sterile' and formal mode and tenor, these novel metaphors are vividly foregrounded. One such metaphor is 'balance of terror' which gives the impression of Manichean duality as though the world is balanced between the good and the evil. This collocates with the use of 'complex and chaotic' in 13:63. Another such metaphor that occurs several times is 'process of transformation' and this is an extremely ambivalent term that could mean any number of things especially as it is used in different contexts.

The text makes various glaring presuppositions and 'common sense' assumptions both about their role in the world and about the world itself. These presuppositions are implicitly ideological. As Gramsci's concept of hegemony clarifies, what is mistaken for 'common sense' is often implicitly ideological, as the process of naturalisation embeds the ideology within the existing social order, and so the ideology becomes implicitly hegemonised, rendering it almost transparent. Hegemony in the individual is what Bourdieu labels 'habitus'; so, in this sense, hegemony is the social whereas habitus is the psychological. At the level of discourse this often leads to implicit presupposition based on the flawed cognition of reality. For instance, in (P13:61-63) the adjective 'superior', appears three times in reference to the United States. This forces the readers to presuppose that all other races are inferior and it can be argued that this superiority complex is reminiscent of National Socialism, eugenics, racism and the notion of a super-race.

The majority of the extract is non-modal as the statements are categorical assertions. However, the narrative does occasionally deviate from this neutral mode. For instance, the modal auxiliary 'must' appears 26 times throughout

the extract. It appears in paragraph 3 exactly three times in close succession, as follows:

(3:12) 'America **must** defend its homeland'.
(3:15) '[U.S.] **must** counteract the effects of the proliferation of ballistic missiles'.
(3:16) 'this **must** have priority'.

This indicates epistemic modality (Fairclough, 2003:167) and functions as imparting a statement of intentions. The epistemic modal system reflects the 'author's commitment to the truth' and their 'representation of reality' and is often marked by the use of auxiliary verbs. In the PNAC text this creates the sense of obligation and commitment to the statements. The deontic modal system reflects 'obligation to the statement' (Fairclough, 2003:168) and this is also apparent. It can be argued that it overlaps with the epistemic system.

These statements are also 'enunciative modalities'. Fairclough (1992:43) describes 'eenunciative modalities' as 'types of discursive activity such as describing, forming hypotheses, formulating regulations, teaching, and so forth, each of which has its own associated subject positions'. These modalities are also further contrasted against the high frequency of non-modal statements and the interaction between the two somewhat clarifies the overall intention. Foucault (1972: 98) argues that 'there can be no statement that in one way or another does not reactualise others'. Fairclough (1992:46) calls these reactualisations 'interdiscursive relations', which 'can be differentiated according to whether they belong to fields of presence, concomitance or memory'. This interaction between the modal and the non-modal occurs because the interdiscursive relations within the extract belong to the fields of presence and concomitance. Foucault (1972:57-58) defines a field of presence as 'all statements formulated elsewhere and taken up in discourse, acknowledged to be truthful, involving exact description, well founded reasoning, when necessary presuppositions', as well as 'those that are criticised, discussed, judged…rejected or excluded.', either explicitly or implicitly.' Foucault defines a field of concomitance as consisting of 'statements from different discursive formations, and is linked to the issue of relationships between discursive formations'.

So, if we consider the examples above from paragraph 3, we see that the epistemic markers are used to emphasise which goals *must* be achieved and, conversely, categorical assertions are used when explaining how these goals *can* be achieved. This is akin to a problem-solution formulation: the aims are imperative because problematic deficiencies exist and so the solution is absolute, as these deficiencies have been expressed with commitment (epistemic) and they have created a sense of obligation (deontic) to the solution, with the initial problematic portrayal of what is to be achieved. The interdiscursive relations facilitate this exchange. This corresponds to the dual nature of the text: the statements are positioned accordingly and function in the role of both producer and consumer. It is also perhaps this commitment to the conflict-resolution, and to the proposition that the text offers which makes the need for capitalist hegemony appear unavoidable, desirable and beneficial – as though there is no alternative.

6 The Electronic Revolution

The Hypertext Phenomenon

In reality, back in the material world, when the PNAC document was released, it *apparently* received no reaction beyond the concentric circles in Washington; not even the media, either in the U.S. or abroad, mentioned what has been shown to be a disturbing document suggesting the use of overwhelming, unilateral military force in order to maintain *pax-Americana* across the globe. But, despite this, the document passed through (or went around) the short-sighted corporate media. However, there was a reaction to the text and to the group, but not in the material world: this reaction occurred in cyberspace and it sent shockwaves across the digital strata. But, this is a measurable, demonstrable reaction and it is also a phenomenon that is unique to the medium and to this period in time.

The dynamics of the text, in terms of its initial production and distribution, and its subsequent consumption, do not fit well with the 'traditional' models for text-production as they are operating within a unique environment.

The most problematic area is attempting to quantify the distribution of the text within the electronic environment. One method of quantifying the distribution of the text within cyberspace is to conduct an advanced search, using keywords as listed, with the results filtered to display only those words in that syntactic sequence. As such, the results mostly constitute direct references to the group and to the document. One limitation is that these searches only take into account the Anglo-American sectors of the internet and are only representative of a cross-section of Anglo-American search engines and media outlets. There are also other groups known as PNAC such as the Pakistani National Accreditation

Council and the Police National Assessment Centre which could interfere with the results.

Keywords - Websites	"PNAC"	"Project for the New American Century"	"Rebuilding America's Defenses"
Google.co.uk	973,000	62,200,000	742,000
Google.com	969,000	47,000,000	734,000
Google.de	983,000	73,600,000	698,000
Google.fr	976,000	74,900,000	1,430,000
Google.es	982,000	73,700,000	1,450,000
Google.ru	978,000	73,300,000	743,000
Google.ie	974,000	72,900,000	743,000
Google.co.in	978,000	74,500,000	743,000
Google.com.pk	979,000	72,900,000	743,000
Google.cn	967,000	78,900,000	1,400,000
Google.co.jp	979,000	85,800,000	609,000
Yahoo.co.uk	1,270,000	27,100,000	1,090,000
Yahoo.com	1,270,000	26,800,000	1,080,000
Alta Vista.com	1,270,000	26,700,000	1,080,000
MSN	109,579	1,221,251	38,530
Ask.com	206,000	7,131,000	7,860
Lycos.co.uk	66,572	2,665,304	146
Excite.co.uk	204,800	7,154,000	50,200
BBC	4	182	4
CNN	-	-	-
Daily Mail	1	0	2038
Fox News	0	0	2
Guardian Unlimited	11	0	1
Independent Online	0	-	0
Reuters Online	0	57	0
Sky News – UK	0	0	0
Times Online	2	-	0
The Washington Times	0	29	6
The Washington Post	0	0	0
New York Times	0	2	38
L A Times	0	10	2
Houston Chronicle	1	123	43
The Province (Vancouver)	0	15	0

The figures above demonstrate that the major Anglo-American news agencies have barely mentioned the PNAC except for the Houston Chronicle. One salient feature found in these results is that the Google search has shown that amongst the developed countries in the western world, the U.S. (47m refs) and Britain (62.2m refs), those most affiliated with the PNAC, have the least amount of references to the group, especially in comparison to France (73m refs) and Germany (85m refs). Even Google China displayed more search results than the U.S.; in fact, the U.S. displayed the least amount of results – nearly half that of Germany - when "Project for the New American Century" was searched for via U.S. based Google.com. The either suggests less interest – which given the size and activity of the U.S. is unlikely – or perhaps some form of censorship or exclusion in the search results.

The major site of reaction however - as demonstrated by the large amount of references on the internet in general when compared to the news agencies - has been in the domain of the 'conspiracy' theorist. However, before investigating any further the 'conspiracy' theorists' response to the PNAC document, we must examine the reconfiguration of society, power and identity in cyberspace

Cyberpower, Identity and Community

Jordan (1999) argues that there are three levels of power in cyberspace. The first is 'when cyberspace is understood as the playground of the individual', or as a 'possession an individual can use'. The second is when 'cyberspace is understood as being a social place, a place where communities exist' and the third is 'when the Internet and cyberspace are understood as being a society or even a digital nation'. So power operates on the individual, social and global levels. Jordan (1999) argues that cyberspace and the Internet are riven by a sociological, cultural, economic, and political battle between the individual and a technopower elite' at all these levels. However, it must be noted that cyberspace and the internet are two different things, but a common misnomer and mistake is to confuse the two. The internet is only one particular realm of cyberspace, although it is the phrase most used, the most accessible, and most likely the element of the online world that many perceive as 'cyberspace'. There are other networks that overlap with the 'internet' or the word wide web such as 'darknet' and 'undernet', the telephone exchange systems, mobile communications, satellite relays – anything that can potentially carry an electronic signal. These networks are all actively used, some more than others, although it is far beyond the remit of this investigation to explore this area. At the individual level, the user is represented by their online identity. Online identities are very different from offline identities as the user is allowed some input in the construction and portrayal of their identity, whereas offline much of this input is inferred from resources that are beyond the control of the individual. Jordan (1999) argues that this 'prevents the use of many offline tactics for discovering identity'. But, dystopian worries aside, this enable the individual to reconstruct their identity and in doing so this also reconstructs the social-world in cyberspace. Yet the social-world is not replicated in cyber space, it is recreated. Jordan (1999) argues that 'renovated hierarchies' are the 'processes through which offline hierarchies are reinvented online, with many online resources undermining offline hierarchies while also defining new hierarchies' and that these 'renovated hierarchies' are in themselves 'inherently anti-hierarchical'. He argues that 'hierarchies are dislocated' through 'many-to-many communication and its ability to include people in decision making', 'the censorship-evading properties of the Internet' and the inherent 'global nature' of the internet and cyberspace. Even 'attempts to censor or restrict access to parts of cyberspace can often be simply bypassed', thus 'allowing unrestricted access to online information' and as 'communication from many people to many people is close to the norm in cyberspace' this then 'opens participation in decision making, creating the potential for conclusions to be reached in more egalitarian ways than are available offline'. In effect this creates global, networked communities of practice and the potential for social emancipation, equality and the liberalisation of knowledge, is astoundingly vast. Jordan, writing in 1999, points out this potential which has only grown in recent years as we shall see. Jordan argues:

> Not only is a greater pool of expertise available, but information that governments or courts might have restricted is almost impossible to hold back once it is free in cyberspace. The global nature of cyberspace is important here, because it requires only one country connected to the Internet to allow the publication of some information and for that information to be let loose in cyberspace. Information restricted in an offline nation-state then becomes available in cyberspace, subverting the national boundaries that have helped in the past to control access to information. A global informational space undermines regional and national attempts to restrict access to information. - Jordan, 1999: Cyberpower.

This can be demonstrated by the Torpark software (www.torrify.com) that allows users from repressive states to browse the web and engage in the online world anonymously, or the explosion of online activism and independent research that will be discussed. For example, aggregators are increasingly used to compile relative information and to connect individuals with similar interests and pursuits. This is not only limited to *My Space* accounts matching people based on their favourite film, or musician, but it also effectively groups together people with similar political interests, social outlooks, ethical beliefs and shared agendas. In this sense the technology is not having a detrimental effect but it is creating social-networks and communities of practice that have the ability to be beneficial to society and to the global community as a whole. Here, technology drives social change and that is, perhaps, the main thesis of this investigation.

Conspiracies: Authority and Authenticity

So within this reconfigured realm of cyberspace, the domain of the internet 'conspiracy' theory, or the domain of independent research in general, is undoubtedly vast and complex. This is the realm of cyber-prophets and electro-anarchists who peddle their wares beyond institutional or societal rules. The concepts they espouse span an extensive spectrum, from nothing more than popular rumours with little or no firm evidence, such as the 'hollow earth' theory, or arguments with substantial evidence, such as the allegations that the Bush administration had prior knowledge, or were directly involved, in the World Trade Center incident. This is why it can be argued that the tag of 'conspiracy theory' is somewhat ambiguous and can be quite tenuous in some instances.

The attitude towards 'conspiracy' theories amongst dominant groups is somewhat hostile. Jameson (1992:340) believes that the social imagination has undergone 'widespread paralysis' when 'confronted with the ambitious program of fantasizing an economic system on the scale of the globe itself', and the result is that the 'older motif of conspiracy knows a fresh lease on life, as a narrative structure capable of reuniting the minimal basic components: a potentially infinite network'. He argues that the 'conspiracy' is an 'imperfect mediatory and allegorical structure'. Jameson (1992:341-342) argues that this represents the 'dialectical intensification of information and communication' in which the 'social life' coincides 'fully with itself' because in the absence of the perfect utopia, the social life remains 'contingent' and 'unequal' and has to be 'pumped back up and patched together with allegory'. Similarly, Hardt & Weeks (2004:23) argue that the 'conspiracy' theory 'offers a particularly simple understanding of the totality in the sense that it tends to trace all mysteries back to a single source or power: the shadow government, the secret brotherhood of conspirators, or the evil genius'. They argue that the 'conspiracy' theory is 'a poor person's cognitive mapping' because 'they are so reductive and crude'. The problem is the 'absurdity of tracing all phenomena to a single identifiable source or cause – because in reality there is no man behind the curtains who pulls the levers and controls everything'.

The alternative then must be a world filled with random events, unravelled by chance, completely beyond human control. This raises the question of 'authenticity' which we will return to. However, Jameson (1992:345) does believe that 'conspiracy' theory 'attempts to represent… the social totality itself' and that it represents the 'tendential end to "civil society" in late capitalism'. Conspiracy theories do indeed reflect dissatisfaction with the status quo and alienation of a large social group but are unlikely to end 'civil society'.

In all, the attitudes and responses to 'conspiracy' theories display a rather elitist, ever dominant, attitude that presupposes it is more valuable than that which it mocks. However, elevate them, or repudiate them: the 'conspiracy' theorist has a large presence in cyberspace.

The PNAC and the RAD document are often associated with two dominant 'conspiracy theories': the first we shall refer to as the 'Illuminati Conspiracy' and the second as the 'New World Order Conspiracy' – the latter being a modern reiteration of the former. The clause that appears in numerous 'conspiracy' theories, specifically alternative theories regarding the World Trade Center incident, appears on page 51 (PNAC, 2000) of the original document. The statement is as follows:

> 'Further, the process of transformation, even if it brings revolutionary change, is likely to be a long one, absent some catastrophic and catalyzing event – like a new Pearl Harbor'

It is then understandable that many independent researchers link this statement with the World Trade Center incident as that event was indeed 'catastrophic' and 'catalysing' in the sense that it became the fundamental pretext for the 'War on Terror' and the illegal invasions of both Afghanistan and Iraq. These are also 'simultaneous major theater wars' as the document first outlined as one of its 'four core missions' (PNAC, 2000:iv).

The root of this conspiracy lies perhaps with the 'Illuminati'. The narrative for the Illuminati 'conspiracy' theory, to be very brief, is as follows: the Knights Templar uncovered 'secret' knowledge beneath Solomon's Temple in the middle ages and they hid this from society before their persecution by the Vatican. A society in possession of this knowledge was established during the Renaissance known as the Illuminati – the illuminated ones - who, after de-stabilising the European monarchy, emigrated to the new world and established their governance amongst the cabal of Stone-Masons already established there to create a 'shadow government' that would eventually rule the world (Hardt & Weeks, 2004:23). The esoteric traditions of the elite American Universities such as the 'Skull and Bones' fraternity at Yale[9], or the participation by political figures in the 'Cremation of Care' ceremony at Camp David[10] - which involves offering a burned effigy to the Canaanite owl god Molloch – have inflated these claims in the modern

[9] CBS News.com, June 14th 2004: Skull and Bones.
[10] Prison Planet.com, 2007: Bohemian Grove

age. Of course, this also correlates with the long-standing tradition of Stone Masons in Britain and Europe, as well as various secretive groups that have previously influenced world affairs, such as the Thule Society which helped promote and fund the NSDAP in Germany.

The New World Order 'conspiracy' is similar although it allocates power to the military-industrial complex and the oil industry rather than a shadowy group with 'secret knowledge'. It can be argued, though, that the New World Order 'conspiracists' are very closely aligned with contemporary social researchers. This may seem like a ridiculous proposition, but the thesis here is that conceptually there is very little difference between the two, with the only variable being language, or for our purposes, discourse. For example, the 'conspiracy' theorists frequently use the term 'sheeple'[11]: an idea which, however derogatorily, expresses a multitude of theoretical concepts such as false-consciousness, homogeneity and hegemony.

The researchers involved in these investigations do not use academic conventions, cite appropriate frameworks and methodologies, and in most cases, they do not cite any credentials or recognised expertise. However, they are engaged in the same practices and adhering, however haphazardly, to the same frameworks, concepts and methodologies as the dominant group, in this case the traditional institutions and government agencies. The only difference is in the discourse practices that they are engaged in. For example, another facet of the 'conspiracy theory', particularly those related the United States, is the use of, often quite complex, semiotic analyses of various forms of symbolism. This ranges from the analyses of iconography, to architecture and ordinance. For instance, one of the key arguments that binds the Illuminati theory is the appearance of Masonic and esoteric symbols on currency, in Government agencies, corporate logos and national emblems. An example would be the eye of Horus atop the un-capped pyramid on the $1 bill with the phrase '*Novus Ordo Seclorum*' (New World Order) beneath the image or the new £20 note that has a similar, albeit abstract, design atop the Bank of England. This correlates with the oft cited speech made by George H.W. Bush to a Joint Session of Congress on September 11th 1990[12] in which the former President continually referred to the coming 'new world order'. In fact, Bush uses the phrase twice: once in the opening ('out of these troubled times, our fifth objective - a *new world order* - can emerge: a new era -- freer from the threat of terror') and finally to close ('[Americans] serve together with Arabs, Europeans, Asians, and Africans in defense of principle and the dream of a *new world order*').

However, one facet of this power struggle is representative of 'class-consciousness' and the resultant 'class conflict': individuals are aware of an elite, dominant group, of a hierarchical social order, and of a world that is seemingly beyond their control. The discourse type of the 'conspiracy' theory reacts against this. Bourdieu (1991:128-130) expresses this idea as 'heretical discourse', which is discourse that 'exploits the possibility of changing the social world by changing the representation of this world which contributes to its reality'. Bourdieu (1991:129) argues that this represents the need 'to externalise the inwardness, to name the unnamed and to give the beginnings of objectification to pre-verbal and pre-reflexive dispositions and ineffable, and unobservable experiences' but, more importantly, this externalisation is achieved through 'words which by their nature make them common and communicable, therefore meaningful and socially sanctioned.' Although perhaps the term 'heretical discourse' is more applicable to those emergent discourse types that reproduce extremist ideologies or attempt to cause controversy with highly politicised agendas that would not necessarily contribute to a progressive society. But, these ideologies, however unpalatable or unbelievable, must exist *in ovo* in the first place for them to be expressed through discourse; in fact, the expression through discourse is necessary to the initial realisation. This demonstrates that, to a great extent, authority is distributed by and through discourse. The discourse types of the dominant group are given preference, authority and credibility over the discourse types of the majority group, as the majority group is less powerful. For instance, the media, the 'official' spokesperson, the politician, even the actor, or the singer, are given preference because they are favoured by the existing social order as they seek to only replicate the existing social-order. Attempting to change the existing social order can result in a form of inarticulation. By engaging in the discourse types of the dominant group, there is the risk of alienating the majority group and so little chance of altering the existing social order, but the very real danger of replicating the existing social order by engaging in, and proliferating, the discourse types of the dominant group. As Bourdieu (1991:129) argues: any discourse type 'authorizes what it designates at the same time as it expresses it'. The same is true of this investigation: the sarcophagus of academia means that this discussion must engage in the dominant discourse type – that of an academic essay - and so it is reproducing the very thing that it is trying to resist.

[11] Urban Dictionary.com, 2007: Sheeple

[12] Bush, G.H.W., 1990. Address Before a Joint Session of Congress (September 11, 1990).

Conversely, engaging in the vernacular discourse types of the majority group, in this case the 'conspiracy theorists', connects with the majority group but is under whelmed because it lacks the capital of the discourse types of the dominant group.

This then, raises the problem of 'authenticity' which is implicitly connected with authority. Adorno (1964:100-101) argues (in response to Heidegger) that the 'pre-terminological use of "authentic" underlined what was essential, in contrast to what was accidental' but now, in post-modernity: 'the interest in the authenticity of a concept enters into the judgement about this concept… whatever is authentic in this concept also becomes so only under the perspective of something that is different from it'. In this sense, the 'authentic' has become the idealised utopian paradigm by which all else must be judged, or, in other terms: the 'authentic' is that which is imbued with the authority of the dominant group because it seeks to reproduce or improve the conditions of reproduction of the dominant group: the 'authentic' is the pre-authorised.

Summary

So, to summarise this point: effecting social change has been rendered difficult because the discourse types of each group have been valued and commodified, with those that suit the dominant group being given preference and authority over those that are marginal, even if they do reside with the majority. Although, it can be argued that in cyberspace these traditional roles break down and are reconfigured. As Jordan (1999) argued: these hierarchies are renovated. In cyberspace the vernacular discourse types are the dominant agents. In cyberspace, power is reconfigured.

Jordan (1999) believes that 'power is the condition and limit of politics, culture, and authority' and that 'cyberpower aims not at the immediately obvious forms of politics, culture, and authority that course through cyberspace but at the structures that condition and limit these', in every sense, at the state apparatuses themselves. He argues that 'cyberpower points not to the ultimate dominance of the elite, although it clearly identifies the burgeoning power of an elite, nor does it predict the libertarian ideal of individual empowerment, although it makes conspicuous the ongoing creation of powers for individuals in cyberspace' but that it points to the 'roar of battle' between these two extremes.

7 Final Results

Synthesis

In November 2006 the Project for the New American Century (PNAC) closed its doors leaving only a website and an internet archive. It can also be argued that the Bush Administration as a political unit has failed and will be unlikely to win a further term in office. But, this does not denote failure by any means, because, if their original goals and interests are considered, the Project for the New American Century and the individuals it helped place in government, has been a resounding and very profitable success. But the American people, and the rest the world, have not profited from this success.

The group's former members have moved in different directions, all of them equally successful and powerful. Paul Wolfowitz[13] was appointed as head of the U.S. controlled Word Bank, although his position has recently been threatened with allegations of corruption; and, as already stated, the 'principal author' Thomas Donnelly is now on the board of Directors at the Lockheed Martin Corporation (LMC). As discussed, LMC, the military-industrial conglomerate, has received extensive benefits and made astronomical profits since the inception of the 'War on Terror'. Disturbingly, this intimate relationship between the state, the economy and the corporate sector is reminiscent of Italian fascism, which now appears to hide behind the name of corporatism.

The Project for the New American Century represents a pre-emptive shift from the economic being governed by the political to the political being governed by the economic. This sentiment is reflected in the language used to construct Rebuilding *America's Defenses* as the critical discourse analysis has shown. The 'War on Terror' is a forced economic process: it is war for the natural resources, the land and the vast profits that the war-machine turns over; but, more importantly: it is about creating new markets through regional hegemony. Every aspect is profitable from the initial destruction, to the 'constabulary duties' that follow. These areas include not just security concerns, but the 're-establishment' of public services, healthcare and judiciary, at a cost; the rebuilding of towns and cities, at a cost; the introduction of media and communications, at a cost; the development of food and agriculture, at a cost – and the inevitable introduction of consumerism through Anglo-American and European ventures, that will perpetually be at a cost. In every sense this is the 'process of transformation' that the PNAC refer to so frequently, the process of drawing order out of chaos – *ordor ab chao* – which is akin to the

[13] The New York Times: May 18th, 2007: Wolfowitz Resigns

Hegelian dialectic reconfigured as a militaristic economic strategy.

Hegelian logic is perhaps the only means through which this debate can be vocalised. Popkin (1986:92) outlines Hegel's development of the 'dialectic', the philosophical theory that Marx inverted. Rather than approaching history as an endless series of uncontrollable events flowing ever onwards, Hegel believed that history developed due to the opposition between two sides: the *thesis* and the *antithesis*. This opposition would result in conflict and the two would break down and merge to form the 'synthesis' - eventually, this state of 'synthesis' will divide and form a new state of opposition. It can be argued that we are at the stage of synthesis in the dialectical process. This exercise has exposed a vast terrain of conflict that can be seen as the emergence of a new site of class-conflict that has breached national boundaries. The PNAC have now played their part in this process: they have executed their roles effectively. The document has been assimilated into the public consciousness through cyberspace. Although, this assimilation has not been a passive process, it has come about due to the reaction against the Neo-Conservative's movements on the world's stage – epitomised by the invasion of Afghanistan and Iraq – and to their socio-economic ideologies which have permeated beyond the usual domains of the media and Washington. As has been demonstrated, multiple factors have influenced this reaction: the group itself, the authors, and their respective economic interests; the history, or the constant revision of history that occurs on the internet due to the increased access to documentation, historical records and the opinions of others; and an enlarged perception of the world due to this increased access to information. In the 'new world' information is power.

However, this is a *reaction* and not an *interaction*. The dynamic is decidedly linear and one-sided which raises grave questions about the functioning of 'democracy' in the contemporary age. After all, despite widespread opposition, the war still rages on in the middle-east, spilling out east through Pakistan and south, across the continent, through Somalia and across Africa.

Final Conclusion

It is no real surprise to discover that the discourse of the New American Empire is one of corporatism, pseudo-nationalism and unilateral military action dedicated economic gain and unilateral control. However, it is a surprise to uncover such vocal, active and widespread resistance to this form of discourse and to the ideology that it represents, albeit in a new and unfamiliar way. As such, the social impact of cyberspace is undeniable. This exercise is the product of social networking, as is the account of Assadullah. Without the resources provided on the internet and the people who provided those resources, this investigation would not have been possible, perhaps not even conceivable. There would have been no knowledge of the Project for the new American Century and certainly no archived copy of the text. There would be no independent media, no bloggers, no forums, no chat-sites, and no information to share, especially not at a global level. But, the electronic resistance is not globalised, it is de-nationalised; it spans the globe, without preference for gender, ethnicity or skin pigmentation. There are no boundaries in cyberspace, no land to be claimed, no resources to pillage, no natives to exploit. Cyberspace is the new world.

Jordan (1999) argues that 'information is endless in cyberspace and creates an abstract need for control of information, which will never be satisfied.' He describes this as the 'technopower spiral'. But, computer technology *is* limited in its current form of microprocessors and silicon as is cyberspace by the both the technology and the number of human beings needed to actualise its existence. Moore's Law[14] (1965) states that the 'number of components the industry would be able to place on a computer chip would double every year', but, that this exponential rise would inevitably reach a peak. Even at the absolute limits of natural law, data could never be transmitted beyond the speed of light and so is ultimately limited even at the highest possible level. Similarly, information is not 'limitless' or infinite, although it is undoubtedly vast, it is also relative to the technology and ultimately limited by it. Nothing we have ever evidenced in the entire cosmos is infinite. In this sense then, it can be argued that the 'technopower spiral' is an essential process that drives forward technological progress, but the 'technopower spiral' is not infinite either, it will eventually unravel when computer technology inevitably stabilises.

The opening account of Assadullah was a deliberate subversion intended to ground this investigation in the real world; these final words will do the same. In all this talk of theoretical models, economic systems and socio-political implications, we must remember that there is a very real human cost to all of this. Millions have been displaced, or have lost there lives in the 'War on Terror', not just innocent civilians, but also combatants on both sides of the 'conflict', who will never benefit, regardless of how much they sacrifice. Tensions across the globe are

[14] Intel Executive Biographies: http://www.intel.com/pressroom/kits/bios/moore.htm

rising each day, environmental catastrophe looms, and the poverty gulf has never been wider.

This is a dangerous time, but it is also an exciting time. Almost in unison, we have seen cyberspace rise from strength to strength, and we have seen it offer new methods of transgression when the old ones seemed to be lost. The dialectic is reaching the point of synthesis - technology will stabilise, society will progress – but what shape this 'new world order' takes is very much in our hands and on a scale that has been hitherto unprecedented. The only indecisive factor is whether or not we take the opportunity to set *our* world free.

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CISBAS: AN ALTERNATIVE APPROACH TO THE CONTROL OF IVT-EQUIPPED VEHICLES

Academic Report: AR-08-08

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CISBAS: AN ALTERNATIVE APPROACH TO THE CONTROL OF IVT-EQUIPPED VEHICLES

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Academic Report AR-08-08. East Lancashire Institute of Higher Education, Blackburn, UK.

Abstract - A motor vehicle using infinitely variable transmission (IVT) requires a controller to select the optimal engine / transmission configuration to meet the driver's instantaneous demands.

Current controllers use heuristic strategies tailored to particular vehicles and transmissions each created at the cost of extensive research and manual optimisation.

This paper introduces a novel generic strategy of Control by Intelligent Selection Between Alternative Solutions (CISBAS).

The method is evaluated in Matlab / Simulink simulation for two different systems each involving a Torotrak IVT and spark-ignition engine.

System behaviour is evaluated in terms of fuel economy and measures of the acceptability of the control behaviour to a typical driver ('driveability') and compared to that of the current state-of-the-art controller.

1. INTRODUCTION

Conventional vehicles use internal combustion engines with fixed transmission ratios and either a clutch or torque converter. The fixed ratios used do not allow the engine to provide power in the 'optimum' state at a given loading.

The solution to this problem is to provide a continuously variable transmission (CVT) enabling the engine to run in a near-optimum state to meet a given requirement.

One problem of CVTs is that their fuel consumption benefits have not always been realised with adequate driveability [Wicke99], and the requirements of the driver are a major factor in CVT controller design.

This paper is based around a CVT produced by Torotrak (Developments) Ltd. The Torotrak design is a true 'Infinitely Variable Transmission' because it has a continuous range of rations from reverse to high-speed cruising.

Results obtained to date show that the use of their system in vehicles can produce fuel economy benefits of 20% over a conventional 4-speed automatic transmission and more than 10% over a 6-speed automatic [Burke03].

In common with most CVT/IVT developers, Torotrak have designed a microprocessor-based control system that represents the 'state of the art' in IVT control.

2. CONTROLLING AN IVT VEHICLE

Fuel economy

Most current controllers use 'Optimal operating line' strategies in which rely on the fact that for a wide range of engines, the pattern of engine performance data follows a 'typical' map. Such a typical engine map for a spark ignition petrol engine is illustrated in Figure 1 below:

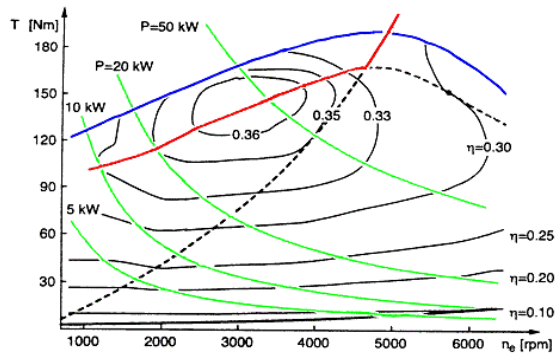

Figure 1 Typical Engine Map

Key:

Blue line - torque available at 100% throttle
Green lines - constant power hyperbolae
Black lines - constant efficiency curves
Dotted line - typical load line
Red line - 'optimal operating line' – follows line of maximum efficiency for torque produced until

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this line meets the load line, after which it follows the load line

Many current CVT control strategies (see for example [Pfiffner99] & [Pfiffner01]) assume the existence of such an optimal line and are designed to move the engine from its initial condition to the 'ideal' state as determined by the line. In such strategies the final state is determined only by demand and thus controller design focuses on the route to be followed when moving from one state to another.

The challenge of such strategies is to provide a balance between fuel efficient operation and the demands of the driver.

Driveability

It is not trivial to define driveability precisely. [Schoeggl02] describes a methodology for the assessment of driveability. This general approach forms basis of the driveability testing regime used here.

[Wicke00] identified three key factors affecting drivers' subjective assessments of the 'feel' of vehicles responding to step changes in accelerator position by means of practical testing conducted with a range of vehicles and drivers. The factors identified were:

- delay time: defined as the time between a first change in pedal position and the first change in the vehicle acceleration.
- acceleration value: the peak value of the initial acceleration phase.
- jerk value: 'Jerk' is commonly taken to be the rate of change of acceleration soon after a step change in pedal position, but the exact definition of 'soon' can be problematic. [Wicke00] defined this as the maximum acceleration after the delay divided by the time required to reach this value, however if the eventual peak is reached slowly after an initial swift rise this measure understates the jerk value. In such cases this paper takes the acceleration value 1s after the delay as its measure of jerk.

[Wicke00] and [Wicke02] published graphs of subjective driver acceptability for each of these parameters measured in response to pedal movements from rest and from 12 kph.

Driveability indices

The CISBAS control strategy proposed here is tested for both economy and driveability. For this purpose linear best-fits of the data in [Wicke00] and [Wicke02] are converted to driveability indices and used to compare the performance of the CISBAS controller with that of the current controller.

The indices used are given by the equations:

$$D_{LD} = 9.5 - 5.63 t_{DL}$$
$$D_{LA} = 4.5 + 12.5 a_L$$
$$D_{PD} = 13 - 16.7 t_{DP}$$
$$D_{PA} = 5.0 + 17.6 a_P$$
$$D_{PJ} = 4.5 + 10 j_P$$

where:

t_{DL} = launch delay (s)
a_L = launch acceleration (g)
t_{DP} = performance delay (s)
a_P = performance acceleration (g)
j_P = performance jerk (gs^{-1})

3. THE CURRENT STATE-OF-THE-ART

Early CVT control systems based on the optimal operating line produced vehicles with very different performance characteristics to conventionally geared systems. These attempts resulted in a subjective driver 'feel' that compared unfavourably with conventional vehicles [Brockbank02].

Modern IVT controllers cannot use a simple operating line strategy but must combine this with knowledge of typical drivers' expectations and a detailed knowledge of the target vehicle in striking the optimal balance between economy and driveability.

The controller therefore has a substantial heuristic content and must be extensively reworked for each target vehicle.

The Torotrak controller is very successful in producing improved fuel-economy combined with performance acceptable to drivers, but the question of whether an alternative generic strategy could be devised remains.

4. THE CISBAS METHOD

This paper introduces a new method of Control by Intelligent Selection Between Alternative Solutions (referred to hereafter as CISBAS).

The principle of the CISBAS controller is to determine the range of possibilities open to the controller at any instant, and to make an intelligent selection from these alternatives rather than to follow any pre-determined heuristic rules.

The CISBAS controller has three distinct phases. In **Phase 1** the driver's instantaneous expectation is computed from the position of the accelerator pedal, the current system state and a measure of recent history. Pedal movement history is converted to a 'sportiness' value by a

discrete filter. The resulting value is high when there has been much recent movement and is low when there has been little. The sportiness value is used as one factor in computing the driver demand, and is also used in the fuzzy selection between alternatives in Phase 3 below.

A neural network is used to produce values of driver wheel force demands from current speed, pedal position and sportiness. The NN used can be taught any mapping between inputs and outputs, but for this work has been taught a relationship similar to that used by the current Torotrak controller. The one significant difference is that the NN outputs slightly raised levels of demand if sportiness is high.

Phase 2 establishes a range of alternative solutions as nearly as possible capable of meeting the driver's expectations. This is achieved by means of a look-up table stored in memory that contains a previously calculated engine demand and transmission loading for every combination of wheel-force, engine speed and road speed the vehicle is capable of requiring.

This table is constructed from steady state engine data in a form commonly produced by engine manufacturers, formulae provided by Torotrak for the behaviour of their transmission and basic vehicle data. The range of data required has been consciously restricted to information that would be readily available for any vehicle.

The results of the look up table produce a list of alternative solutions at different engine speeds to meet the current demand at the current road speed. These are adjusted slightly to account for the effect of any implied acceleration or deceleration of the engine and the final list of alternatives is passed to the next phase.

Phase 3 uses a simple fuzzy-logic tool to score the desirability of each of the alternative solutions on the basis of nearness (how close the proposed engine speed is to the current engine speed), proposed engine speed, fuel economy, achievability (how quickly the engine can reach the proposed speed), sportiness, pedal position and road speed.

An intuitive set of membership functions and rules is used in the scoring of these alternatives. The adjustment of these functions and rules forms the principal method of tuning the CISBAS controller.

The 'optimal' solution is selected from the alternatives presented on the desirability scores.

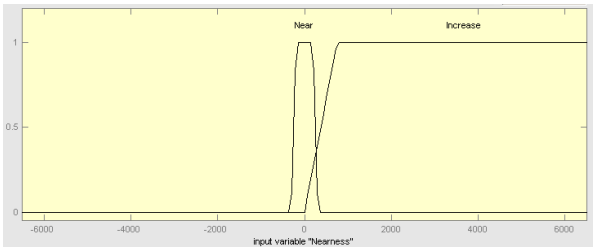
Membership functions

The membership functions used in the fuzzy selector for Vehicle 1(see below) are:

Inputs

Nearness

Nearness is defined as the difference between the current engine speed and that of the candidate solution.

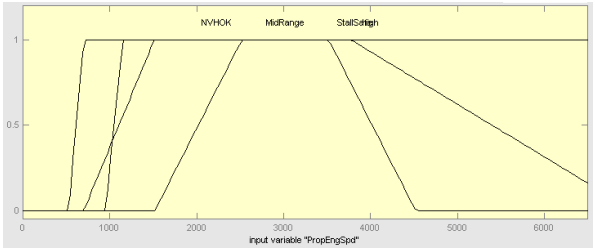


Membership functions for 'Nearness'

The two variables defined for nearness are shown in above.

- Near – takes a high value in situations where the engine speed change implied by selection of a particular candidate solution is small.
- Increase – gives a high membership value for those candidate solutions involving a significant increase in engine speed.

Proposed Engine Speed

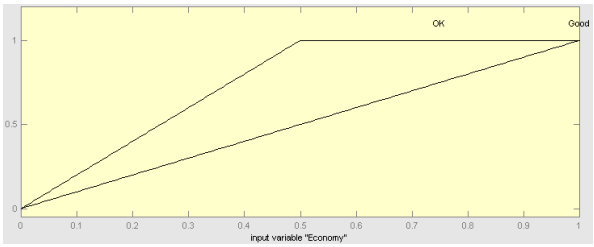


Membership functions for 'Proposed Engine Speed'

The four membership functions defined for Proposed Engine Speed are:

- NVHOK – this specifies the range of engine speeds over which the noise vibration and harshness are likely to be acceptable.
- StallSafe – indicates that the engine would be unlikely to stall at the proposed speed.
- Mid-range – indicates that the proposed engine speed is moderate
- High – This function was difficult to name, and indicates that the proposed engine speed is not low rather than that it is high in absolute terms.

Economy

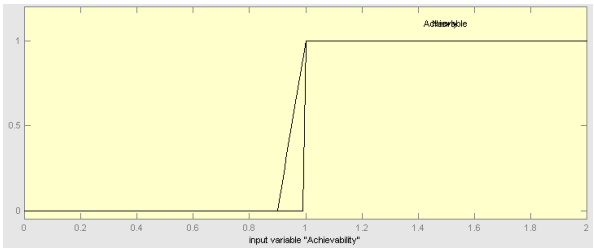


Membership functions for 'Economy'

Two variables are defined for Ecomomy:

- Good – this variable has a linear membership function producing an output value exactly equal to the input. This function is used to give preference to fuel efficient solutions.
- OK – this variable has a membership function that rises from zero to one as the economy value moves from 0 to 0.5 and is one thereafter.

Achievability

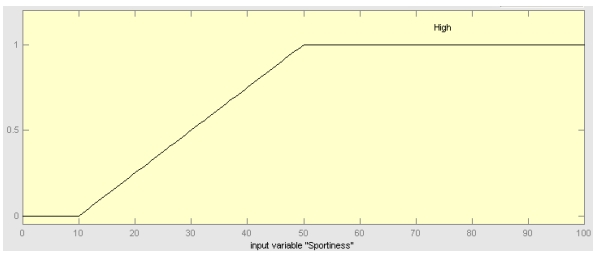


Membership functions for 'Achievability'

Two membership functions are defined for achievability:

- Achievable – is one only when achievability is 1 (the achievability cannot exceed 1), all other values produce zero.
- Nearly – is one when achievability is one and declines linearly to zero as achievability drops to 0.9.

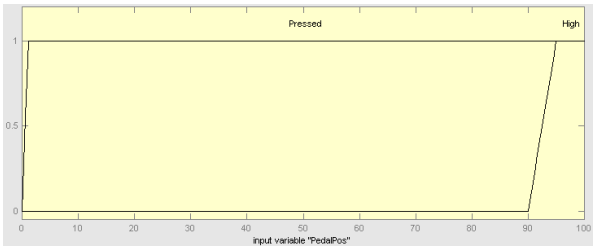
Sportiness



Membership function for 'Sportiness'

- One membership function is defined for sportiness and returns one when sportiness is 50 or higher, zero when sportiness is less than 10 and varies linearly in between.

Pedal Position

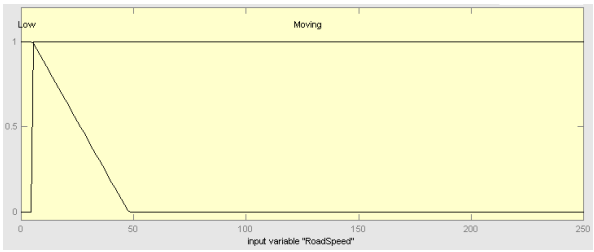


Membership functions for 'Pedal Position'

Two membership functions are defined for pedal position:

- Pressed – indicates that the pedal position is non-zero.
- High – indicates very high pedal demand.

Road Speed

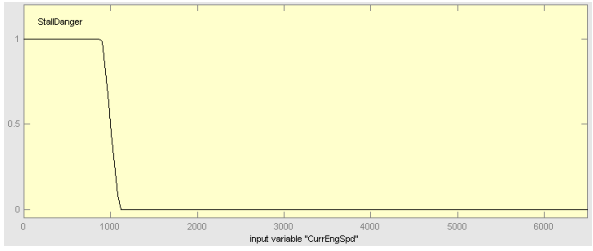


Membership functions for 'Road Speed'

Two membership functions are defined for road speed:

- Low – indicates low road speeds.
- Moving – is zero until below 5 kph and is one at and above 5 kph.

Current Engine Speed



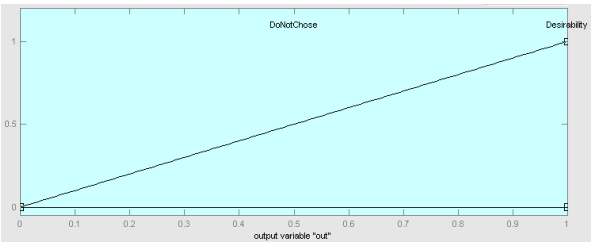
Membership function for 'Current Engine Speed'

Only one membership function is defined for current engine speed.

- 'StallDanger' indicates engine speeds where there is some danger of an engine stall if suddenly loaded.

Output

Desirability



Output membership functions

The output stage has two membership functions:

- Desirability – is linear with input, so that the output is exactly the same as the input.
- DoNotChoose – is fixed at zero. This value is only used by the two rules required to prevent Simulink's Fuzzy Logic Toolbox from arbitrarily allocating an output value when no rule is triggered. Its output value of zero ensures that these rules take no part in the logic of the system.

Rule Set

The rule-set used for Vehicle 1 is:

No	Rule	Weight
1	If (Nearness is Near) and (Proposed Engine Speed is NVHOK) and (Economy is Good) and (Achievability is Achievable) then (Output is Desirability)	0.5
2	If (Nearness is Increase) and (Proposed Engine Speed is StallSafe) and (Economy is OK) and (Pedal Position is Pressed) and (Road Speed is Low) and (Current Engine Speed is StallDanger) then (Output is Desirability)	1
3	If (Nearness is Near) and (Proposed Engine Speed is MidRange) and (Economy is OK) and (Achievability is Nearly) and (Sportiness is High) and (Pedal Position is High) then (Output is Desirability)	1
4	If (Nearness is Increase) and (Proposed Engine Speed is High) and (Economy is OK) and (Achievability is Nearly) and (Sportiness is High) and (Pedal Position is high) then (Output is Desirability)	1
5	If (Achievability is not Achievable) then (Output is DoNotChoose)	0.5
6	If (Nearness is not Near) then (Output is DoNotChoose)	0.5

Evaluation method

The method is evaluated in Matlab / Simulink simulation for two different systems each involving a Torotrak IVT and spark ignition engine. The first (Vehicle 1) is a model of an SUV for which an exactly comparable model of the engine, vehicle, IVT and the state-of-the-art controller has been provided by Torotrak for comparison.

The second (Vehicle 2) is a similar model of a saloon car. This model represents a mechanically similar vehicle that is significantly different to the SUV in engine characteristics, transmission inertias and vehicle dynamics.

The fuel economy performance of both models is evaluated in terms of by means of simulations of industry-standard tests. Fuel use simulations are compared to results generated the same models running the same tests with the manufacturer's own control system.

Results of the performance of the CISBAS controllers are compared to those achieved by the manufacturer's own controller using measures of driveability defined above.

5. SIMULATION

The engine – transmission – vehicle model used in this study was provided by Torotrak and is constructed in Matlab-Simulink. This model is used unchanged for all tests. The differences between the two vehicles tested are contained in data files used by the simulations.

Torotrak also supplied a model of their controller design. This is used for all the comparative tests and is described as the current controller below.

The CISBAS controller is also implemented in Matlab-Simulink and is used to replace those sections of the Torotrak controller involved in deciding the outcomes desired. The results of the CISBAS decisions are passed to those parts of the Torotrak controller responsible for implementing decisions which are used unmodified.

The details of the Torotrak controller are commercially confidential and are not discussed here.

6. SIMULATION RESULTS

Tests

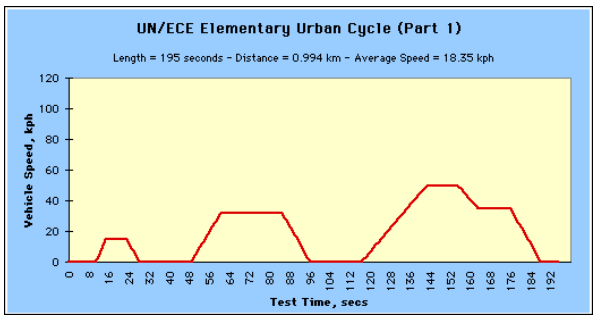
Full-throttle acceleration

Simulations of both the SUV and the saloon car were run at 100% accelerator pedal depression.

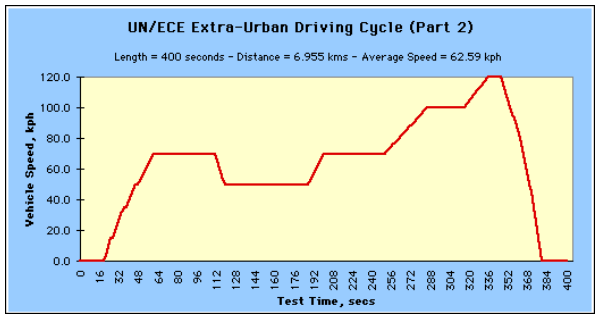
Fuel consumption

Fuel consumption was measured using cycles of accelerations, decelerations and cruising as defined by a number of international standard tests (e.g. [US95]). Each test cycle defines a velocity / time profile that must be driven. A model driver is required in order to simulate the driver's pedal activity in response to a requirement to follow a velocity profile. A simple closed-loop PI controller with look-ahead was used as a driver model.

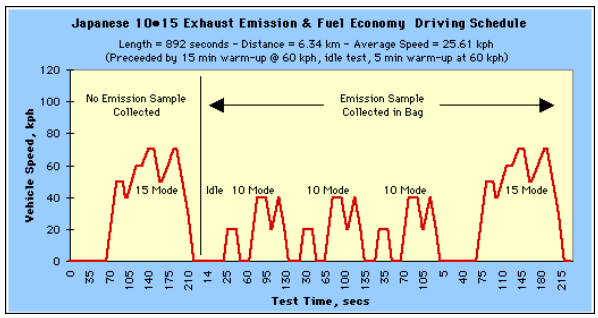
The test cycles used were velocity traces of international standard test cycles as shown below:



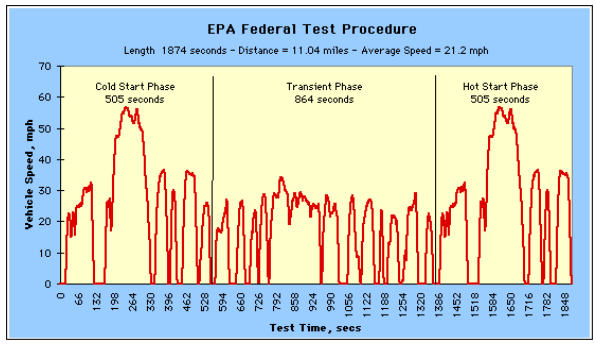
European Urban Cycle



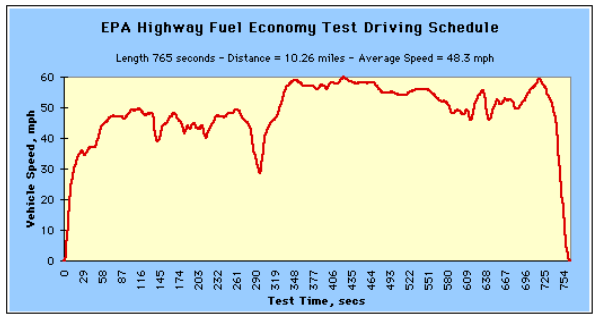
European Extra-Urban Cycle



Japanese Cycle



US City Cycle



US Highway Cycle

In addition, the fuel consumption was tested for 10 minutes driving at a constant 50 kph and 100 kph.

Driveability

To compare the responses of both systems to driver demands the velocity / time responses of both models were plotted for:

A step change in pedal position to 100% from rest (Launch)

A step change in pedal position to 100% from 12 kph (Performance). The performance test was conducted for acceleration from steady cruising at 12 kph (zero sportiness) and for simulated pedal thrashing (high sportiness).

Results

Vehicle 1

Full throttle acceleration

Test	Current Controller	CISBAS Controller	Improvement
0 – 100 kph	13.4 s	13.3 s	0.7%
50 – 110 kph	11.3 s	10.6 s	6.2%
0 – 60 mph	12.6 s	12.3 s	2.4%
30 – 70 mph	12.3 s	11.4 s	7.3%

Fuel economy

Cycle	Current Controller	New Controller	Improvement
European Urban	0.5570 kg	0.5691 kg	-2.23%
European Extra Urban	0.7150 kg	0.7135 kg	0.20%
Japanese	0.5277 kg	0.5385 kg	-2.00%
US City	2.0307 kg	2.0483 kg	-0.86%
US Highway	1.4631 kg	1.4689 kg	-0.40%
Constant 50 kph	0.5890 kg	0.5867 kg	0.40%
Constant 100 kph	1.6406 kg	1.6394 kg	0.07%

Driveability tests

Raw Data

Assessment	Current Controller	New Controller (Economy)	New Controller (Sport)
Launch delay	0.12 s	0.02 s	0.02 s
Launch acceleration	3.48 ms^{-2}	3.32 ms^{-2}	3.32 ms^{-2}
Performance delay	0.12 s	0.02 s	0.02 s
Performance acceleration	3.47 ms^{-2}	3.07 ms^{-2}	3.09 ms^{-2}
Performance jerk	2.48 ms^{-3}	3.08 ms^{-3}	3.01 ms^{-3}

Driveability indices

Assessment	Current Controller	New Controller (Economy)	New Controller (Sport)
Launch delay D_{LD}	8.8	9.4	9.4
Launch acceleration D_{LA}	8.9	8.7	8.7
Performance delay D_{PD}	11.0	12.7	12.7
Performance acceleration D_{PA}	11.2	10.5	10.5
Performance jerk D_{PJ}	7.0	7.6	7.6
Total Scores	46.9	48.9	48.9

Vehicle 2

Full throttle acceleration

Test	Current Controller	CISBAS Controller	Improvement
0 – 100 kph	12.3 s	12.4 s	-0.8%
50 – 110 kph	10.2 s	10.1 s	1.0%
0 – 60 mph	11.5 s	11.7 s	-1.9%
30 – 70 mph	11.0 s	11.0 s	0.0%

Fuel economy

Cycle	Current Controller	New Controller	Improvement
European Urban	0.2838 kg	0.2272 kg	19.94%
European Extra Urban	0.2645 kg	0.2568 kg	2.91%
Japanese	0.2051 kg	0.2066 kg	-0.72%
US City	0.7824 kg	0.7808 kg	2.04%
US Highway	0.5083 kg	0.4958 kg	2.46%
Constant 50 kph	0.2113 kg	0.1977 kg	6.44%
Constant 100 kph	0.6144 kg	0.6205 kg	-0.98%

Driveability tests

Raw Data

Assessment	Current Controller	New Controller (Economy)	New Controller (Sport)
Launch delay	0.17 s	0.02 s	0.02 s
Launch acceleration	4.03 ms^{-2}	3.41 ms^{-2}	3.41 ms^{-2}

Performance delay	0.1 s	0.12 s	0.08 s
Performance acceleration	3.9 ms^{-2}	3.2 ms^{-2}	3.1 ms^{-2}
Performance jerk	1.92 ms^{-3}	2.54 ms^{-3}	6.09 ms^{-3}

Driveability indices

Assessment	Current Controller	New Controller (Economy)	New Controller (Sport)
Launch delay D_{LD}	8.5	9.4	9.4
Launch acceleration D_{LA}	9.6	8.8	8.8
Performance delay D_{PD}	11.3	11.0	11.7
Performance acceleration D_{PA}	12.0	10.7	10.6
Performance jerk D_{PJ}	6.5	7.1	10.7
Total Scores	47.9	47.0	51.2

In vehicle 1 the CISBAS controller produces an improvement (averaging 4%) in all acceleration times at the expense of a very small (0.55%) reduction in overall fuel economy.

In vehicle 2 there is a very slight worsening of some acceleration times (averaging -0.4%) but the CISBAS controller produced a 2.94% improvement in overall fuel economy.

It is clear from the results above that the full-throttle accelerations and fuel economy figures produced by the CISBAS controller are directly comparable to those of the current controller design.

The driveability tests show two series of results for the CISBAS controller and only one for the current system. This is because the behaviour of the CISBAS system takes account of the recent history of driver demands, maintaining a 'sportier' feel if this history shows frequent changes in demand, and maximising economy if there have been few changes. The current controller does not consider these different cases.

The results for vehicle 1 show very little difference between sport and economy mode, and in both cases the performance of the CISBAS controller is superior overall.

Vehicle 2 shows more difference with the economy driveability scoring slightly lower than the current controller but the sport scoring significantly higher.

Taken together, these tests show that the CISBAS controller is capable of producing performance similar to, and occasionally better than, the current state-of-the-art controller. It achieves this without any specialist knowledge of the system being controlled.

7. IMPLEMENTATION ISSUES

The CISBAS controller is computationally more complex than current systems. The time taken to calculate the range of available options and to select from them is non-negligible.

The key processes involved in the CISBAS controller have an execution complexity of $O(r*t*s^{-1})$ where **r** is the number of RPM steps considered, **t** the number of throttle steps and **s** is the size of the iteration time.

The frequency of iterations of the solutions selection routine and the engine and vehicle simulation need not be the same. The CISBAS controller need not iterate as frequently as the code executing its decisions. In tests, iteration times ratios set at up to 1:10 produced almost identical results. For the tests used to produce the results presented here the ratio was set at 1:10 and the execution speed averaged 16% slower than that of the current controller.

The controller takes up only part of the time taken for the simulation and the impact of the CISBAS method on computational cost of the controller is estimated at 25-30%. This cost is not insignificant, but the computation of the existing controller is easily accommodated in real time on currently available microprocessors and an increase of this order presents no serious problem.

The data storage requirement of the new controller is O(r * t). At the level of detail used to produce the results presented here involves the additional storage of a 29 million-element array. In the Matlab floating point format this requires a total of 223Mb, however no more than 8-bit precision is actually necessary and the required data could be reduced to approx. 30Mb without loss of functionality.

Both 223Mb and 30Mb are beyond the address range of the 16-bit microprocessors used in many current automotive applications which is a significant issue in implementation. It would be possible to reduce the number of elements in the array without substantially reducing the precision of calculation but this reduction would be unlikely to be more than a factor of 8, which would leave the requirement outside the scope of a 16-bit address space.

However, even 223Mb falls well within the range of 32-bit processors and the cost of the additional memory is small, so it should be possible implement the algorithm in reality.

8. CONCLUSIONS

It is demonstrated that:

- The use of the CISBAS method produces a controller CVT powertrains with a performance directly comparable to the state-of-the-art system.
- The CISBAS control strategy is easily transferable between different engine, transmission and vehicle combinations based on the Torotrak IVT.

This is achieved at the expense of a minor increase in the computing resource available to the controller and produces a generic method

- that requires only readily available engine, transmission and vehicle data, and requires no inbuilt assumptions of the ideal solution to meet any particular operating conditions
- in which the driver expectation is stored in a readily re-trainable neural network
- in which almost all tuning of system response is achieved by intuitive adjustments of the membership functions of a fuzzy selector.

and

- that requires little adaptation when applied to different vehicles of similar design.

This provides a benefit in reducing the considerable time typically taken to tailor current controllers to new vehicles or to updated or changed specifications of existing vehicles.

It will also permit rapid investigation in simulation of vehicles for which no heuristic controller exits. This enables detailed exploratory work to be carried out on new engine, vehicle and drivetrain configurations that could prove prohibitively expensive to investigate by other methods.

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The East Lancashire Institute of Higher Education at Blackburn College

RELIGION IN SEGREGATED COMMUNITIES

Academic Report: AR-08-09

Dr Andrew Holden[1]

April 2008

Sociological Research Group
Sustainable Development Research Group

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RELIGION IN SEGREGATED COMMUNITIES

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Academic Report AR-08-09. East Lancashire Institute of Higher Education, Blackburn, UK.

Abstract- In the summer of 2001, a series of disturbances erupted in Oldham, Burnley and Bradford. These disturbances prompted questions about how a society that is home to an increasingly large number of faith and ethnic groups can remain cohesive. Andrew Holden discusses whether religion can help to unite communities that have been damaged by civil unrest.

1 INTRODUCTION

In 2001, the northern town of Burnley received huge media attention because of some violent disturbances (a euphemism in the eyes of many local residents for *riots*) that had taken place during a hot summer weekend. The main protagonists of these 'disturbances' were young White and Asian men. Some weeks later, a group of local Christian and Muslim leaders met to form an interfaith group known as *Building Bridges Burnley* (referred to hereafter as BBB), the aim of which was to help restore unity and to contribute to the borough council's community cohesion action plan. Like many other voluntary groups established around this time, BBB was concerned that the different ethnic groups of Burnley were starting to live in segregated enclaves – a situation that was resulting in the formation of what Trevor Phillips, Chair of the Commission for Equality and Human Rights, described as 'parallel lives' (Cantle 2005). The group's ultimate fear was that if left unaddressed, these deepening social divisions could lead to further civil unrest.

There is much debate within classical and contemporary sociology about the extent to which religion can contribute to social cohesion. While Marxists and neo-Marxists saw religion as an ideological tool used to oppress powerless groups, functionalists such as Durkheim, Malinowski, Parsons and Bellah emphasised the effectiveness of religion in uniting communities (even whole nations) into a collective social order. In the last three or four decades, however, secularisation theorists have argued that traditional religion has lost most of its influence and that religious beliefs are now regarded as a purely private matter (Bruce 1996). Postmodernists adopt the middle ground by arguing that although religion has not completely disappeared, it no longer has the ability to unite whole communities as people start to construct their own 'reflexive' identities. So does this mean that religious groups are unable to contribute to the community cohesion effort? Is it possible for faith communities to work together (and with secular bodies) in order to create a more unified society? And what form should this 'interfaith' approach take? The Burnley Project attempted to address these challenging sociological questions.

2 METHODOLOGY

The Burnley Project was a sociological investigation carried out between 2005 and 2007 by a team of researchers at Lancaster University. The project had two broad aims: firstly, to establish the extent of religiosity in Burnley and secondly, to examine whether interfaith activities could help to avert some of the social segregation that was allegedly taking place. It was clear from the outset that if BBB was to achieve its full potential, it would need to know what kind of initiatives would work best and how to engage with the wider society. The investigation focused mainly, though by no means exclusively, on young people between the ages of fifteen and thirty years.

Several methods were employed throughout the project including demographic research from secondary sources, semi-structured interviews with young adults (including those with no religious convictions), a questionnaire survey of religious attitudes among local high school pupils and observations of interfaith events. Each of these methods produced different kinds of data until a whole picture of the religious landscape of Burnley and the success of BBB activities was established. Sociologists often refer to this multi-methodological approach as *methodological pluralism*. Unlike many other sociological studies, however, the Burnley project is an example of what is

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known as a*ction research* – not something to which A Level Sociology text books often refer. This is where a researcher becomes personally involved in the activities that he or she is investigating in order to help a group or organisation (in this case, BBB) achieve its objectives. This means that action researchers are involved in *evaluating, advising* and *planning* as well as gathering information and developing hypotheses.

3 The Findings

A segregated town

Our demographic research revealed that Burnley was a bi-polar town with a high level of social deprivation (Census 2001). The two main ethnic groups were White (around 92 per cent of the local population) and Asian (around 7 per cent, or, in raw numbers, 6,300 people). The borough council's local population data confirmed that the town's Asian residents, most of whom were of Pakistani heritage, were concentrated in one ward – a situation that painted a picture of segregation not only in housing but in education and in recreational activities (Burnley Borough Council 2005). Our subsequent primary research revealed that there was hardly any interaction between ethnic groups and little if any interest in interfaith activities.

Religious attitudes of young people

The attitudes of the young people of Burnley towards religion were ascertained through a Year 10 questionnaire survey and through a series of semi-structured interviews conducted at regular intervals. The questionnaires were completed by 435 pupils from three different schools (a 'majority-Asian', a 'majority-White' and a mixed school) and the interviews were carried out among forty young adults in the 18 to 30 age group. Although these were relatively small samples, our intention was to establish the level of religious cohesion in the town and to help BBB identify the kind of activities that might help to improve relations between young people.

The school survey

Perhaps not surprisingly, the questionnaire results showed that Asian pupils (the overwhelming majority of whom were Muslim) had a far greater level of religious conviction than their White counterparts. They were more likely to believe in God (97 per cent), attend a place of worship on a regular basis (81 per cent) and live in accordance with religious rules (94 per cent). From the point of view of social and religious unity, 86 per cent of these Asian pupils expressed a willingness to listen to other people's religious views, 76 per cent felt that faith communities should work together in pursuit of harmonious social relations and 87 per cent believed in showing loyalty to the UK. These findings seemed to fly in the face of popular media representations of British Muslims as insular, intolerant and unwilling to integrate.

In sharp contrast with the Asian pupils, the White pupils were a more diverse group and their responses were, from a community cohesion point of view, less positive. Only 19 per cent of the respondents believed in God and only 8 per cent regularly attended a place of worship. Around 50 per cent said that they were willing to listen to other people's religious views and only 29 per cent felt that religious unity was a worthy endeavour. The most disturbing finding of all was the response to a question about racial equality. Almost one third of the White pupils believed in the superiority of their own race and only one quarter believed that it was important to show tolerance towards people from different religious, cultural and ethnic backgrounds. Although these views represented only those of a minority, they highlighted the challenges for BBB and other community-based organisations.

The interviews

The interviews with the forty young adults revealed a wide range of attitudes towards religious beliefs and religious unity. These attitudes can be demonstrated in a typology that was produced after all the interviews had been completed. In broad terms, the interviewees fell into one of four sub-groups or 'types':

- *Religious inclusivists* – people of faith who were willing to engage in dialogue with members of other religious groups and who strongly supported faith cohesion;
- *Secular cohesionists* – people with no religious faith but who recognised the contribution that faith communities made to civil society. Secular cohesionists regarded interfaith initiatives as a worthy exercise and some were even willing to take part in activities not involving acts of worship;
- *Religious exclusivists* – people of faith who believed in the legitimacy and 'correctness' *only* of

their own doctrines and who refused to enter into dialogue with other religious communities;

- *Secular aversionists* – people of no faith who regarded all religion as a divisive and destructive force. Like religious exclusivists, secular aversionists refused to support faith cohesion initiatives, though for different reasons.

One of the most interesting findings was just how much support there was for interfaith activities among those with no religious convictions (identified in the typology as the secular cohesionists). While this was more reassuring for BBB than the questionnaire results, it did, none the less, suggest that Burnley was a largely secular town and that if faith cohesion strategies were to be effective, there would be little point in preaching only to the converted.

Activities of the BBB partnership

The fact that BBB attracted lay people as well as religious clerics meant that it was more easily able to establish links with schools, community centres, voluntary organisations and local government agencies than might have been the case had this been a partnership only of priests and imams. In addition to faith-specific initiatives such as the formation of a Christian-Muslim leaders' alliance and the facilitation of a residential interfaith project, BBB hosted a large number of feasts, fund-raising events, church/mosque visits and after school activities in the hope of engaging more actively with the wider secular community (local authorities refer to a group's ability to attract wider audiences as *capacity building*). Some of its younger members also represented the group at multicultural events such as annual park festivals, summer extravaganzas, road shows and carnivals.

Perhaps the most successful BBB 'capacity-building' initiative of all, however, was the school outreach programme. This consisted of a series of workshops led by BBB members themselves and delivered to Year 6 and 7 pupils as part of Citizenship and/or Religious Education. The success of this programme can be attributed to the fact that it emphasised ethical/humanitarian issues rather than religious doctrines. This is an approach which invites people of all faiths as well as those with none to reflect on values that unite modern liberal democracies. These values include respect for religious and ethnic differences, the right to free speech and the protection of civil liberties - values that we have all come to recognise as essential requisites for a unified society.

The way forward?

So, can religion help to unite segregated communities? The Burnley Project unearthed a number of important findings. The questionnaire and interview data revealed a wide range of attitudes towards religion and towards the concept of faith cohesion. Although the Asian respondents took faith much more seriously than their White counterparts, they too varied in their religious convictions and in their support for interfaith initiatives. These variations occurred within as well as between generations. Our research also highlighted the interplay between religion, ethnicity and culture. Pakistani Muslims, for example, were more likely to worship at different mosques and associate with different groups of people than Bangladeshis, in much the same way that Christians are allied to different denominations and identify with specific ethnic and/or cultural traditions. This suggests that religion is only one marker of identity and that in societies as diverse as our own, it cannot easily act as a unifying force.

The alarming levels of racial and religious intolerance expressed by the pupils in the majority-White school bore all the hallmarks of a segregated town in which the far-right BNP had had a strong influence on the attitudes of local people (at the time of the study, the party held seven seats on the local council). These findings have far reaching implications for educational policy and for the formulation of community cohesion strategies. Mixed schools, it seemed, were better able to address the challenges presented by social segregation in Burnley than monocultural schools and it was in these settings that BBB had the greatest impact.

The ultimate test of whether religious groups can help to unite segregated communities, however, lies in how they approach their mission. In a society in which religious attitudes are very wide ranging and where interfaith activities touch only a minority of the population, faith-oriented strategies are unlikely to make a decisive difference. It will be the ability of religious communities not only to work together but to engage with secular bodies that will determine their future success. In the final analysis, sociologists might see this as the secularization not only of society, but of religion itself.

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Disability and Death in Elizabeth Gaskell's 'The Three Eras of Libbie Marsh'

Academic Report: AR-08-10

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Sociological Research Group

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Disability and Death in Elizabeth Gaskell's 'The Three Eras of Libbie Marsh'

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Academic Report AR-08-10. East Lancashire Institute of Higher Education, Blackburn, UK.

In all societies people are subjected to what the sociologist Michael Anderson calls 'critical life situations', including, unemployment, sickness, disability or death which remove the social and often the economic support for the family.[2] In our contemporary Western society, along with improved living conditions, the economic impact of such situations is somewhat lessened by the welfare state. However, in the mid-nineteenth century, particularly in industrialized urban areas, bureaucratic assistance was much less forthcoming, and if eligible for relief under the New Poor Law Act (1834) it was only provided when living in a workhouse, where conditions were appalling.[3] This lack of assistance, coupled with the fact that these situations tended to occur frequently, increased the necessity for a support framework to be established by families and kin to counteract suffering, and to provide both economic and emotional assistance in critical life situations.[4]

Such situations inevitably provided the literary world with an ample source of information and Elizabeth Gaskell was no exception to this, and by writing about issues such as death and disability, allowed her to explore 'a way of confronting characters with a sharply changed situation'.[5] 'Although Gaskell is probably best known for her major novels including *Mary Barton* (1848) and *North and South* (1854-5), which offer a critique of the Condition of England in the industrial north during the mid-nineteenth century, it is generally less well known that Gaskell wrote over fifty short stories during her career, many of which were published in various periodicals of the time.[6]

Gaskell's writing frequently shows a preoccupation with these critical life situations, especially in her short stories, but, rather than emphasizing the more negative aspects associated with sickness, disability and death, she instead seems to utilize these aspects to emphasize how individuals and their wider community can learn and ultimately benefit from what would normally be devastating experiences.

Thus, consideration will be given to the notion of disability and death and how a recurrence of these themes in one of her earliest publications 'The Three Eras of Libbie Marsh' (1847) is used to highlight how women are able to create a mutually supportive 'family' unit, sometimes independently of men. This will be discussed alongside, and in relation to, how Gaskell utilizes these critical life situations as a vehicle in her many short stories to critique certain social values and explore the radical possibility of alternative, yet viable relationships to that of a biological family or marriage in mid-nineteenth-century society.

Nineteenth century disability history is often difficult to research, mainly because of the lack of primary sources available in this area and the fact that very few disabled people or those who cared for them have left any records of their experiences behind for future generations. Much of the research undertaken has tended to be institutional based, which has ultimately resulted in a general lack of 'vernacular and experiential perspectives of disablement'.[7] This is particularly the case with physical disability, as those who were physically incapacitated tended to be cared for within their own social setting rather than in an institutional environment. This was further compounded by the fact, that for working-class adults with a physical disability, support was available from their family and occasionally the wider community in order for them to remain in 'the productive cycle', which in effect resulted in the extent of the problem being 'hidden from view'.[8]

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[2] Michael Anderson, *Family Structure in Nineteenth Century Lancashire* (Cambridge: Cambridge University Press, 1971).p.136.

[3] Michael Anderson, p.137.

[4] Family is defined as the typical nuclear family, for example mother, father and children, whereas kin refers to relatives such as, aunts, uncles and cousins. Kin can often include more distantly related cousins. Michael Anderson, p.112.

[5] Laurence Lerner, *Angels and Absences: Child Deaths in the Nineteenth Century* (Nashville; Vanderbilt University Press, 1997) p.159.

[6] One of the reasons for this lack of knowledge is the difficulty in accessing these short stories. Although a small number of Gaskell's stories have been included in editions of her longer works, the majority of them are out of print. At present there is only one edition in print by Elizabeth Gaskell named *Gothic Tales*, ed. Laura Kranzler (Harmondsworth: Penguin, 2000), containing nine of her short stories. However, most of Gaskell's short stories are now available to download from The Gaskell Society website on the internet. See http://www.lang.nagoya-u.ac.jp/~matsuoka/gaskell/e-texts.html#E-texts

[7] Elizabeth Bredberg (1999) in Iain Hutchinson, 'Disability in Nineteenth Century Scotland - the case of Marion Brown' in *University of Sussex Journal of Contemporary History*, issue five, December 2002, p.14.

[8] Hutchinson p.1.

However, in nineteenth-century society such people would not have regarded themselves as being disabled in the way that this term is now recognized and understood. Therefore, it is important at this stage to more clearly define what is meant by the terms 'disabled' and 'disability' which are in themselves arguably social constructs determined partly by the society and the culture in which a disabled person lives.[9] In our contemporary society, for example, disability does tend to suggest some form of a mental or physical impairment, with either being essentially a deviation from what is regarded to be the social norm, although arguably this social norm is in itself arbitrary, encompassing a rather wide spectrum. However, in the nineteenth century the terms 'disabled' and 'disability' were rarely used in such a way. Instead, the terms had more of an economic bias as they tended to refer directly to 'the inability to work and be self-supporting' and were often a determining factor in deciding whether a person was eligible to receive poor relief.[10] In this nineteenth-century context, being disabled not only included people who were paralysed, deaf or blind, but it also included the elderly and infirm, along with single mothers and their young children who were in extreme financial difficulties. Thus in the nineteenth century, these terms were used in a much more generalized context than today,[11] and those who would now be seen as disabled would not have been regarded as such during the mid-nineteenth century because of their continuing ability to work.

It could be argued that because the majority of these people were not segregated from general society until the latter half of the nineteenth century with the introduction of asylums and hospitals, it was unnecessary to further define the boundaries between disabled and able-bodied people apart from on this economic basis.

However, according to Colin Barnes and Geoff Mercer, from the late eighteenth century onwards there has been a cultural tendency in Western society to differentiate 'able-bodied' from 'disabled' people, with the 'able-bodied' automatically assuming that they are 'the universal standard by which all other "bodies" are judged'.[12] This has therefore resulted in the disabled, being labelled as 'Other', which is in itself a distinctive form of social oppression not unlike racism or sexism.[13] This could be linked to the notion that because disability, particularly when the body is regarded as being deformed in some way, is seen as being a deviation from the able-bodied, ultimately producing a sense of fear of the unknown or worry that the disability may be something that could also happen to anyone.[14] As a result, a form of stigmatism is created through which able-bodied people are able to distance themselves from the 'fundamentally different and alien' disabled who are treated as 'objects of pity'.[15] This therefore is highly suggestive of society rather than the impairment itself being the cause of the disability.

Such cultural assumptions have inevitably influenced the literary world and disabled people are notably absent from literature. When such characters are present they are stereotypically portrayed in the 'passive voice' and depicted either as 'victims' or 'sufferers', or as a figure to be feared or loathed.[16] These negative representations permeate the literature in the Victorian period with well known, yet diverse examples including Tiny Tim in *A Christmas Carol* (1843), Captain Ahab in *Moby Dick* (1851) and Frederick Fairlie in *The Woman in White* (1860). According to Laurence Kriegel, the common denominator for many of the disabled characters is that they tend to be represented wholly through the able-bodied, with Kreigel vehemently claiming that 'the cripple is the creature who has been deprived of his ability to create a self …. He must accept definition from outside the boundaries of his own existence',[17] To put this in simple terms it suggests that such characters are repeatedly defined in terms of the able-bodied, reinforcing the notion that it is from the viewpoint of the able-bodied rather than that of the disabled that the disability is viewed.

Elizabeth Gaskell's writing was no exception to this literary theme as many of her short stories contain representations of physically or mentally disabled characters. Gaskell's disabled characters do appear, to a certain extent, to be representative of the stereotypical nineteenth-century viewpoint, as many are depicted as being a passive victim of circumstances. At the same time however, Gaskell does deviate from this norm by instead tending to utilize the disabled more as a narrative device to explore relationships between family, kin and the wider community particularly at times of crisis. Particular emphasis is given to how individuals and their surrounding community can improve through the example set by the suffering endured by the disabled person. An apt example of this is Gaskell's short story 'The Three Eras of Libbie Marsh' (1847) which contains several interrelated key concepts that are of particular interest, including how the

[9] Anne Borsay, *Disability and Social Policy in Britain since 1750* (Houndmills: Palgrave Macmillan, 2005), p.3.

[10] Hutchinson p.3.

[11] Hutchinson p.3

[12] Colin Barnes and Geof Mercer, *Disability and Social Policy in Britain since 1750* (Houndmills: Palgrave Macmillan, 2005) p.22.

[13] Barnes and Mercer, p.19.

[14] Morris (1991) in Barnes and Mercer p.92

[15] Morris (1991) cited in Barnes and Mercer p.92

[16] Barnes and Mercer p.93.

[17] Laurence Kriegel, 'The cripple in literature' in *Images of the Disabled* ed by Alan Gartner and Tom Joe (New York: Praeger, 1987), p.33.

physical disability, suffering and eventual death of a child are used as a vehicle in the narrative to suggest that a woman can find companionship through duty and service, that is, by the undertaking of tasks out of a sense of moral obligation in order to assist another. This short story also explores how women are enabled to create their own alternative family unit when marriage is not necessarily a viable option

'The Three Eras of Libbie Marsh' was one of Gaskell's earlier short stories and it was published under the pseudonym of Cotton Mather Mills in *Howitt's Journal* in three installments in June 1847.[18] The three eras, or chapters of the story, centre around the festivals of St Valentine's Day, Whitsuntide and Michaelmas. The narrative's protagonist, Libbie Marsh is a young, working-class seamstress living in a poor district of Manchester, who through the giving of a Valentine's gift, a canary, befriends a neighbouring disabled boy named Franky Hall, and his washerwoman mother, the widowed Margaret Hall. Sadly, Franky dies and the narrative concludes with Margaret and Libbie, living together as mother and daughter.

It could be argued that this short story, rather than using the physical disability and death of Franky as a centrally engaging theme, is a typical example of how Gaskell utilizes this notion more as a narrative device for the exploration of the possible relationships that can be experienced outside the more traditional family unit. In this narrative for example, Gaskell writes about how a successful non-biological surrogate mother and daughter relationship is achieved through a shared experience of caring for a disabled child. One suggestion could be that Franky is the vehicle through which Libbie is able to demonstrate her nurturing qualities, which under the more traditional circumstances would be bestowed upon husband and children.[19] Perhaps it is a widely accepted social belief that this nurturing quality is within all women, but the difference in emphasis with the 'The Three Eras of Libbie Marsh' is that that a woman does not have to be part of a heterosexual relationship in order to express such qualities to others.

This young disabled boy is a somewhat passive agent in this narrative, and the gradual sketching in of his character via a series of body parts, does appear to reinforce this. For example, it is not until the second era of Whitsuntide, when the trio embark upon a day out to Dunham, that the reader is able to see Franky as a whole person. Previous to this he is introduced to the reader through Libbie's point of view, who at first from her bedroom window sees only:

> the constant weary motion of a little, spectral shadow: a child's hand and arm, - no more; long thin fingers hanging listslessly down from the wrist, while the arm moved up and down, as if keeping time to the heavy pulses of dull pain …. Now and then it [that incessant, feeble motion] did cease, as if the little creature had dropped into a slumber from very weariness; but presently the arm jerked up with the fingers clenched, as if with a sudden start of agony. [20]

Comparisons can be drawn here between Franky and industrialization, with the movements of his arm being described in a similar fashion to the mechanical ram of a steam engine. Note how Franky is first described to the reader purely in terms of his illness, suggesting that these details about him do seem to be used as a device for characterization.[21]

Again, when Libbie sends Franky the canary, she sees from a distance;

> 'the little face flush into a bright colour, the feeble hands tremble with delighted eagerness, the head bent down [over the cage] to try and make out the writing, (beyond his power, poor lad, to read)'**.** (30)

Franky is described by others as the 'little creature' or a 'cripple'(30), which during this period were terms commonly used to refer to physically and mentally disabled people. One reason for such characters defined in terms of their illness or disability could be because of their inability

[18] Cotton Mather was an American Puritan minister during the late seventeenth and early eighteenth centuries, who took part in the Salem witchcraft trials. Jenny Uglow discusses possible connotations of the pseudonym. Jenny Uglow, *Elizabeth Gaskell, A Habit of Stories* (London: Faber and Faber, 1999), p.172.

[19] The term nurturing is used here to refer to how a person can nurse, support, educate or train others, in order to promote the development of a relationship. In 'The Three Eras of Libbie Marsh' (1848) for example, Libbie nurses Franky and supports both him and his mother Margaret. Through this, Margaret is educated to be more considerate to her neighbours.

[20] Elizabeth Gaskell, 'The Three Eras of Libbie Marsh' (1847), in *Elizabeth Gaskell* : *Four Short Stories* ed by Anna Walters (London: Pandora Press, 1983), pp.25-26. All future references to this text will be given parenthetically.

[21] Lynn Alexander, *Women, Work and Representation; Needlewomen in Victorian Art and Literature* (Athens, Ohio, USA: Ohio University Press, 2003), p.88. Note also the descriptive similarities between Franky, and also Alice in *Mary Barton* (1848). Alice who has suffered a 'paralytic stroke' is moved into a larger bed to be more comfortable. Alice, likened to a child 'lay with the rosy colour, absent from her face since the days of childhood, flushed once more into it by her sickness nigh unto death. She lay on the affected side, and with her other arm she was constantly sawing in the air, not exactly in a restless manner, but in a monotonous, incessant way, very trying to a watcher. *Mary Barton* (253)

to contribute economically to society, and are therefore perceived as a potential threat to social progress. This could also suggest that because many disabled people are often unable to make this financial contribution it results in them being viewed as incomplete.

The reader is also given relatively little detail over the death of Franky as the narrative swiftly moves from the day trip to Dunham to Franky's small funeral procession of only his mother and Libbie, which 'wound its quiet way', 'slowly, slowly along the streets, elbowed by life at every turn' (40). Note how Franky's life is condensed into one passive sentence; 'his romps, his games, his sickening, his suffering, his death' (40). A sentimental death-bed scene which was popular in Victorian fiction particularly for children, is conspicuous by its absence, further questioning Franky's role in the narrative. Although it has earlier been implied that Franky was not born this way as he had once been 'the Puck, or the Robin-goodfellow of the neighbourhood, whose marbles were always rolling themselves under people's feet'(37), the reader is left with several questions unanswered, including the age of Franky and the reason for his disability.[22] Likewise no information can be gleaned as to whether Franky's inability to walk has resulted from an accident or an illness. Furthermore it is unclear if the consequences of Franky's disability have led directly to his death. One may question Gaskell's refusal to reveal such details, and furthermore the purpose of Franky's role in the narrative.

One suggestion could be that Gaskell is using Franky's disability as a means of offering comment on the limitations faced by working-class women in mid-nineteenth century society. Libbie and Margaret are confined both spatially, because of Franky's confinement to bed, and also temporally through the time involved need to care for Franky, and it is only through his death that the two women are released from this confinement. Thus, Franky could be a metaphorical representation of the limits imposed on the lives of Libbie, Margaret and single working-class women in general who are in fact both socially and economically disabled by the society in which they live, especially as working-class women were extremely limited in their choice of work, to either being a seamstress or working in a factory. The fact that Libbie is a working-class seamstress is an extremely interesting concept, as this profession was widely used cultural symbol in the literary world to be representative of the conditions and suffering endured by the working class as a whole. Other examples from the period include *Jessie Phillips* (1844) by Frances Trollope and Eliza Meteyard's *Lucy Dean; the Noble Needlewoman* (1850), published under the pseudonym of Silverpen.[23] As these examples illustrate, the seamstress often appears as the title character, but rather than the narratives being written in terms of her own suffering, this figure instead tended to be a reflection of the suffering of other people around her.[24] For example, it is through Libbie's eyes that the reader first observes the pain endured by Franky, who is primarily defined in terms of his illness and disability.

One social comment that is subvertly implied within the text is regarding the negative consequences faced by working women, not only upon themselves but also upon family life. In 1861 the writer and critic Bessie Rayner Parkes expressed concern for the loss of domestic virtues by women and 'the suction of them by hundreds of thousands within the vortex of industrial life'.[25] Note how this suggests the passiveness with which the women were increasingly becoming their own breadwinners. Rayner Parkes continues claiming that 'nobody can doubt, that so vast a social change must be gradually inducing an equally great moral change', a comment which Gaskell adheres to with factory worker Ann Dixon and her unwise choice of husband. [26] This however, just reinforces the lack of occupational choices available to working class women who were restricted to either being a respectable, but often ill-paid seamstress, or a well-paid, but less respectable factory worker.

Similarly, it has been suggested that the canary is representative of the 'caged lives' of Franky and the women and their 'lack of a heard voice'.[27] However, it has to be remembered that Libbie, with regards to Franky, has entered into this confinement willingly, so in one sense she has shown independence of mind because she has specifically chosen this path in life. It could also be argued that this canary is, like Franky, a vehicle through which both Libbie and Margaret are enabled to form a lasting relationship, because of 'the peace he had brought, the happiness he had caused, to three individuals at least'(32).

It is also worth discussing the significance of the names given to the canary, because when Libbie first buys the canary it is already called Jupiter, but she immediately renames it Peter. Jupiter is the Roman ruler of the Gods, king of the air, and God of justice and morals. Peter, otherwise known as 'the Rock' was one of Jesus's disciples, who it is believed healed a man who had been crippled from birth by saying the words 'silver and gold I

[22] The term puck is used to refer to a mischievous or evil spirit. A Robin-goodfellow is another name for a puck. Collins English Dictionary, p.1248.

[23] Lynn Alexander, pp.241-247. Further examples can be found here.

[24] Lynn Alexander, p.87.

[25] Bessie Rayner Parkes, 'The Condition of Working Women in England and France' (1861), in Elizabeth Gaskell *North and South* ed by Alan Shelston (London: W.W. Norton, 2005), p.483.

[26] Bessie Rayner Parkes in Elizabeth Gaskell, *North and South*, p.488

[27] Jenny Uglow, Elizabeth Gaskell, A Habit of Stories, (London: Faber and Faber, 1999), p.175.

do not have, but what I have I give to you'.[28] In one sense, by Libbie's deliberately renaming of the canary 'Peter', she is likening herself to the disciple Peter and his willingness to sacrifice what he has for the benefit of another less fortunate than himself. This true Valentine's gift, where the 'delight is in the giving', is a selfless act derived from showing careful thought for another person and financial sacrifice on Libbie's part, as despite struggling to save, she only has enough money to buy the cheapest canary in the shop.[29] Libbie gives the canary to Franky with no expectations of anything being reciprocated. Libbie hopes this gift will bring a form of happiness to Franky as he is confined, in so far as the bird is able to 'occupy his thoughts, and … distract his attention, when alone through the day, from the pain he endured' (27). However, it is also the catalyst which breaks his mother's silence towards Libbie and eventually heals the rift between Margaret and her neighbours, thus binding community relationships closer together. The implication suggested here, and a notion which permeates Gaskell's writing is that 'kindness may breed kindness and love be returned for love' [30] which reinforces a claim made by Jenny Uglow that 'love is a social virtue, not a biological instinct. It can exist between strangers and need not be confined to the family'.[31]

It is also interesting to note that the giving of this Valentine's gift is not based upon a heterosexual or patriarchal relationship, and instead results from a mother to daughter legacy where Libbie always used to receive a small gift from her mother on her birthday, St Valentine's Day. As Libbie has always associated this celebration with her mother, this further suggests that the act of giving a gift to someone based on some form of attachment does not have to depend on a heterosexual relationship. This offers a challenge to the stereotypical patriarchal pyramid often found in nineteenth century literature, in itself a reflection of real life at the time when women were expected to be subservient to men, 'destined by God and by nature, not for an active life in the world, but for the domestic sphere'.[32] Independence was regarded as a rather unfeminine trait, and therefore women were required to be dependent on, and defined in terms of men, with marriage being seen as the most important 'validation of social structure' in Victorian society.[33]

Although it was a typical Victorian literary convention for a narrative to conclude with its heroine married or be at the point of marriage, this was actually more a representation of the social assumption that being married should be the 'only desirable goal' that a woman should hope for in her life.[34] However reality was somewhat different because although the working class in urban Lancashire tended to marry at quite a young age, partly due to the high wages obtained by young people in the cotton industry, there was a relatively large proportion of the female population who remained single. A survey conducted in Preston, Lancashire in 1851 concluded that the percentage of single women aged between twenty-five and thirty-four years was thirty-six percent.[35] With over one third of the working-class female population in this age group being unmarried it is probable that many of these women would have sought alternative forms of supportive relationships as a matter of both economic and personal necessity. Although there is limited data available to support this claim, the information that is available suggests that girls and also older women living in lodgings in urban Lancashire without any form of kinship network were often in poor health, and because of this absence of kin or friends there was an increased chance of being in severe financial difficulty.[36] According to Anderson, as it tended to be the women who were most often subjected to these critical life situations, they often contributed the greatest effort into 'binding together the kinship system', as a safeguard.[37] Again, although there is a general lack of statistical evidence, it is quite probable that a number of women would form relationships similar to that portrayed by Libbie and Margaret. In addition to this, the lack of a kinship network for Margaret severely hinders her choices; she has to work to financially support herself and Franky, but in the process of doing this she has to sacrifice the emotional support she would normally bestow upon Franky as he is left alone all day suffering.

It could be argued therefore that Gaskell is attempting to convey a greater sense of realism than is generally portrayed in much of the literature at the time, as through Libbie's caring actions to Franky and his mother, Libbie in effect becomes proactive in finding her own support

[28] *Holy Bible*, Good News Edition (Westlea: Bible Society, 1976), The Acts 3:6, p.1108.

[29] Terence Wright, 'We are not angels': Realism, Gender, Values' (Houndmills: Macmillan, 1995), p.16.

[30] Terence Wright, p17.

[31] Jenny Uglow, p.177.

[32] Heather Glen, 'Charlotte Bronte: Jane Eyre' in *Literature in Context* ed by Rick Rylance and Judy Simons (Basingstoke: Palgrave, 2001), p.109.

[33] Rosalind Coward, 'The True Story of How I Became My Own Person', *The Feminist Reader* second edition, ed by Catherine Belsey and Jane Moore, (Basingstoke: Macmillan, 1997), p.28.

[34] Tess Cosslett, *Woman to Woman, Female Friendship in Victorian Fiction* (Brighton: Harvester Press, 1988), p.2.

[35] Figures for unmarried women aged between twenty and twenty-four years were seventy-one percent, and if aged thirty-five to fourty-four years it was sixteen percent. Michael Anderson, pp.132-133.

[36] Michael Anderson, p.152.

[37] Michael Anderson, p.169.

system. Likewise, if Margaret already had some sort of kinship network in place she may have been spared the agony of having to return to work straight after Franky's funeral. Again, Gaskell shows an astute awareness of reality by placing emphasis on the economic necessity of working-class life, when Margaret states 'and I mun go washing, just as if nothing had happened' (45), implying that there is no time for her to grieve for her dead son.

One interesting concept raised in 'The Three Eras of Libbie Marsh' is how the notion of happiness, defined as a general sense of well-being, is an emotion not normally associated with disability, the ideology of which is more suggestive of 'personal tragedy, passivity and dependence'. [38] The pleasure that Franky has from receiving and looking after the canary, and the ensuing relationship with Libbie challenges the preconceived notions that the only ways to thrive in society are through being healthy, able-bodied and being in a heterosexual relationship, suggesting that the disabled are not capable of feeling such emotions because they are 'less than human'.[39] Gaskell is quick to point out that the disabled are more than capable of experiencing similar emotional response to the able-bodied as both Libbie and Franky 'find solace in nature' realizing that its beauty is able to offer Franky a foretaste of heaven. [40] Gaskell firmly believed in the ability of the power of nature to restore people to their better selves, and is a concept she explores in the second era of Whitsuntide, where many of the working-class families venture out on a day trip to Dunham, in the countryside surrounding Manchester. Dunham dramatizes a combination of 'kindly Mother Nature's soothings at that holiday time'(37), coupled with Franky's physical disability and deteriorating frame which is 'so changed since the Dixons had seen him'(37). This combination results in healing the long-standing rift between Mrs Dixon and Margaret Hall. Gaskell could be attempting to point out that because of the pressures of everyday life most working-class people are too busy to express concern for others, because under normal circumstances it requires a great deal of time and effort. However, the narrative may be expressing the importance of support networks for those in need being consistent, particularly during critical life situations. Therefore, this is probably not intended to be a criticism of the working class, as Gaskell is quick to show how sympathy for Franky and the surrounding countryside successfully brings out the nurturing ethos of the working class, particularly the more feminine, nurturing side of the male characters. The men led by Mr Dixon make a hammock for Franky, carrying him 'merrily along down the wood-paths, over the soft grassy turf' (37) so that he is able to see the deer by the oak trees. Thus 'the soul grew much that day … and all unconsciously, as souls do grow' (38) reinforcing that through working together for Franky's well-being, the visitors to Dunham have regained their community spirit.

It is also noticeable that a feminization of physical disability takes place in the narrative, with a stark contrast given between how Franky is represented both before and after he becomes physically disabled, as this 'feeble, mild, almost girlish-looking lad had once been a merry, happy rogue, and as such often cuffed by Mrs Dixon'(37). Note how as an active child Franky is defined in terms of his behaviour, yet as a disabled child Franky is represented only through his physical appearance. In a similar vein, it is through physical appearance rather than personality that the 'very plain' Libbie (24) is deemed unlikely to find a suitable marriage partner, thus implying that marriage in Victorian society was all to often based on the pretence that a more attractive woman would make a better wife.

The narrative does intimate that undue emphasis is sometimes placed on physical appearance, not only with disability, but also with regards to potential success in the marriage market, particularly from Libbie's point of view who is first introduced to the reader mainly in terms of her looks**.** She is described as 'very plain', and although Libbie is aware of this fact, it 'had ceased to mortify her', realizing that she will never marry because her lack of female beauty (24). Instead Libbie is extremely accepting of this, claiming that she 'must not lose time in fretting and fidgeting over marriage, but just look about … for somewhat else to do'(43). This therefore suggests that Libbie is attempting to play an active role in finding a suitable relationship as a viable alternative to a heterosexual one, and that in the absence of female beauty, it is instead through loyalty, assistance, and ability to nurture those less able, that eventually procures Libbie her personal reward of companionship with another person. Thus, it could be argued that the relationship formed between Libbie and Margaret should not be regarded as a 'sad, second best to marriage', but should instead be seen as a positive and feasible alternative to the expected and conventional way of life.[41]

Gaskell may be implying that women who do not marry should not regard themselves as failures and instead should open themselves up to the possibility of other, more fulfilling and nurturing relationships that may be available to them. Libbie makes it quite clear that she is unlikely to marry, and instead says that she is 'just looking round for

[38] Barnes and Mercer, p.24.
[39] Barnes and Mercer, p.26.
[40] Jenny Uglow, p.175.

[41] Anna Walters in Elizabeth Gaskell, 'The Manchester Marriage' (1858), in *Elizabeth Gaskell Four Short Stories* ed by Anna Walters (London: Pandora Press, 1983), p.8.

the odd jobs God leaves in the world for such as old maids do', claiming that looking after Franky up to his death was one of her 'odd jobs'. Perhaps Libbie's relationship with God and consequently with Margaret is of more paramount importance than a heterosexual one.

Gaskell does appear to be issuing a challenge here to the more traditional view on the institution of marriage, advocating that it is not the only relationship that women should necessarily expect.[42] In fact, this narrative can be seen to offer less than positive critiques of marriage, suggesting that it is perhaps more beneficial to remain single and self-supportive rather than be imprisoned within an unsuitable marriage. For example, Libbie's neighbour, Anne Dixon tells Libbie that she would rather have her future husband Bob 'tipsy than any one else sober' and calls marrying 'just a spree' (43), suggesting that Anne is entering into marriage without due care and consideration for the possible consequences of having a drunkard for a husband. Anne's flippant comments about marriage are likely to have produced mixed emotions from its Victorian readers because, although they are likely to have been horrified by Anne's remarks, at the same time they may have been forced to consider the circumstances which led to them being articulated. Anne's comments result in a passionate outburst from Libbie who attempts to warn Anne by relating how her drunken father killed her 'darling' baby brother in 'one of his bouts' (43), and how the repercussions of this act not only ruined her parents' marriage, but eventually led to her mother's death. Comments can be made here in terms of gender differences and the notion of power, as there is a distinct contrast between Libbie's father who kills the baby, as opposed to the mother who is powerless to protect her son from brutality. Similarly, Libbie and Margaret are unable to prevent Franky from death, further emphasizing the powerlessness of women although, as already suggested, this death results in a betterment of economic and social conditions for both women.

It is important to realise however, that although Gaskell can be seen to be radical to a certain point, by raising awareness that marriage may not a suitable or viable option for all women, she is at the same time being conservative because she does not directly criticize the institution of marriage itself. Evidence for this can be found in the text, when at one point Libbie claims that being married is 'woman's natural work'(43). Perhaps Gaskell could be suggesting the need to be more aware of the potential consequences of entering into an unsatisfactory marriage, whilst exhibiting an asute awareness of how social and economical factors are inextricably bound up with the potential for an individual achieving happiness within a relationship. Thus despite the best of intentions by all concerned, and due to uncontrollable factors, marriage does not live up to its expectations.

According to the early feminist critic Aina Rubenius, Elizabeth Gaskell saw women 'only as appendages of men, without any intrinsic values in themselves' claiming that it was only in her later work that Gaskell began to regard women, for example Margaret Hale in *North and South* (1854-1855) as 'independent beings whose duty it is to have a will of their own and to accept moral responsibility'. [43] However 'The Three Eras of Libbie Marsh', despite being one of Gaskell's earliest publications does appear to partly contradict Rubenius's view, as whilst Libbie is accepting of her destiny to remain single, she quite clearly demonstrates an acute personal awareness of moral responsibility which she feels is required by the community towards Franky and independence of thought by offering to nurse Franky and eventually live with Margaret Hall. Although some of Gaskell's major works adhere to the Victorian convention of ending a novel with the marriage of the heroine,[44] she does tend to break away from this tradition in her short stories by exploring these alternative relationship opportunities for working-class women.

Tess Cosslett argues that it is extremely rare in nineteenth-century writing to find a female friendship which acts as either a substitute to, or in direct competition with a heterosexual relationship.[45] 'The Three Eras of Libbie Marsh' is a refreshing example of this alternative relationship, as it tends to reflect the harsh reality that many working-class women would not have the opportunity to marry, rather than the 'social assumption' that marriage was the only worthwhile aspiration for a woman during this time.[46] Instead this narrative explores the ways in which a woman is able to find and be comfortable with her own identity. As Janice Swanson points out 'seldom do we have the chance to observe women in a sustained relationship which nurtures them, revolving around interests other than a heterosexual attchment'.[47] Although the relationship between Libbie and Margaret validates the traditional female roles of mother and daughter, at the same time it is able to

[42] Shirley Foster, *Elizabeth Gaskell: A Literary Life* (Basingstoke: Macmillan Press, 2002), p156.

[43] Aina Rubenius 'Factory Work for Women' (1950) in Elizabeth Gaskell *North and South* ed by Alan Shelston (London: W.W. Norton, 2005), p.517.

[44] Examples include *Mary Barton* (1848), *North and South* (1855), and *Wives and Daughters* (1866).

[45] Tess Cosslett, p.3.

[46] Tess Cosslett, p.2.

[47] Janice Swanson (1981), in Tess Cosslett, p.11.

transform this relationship into a strong female community.[48]

By reading the narrative in this way, the reader comes to realise that it is not as one would first imagine, a depressing tale of childhood disability and death, but is instead 'active and positive' and a celebration of 'practical human endeavour'[49] in which Gaskell explores the possibilities available within what would normally be a rather limited preordained destiny for working-class women. Although the external conditions such as their poverty cannot be significantly altered, Libbie and Margaret are able, through their mutual experiences of caring for Franky, to form a viable and sustainable surrogate mother and daughter relationship. They are thus able to positively transform the quality of their inner life, as they now have each other to rely on for financial support, company and comfort. Thus as Gaskell points out, 'out of the little grave, there sprang hope and a resolution which made life an object to each of the two'(46)

The short story 'The Three Eras of Libbie Marsh', can be said to reveal, albeit 'in embryo', some of the major concerns that would be more fully explored in Gaskell's later writing career.[50] This includes how both disability and death are used by Gaskell as a device for teaching others the importance of family, kin and the wider community in order to protect the most vunerable in society, and how it tends to be the bonds between women that promote a moral code of behaviour where everyone works together for the common good.

[48] Tess Cosslett, p.5-6.
[49] Terence Wright, p16.
[50] Anna Walters, p.2.

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Agent-Mediated Information Exchange: Child Safety Online

Academic Report: AR-08-11

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Agent-Mediated Information Exchange: Child Safety Online

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Abstract **-** This paper presents a tool for agent-mediated information exchange between users/children while chatting online. The Internet plays a significant role in the lives of children today by opening up a whole new world. It provides excellent educational opportunities, access to a huge range of information and can be fun. However, it also plays a role in the abuse of children in a variety of ways. We are aware of the potential for pedophiles to misuse modern technology to abuse children's trust by attempting to contact them through chat rooms. Hence, there is a need to automate the process of monitoring information exchange when children chat on-line.

We are proposing to develop agent-mediate autonomous system that is able to automatically block the transmission of personal data, such as addresses and telephone numbers to other users, if such data is detected in a message. The system will block any transmissions which include the arrangements of meetings between users, and will report any attempts to transfer personal data to the user's nominated parent.

The architecture of this system incorporates four software agents: processing agent containing user profile, detection agent monitoring information exchange, notification agent generating an alarm e-mail to nominated recipients, and warning agent informing the users of dangerous on-line activity. The overall aim of the system is to make it safer for children to chat online..

I. Introduction

The Internet plays a significant role in the lives of children today by opening up a whole new world. It provides excellent educational opportunities, access to a huge range of information and can be fun. However, it also plays a central role in the abuse of children in a variety of ways.

Most parents are concerned about their children's safety while chatting on the Internet. There were attempts by various government bodies across the UK to address this issue. The Internet Taskforce on Child Protection was set up in March 2001 in the United Kingdom. The taskforce included representatives from the internet industry; the police, child welfare agencies as well as the government.There are government published guidelines for parents that are designed to educate parents and children **[1]** to:

- **Never** give out personal information (including their name, home address, phone number, age, race, family income, school name or location, or friends' names) or use a credit card online without parent's permission.
- **Never** share their password, even with friends.
- **Never** arrange a face-to-face meeting with someone they meet online unless parent approve of the meeting and go with them to a public place.
- **Never** respond to messages that make them feel confused or uncomfortable. They should ignore the sender, end the communication, and tell parent or another trusted adult right away.

As part of our investigation into this subject we carried out independent research amongst children in Lancashire, UK, which involved a survey of 437 school children between the ages of 11 and 13 on their internet chat habits, with the following results:

- 59% of those who took part regularly chatted to people over the Internet
- 24% of those who did chat online admitted to giving out some kind of personal information, these included home telephone number, mobile telephone number and home address.
- 14% of the children admitted that they had arranged to meet someone they had only met online (Figure 1).

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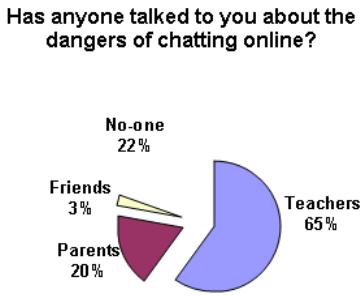


Figure 1: Survey results

Based on this investigation we concluded that there is a need to check that the safety guidelines are followed when children chat on-line (see http://www.safe-chat.org/index.html). Our aim is to develop a chat system which contains built in functionality to block the transmission of personal data, such as addresses and telephone numbers to other users and any data that involve the arrangements of meetings between users, and report any attempts to transfer safety compromising data to the child's nominated parent/guardian.

Figure 2. Safe-Chat Agent-Mediated System [3]

The child will get an on screen prompt when a transmission is to be blocked, informing them why it has been blocked and could not be sent, making them aware of the danger. The blocked message will then be copied into an email and sent to the parent of the child; so that the parent can make sure the child is aware of the problem and can reaffirm the dangers to the child.

II. Safe-Chat System Architecture

The Safe-Chat system is a multi-agent system. It consists of four agents: the Profile Agent, the Detection Agent, the Notification Agent, and the Warning agent (Figures 2 and 3).

The fact that agents are able to work together autonomously and co-operate by communicating with each other, automates the process of monitoring user activities while chatting on-line.

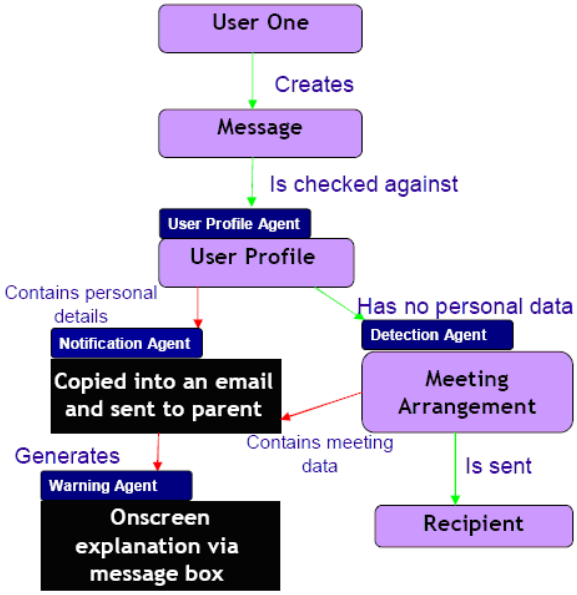


Figure 3: Safe Chat multi-agent system

2.1 Chat room Information Exchange Scenario

When User has composed a message it will be sent to the Detection agent (Figure 4).

- The Detection Agent will send a message to the Profile Agent
- The Profile Agent receives the message and will check it against the user details. If a match is found the Profile Agent will send a message to the Notification Agent,
- The Notification Agent will send the details of the infringement to the parent of the user, and send a message to the Warning Agent.
- The warning agent should print a message to screen to tell the user that they broke the rules and the last message was not sent.

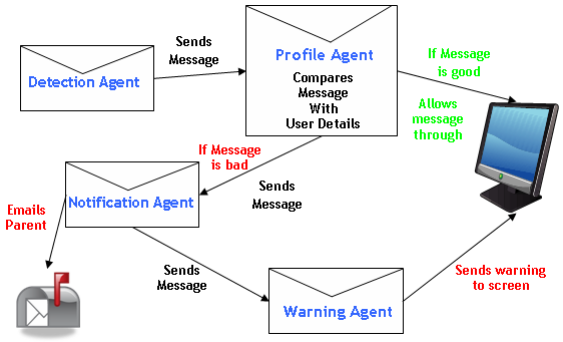
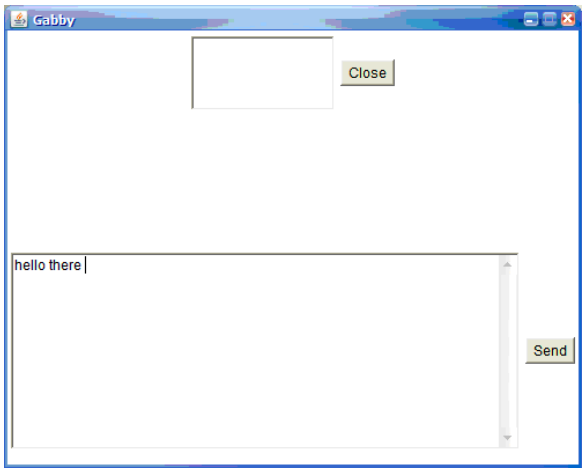


Figure 4: Multi-agent system architecture

III. System Implementation

The Safe Chat multi-agent system was implemented using Java Agent Development Environment – JADE [2].
When creating agents in Java it is necessary to ensure that the JADE libraries are incorporated into the software package which will allow the agents to access all the libraries they need to operate. This is a one time only process and is done when you set the package in JCreator; once the options are set for the package, every class or agent that is created in that package has access to the JADE libraries.

IV. Initially, to provide a basic user interface with limited chat functionality, sending and receiving messages (Figure 4), we used the Java AWT library.



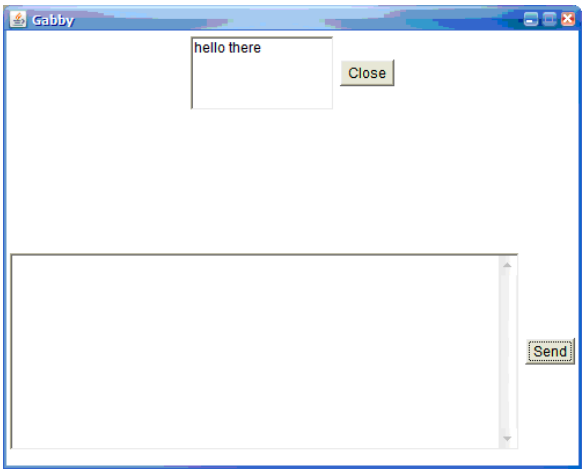


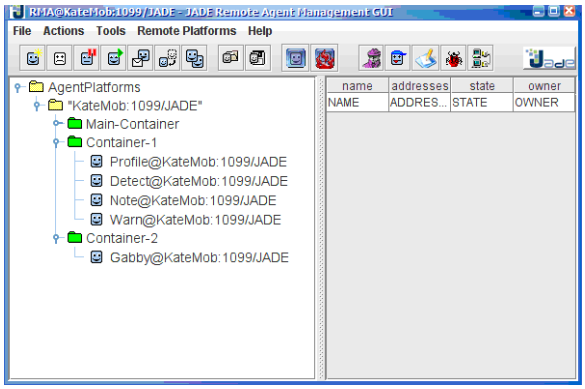
Figure 4: Simple Graphic user interface for sending and receiving messages

To run the agent files, a batch file is created to set the parameters for the JADE installation files and the JDK files needed to run the agents. We decided to run a separate batch file to start the Jade Remote Management GUI.

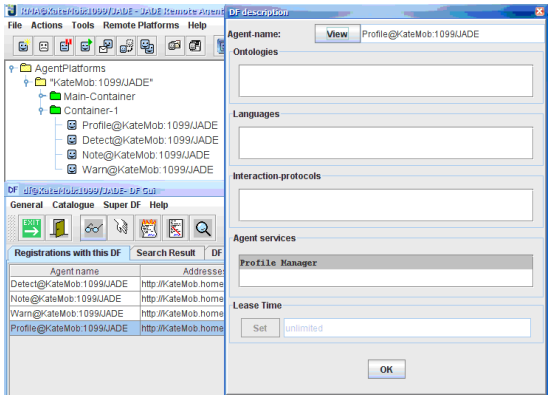
```
echo off
set path=C:\java1.6\bin
set JADE_HOME=C:\jade
set classpath=%JADE_HOME%
set classpath=%classpath%;%JADE_HOME%\lib\jade.jar
set classpath=%classpath%;%JADE_HOME%\lib\jadeTools.jar
set classpath=%classpath%;%JADE_HOME%\lib\iiop.jar
set classpath=%classpath%;%JADE_HOME%\lib\base64.jar
set classpath=%classpath%;%JADE_HOME%\lib\http.jar
java jade.Boot -gui
pause
```

This Agent GUI interface allows interaction with and management of the agents that are running in the system. Agents can be investigated, copied and even stopped from this interface. This is also where the information about active agents is found.

Once the JADE GUI is running separate batch files can be run to start the agents. The agents should then appear in the GUI as well as start performing the tasks at hand. All four agents were running in Container-1 in the JADE GUI as seen below.



We also added functionality for the agents to register their services with the Directory Facilitator (DF) in JADE. The DF is a specialised agent that provides a registry where agents can register their services, as well as look for other agent's services. This provides a valuable service for agent systems; agents are able to discover and exploit services this way. Each agent would need a service name to register with the DF, and a ***registerService*** method to enable registration (see example below).



JADE uses the FIPA ACL **[9]** message structure to enable inter-agent communication. This allows for asynchronous message passing between the agents. Each agent has a message queue where the JADE runtime can post any messages that are sent to it. Depending on the type of message, the agent can take the appropriate action. A message in JADE can include the following fields:

- A field containing the *Sender* of the message
- The receiver or receivers of the message
- A performative field, indicating what the sender expects as a result of sending the message. In the case of an INFORM performative, the sender wanted the receiver to know something, where as a REQUEST performative means that the sender wants the receiver to perform a task
- The content of the message

In our system the Detection agent sends a message to the Profile Agent in the first step in the chain. The Profile Agent then compares the received message with the variables explicitly defined by the user's registration; if it finds a match it sends an INFORM message to the Notification Agent.

A.

```
addBehaviour(new SimpleBehaviour(this) {

                private boolean finished = false;

                public void action() {
                doWait(2000);//we sleep here

                 AID r = new AID();

                 r.setLocalName("Profile");

                 ACLMessage msg = new ACLMessage(ACLMessage.INFORM);
                 msg.setSender(getAID());
                 msg.addReceiver(r);
                 msg.setContent("47 green street");
                 send(msg);
                 System.out.println(getLocalName() +": Message Sent"+msg);
                 finished = true;
                 doWait(2000);
                    }



                public boolean done(){
                        return finished;
                }
```

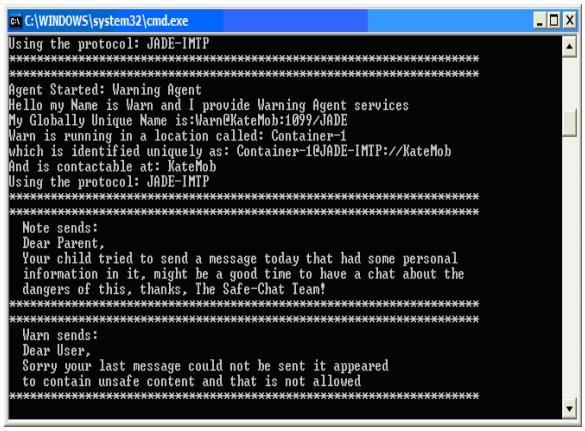
Code snippet from the DetectionAgent:
This code sends a message to ProfileAgent

```
public void action() {

        doWait(2500); //we sleep here
        ACLMessage msg = receive();
        System.out.println(msg);
        if (msg!=null){
            String test=msg.getContent();
            if (test.equals("47 green street")){

            ACLMessage msg1 = new ACLMessage(ACLMessage.INFORM);
            msg1.addReceiver(new AID("Note", AID.ISLOCALNAME));
            msg1.setLanguage("English");
            msg1.setContent("bad");
            send(msg1);
            finished = true;
            doWait(2500);
        }

      else{
      System.out.println("*************************************************************
      System.out.println("  "+getLocalName()+"The message was good:No action taken!");
      System.out.println("*************************************************************
      block();
        }
```

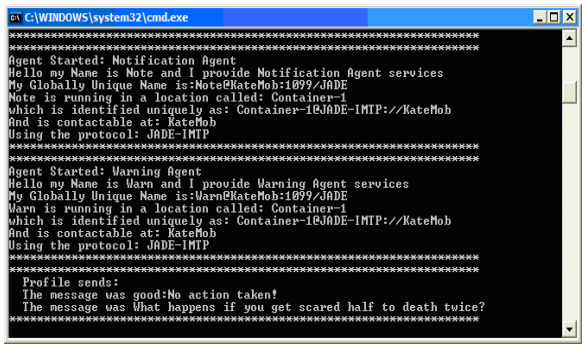
Code snippet from the ProfileAgent:
This code compares the message received with the address variable and takes the appropriate action

The Notification Agent, on receiving the message from the Profile Agent, in case the message sent contained the addressed held by the Profile Agent, would display the following:

The following was the outcome when the message sent matched the address held by the Profile Agent:



The following was the outcome when the message sent did not match the address held by the Profile Agent:



Similar tests were carried out for the rest of the data in the Profile Agent's knowledge base. The knowledge base in the Profile Agent was collected, explicitly, when the users register to the Chat-Safe site [3].

In all cases, the Notification and Warning Agents provided information to the user with the aim of helping them to understand the implication of sending the sensitive data as a part of data exchange, and make correct choices when while chatting online. These agents also assisted parents in controlling and informing the children on the dangers in chatting online. The agents initiate the dialogue with the user only when the sensitive data is detected, and are "invisible" to the users otherwise.

V. Summary and Future Work

In this paper, we have presented our efforts in creating a tool for agent-mediated information exchange between users/children while chatting on line.
The initial objective of our project - building the Safe-Chat system as a multi-agent system using JADE was successful.

Detecting and blocking the transfer of personal data in the transmitted messages was relatively straight forward. The agent dealing with the detection can just forward the message to the agent dealing with personal details for a direct comparison against the knowledge base with the user's personal data. If a match is found, the message can be blocked.

However, scanning messages to see if meetings are being arranged presents a challenge.

To achieve this objective, the agents in our system will have to be able to understand language as it is written. This is not easy for a computer to do. All languages can be ambiguous, words often have more than one meaning and understanding the context of even the most simple of sentences can pose serious problems.

Other problems that come up when trying to filter natural language text include, slang speech, regional anomalies in speech and new trends like text speech. The computer has to be able to pick all these up and understand, or at least be able to detect if meetings are being arranged.

Another possible solution to this problem would be to develop an ontology that the agent could use to recognize proposed meetings. Ontology is a formal description of all the objects, rules and relationships within a particular domain of knowledge. Once ontology has been created for a particular field logical inferences can be drawn from the presented information to draw much more effective conclusions from that information.

The JADE agent development platform has been designed to support the use of ontology; agent technologies are an integral part of the new semantic web features, and will be used to make searching for information a lot more effective.

It would be possible to build an ontology domain, where words and phrases like "let's meet", "meet me" and "see you at" are picked up as ***intentions***. If they are followed by a ***location*** like "cinema", "café" or "football stadium", and are then followed by something that is picked up as a ***time***, "on Saturday", "at 3" or "tomorrow". Consequently, the agent would have to look through each message to see if it contains an intention, a location and a time. In the case where the agent detects all three parameters, the message could be blocked and the appropriate action could be taken by the system. The ontology would have to be updated frequently but this would be the case for any solution because of the nature of language; it evolves constantly.

In the next phase of our work on the Safe-Chat multi-agent system, we will be working on "meeting arrangements" messages detection and interception in chatting online. We will explore both the NLP and Ontology solution and incorporate the most suitable solution into our system.

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The East Lancashire Institute of Higher Education at Blackburn College

Utopian Mysteries from within the Fairytale Forest: Uncovering *Traces* of Redemptive Journeys towards *Home*.

Academic Report: AR-08-12

Craig Hammond[1]

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Sociological Research Group

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Utopian Mysteries from within the Fairytale Forest: Uncovering *Traces* of Redemptive Journeys towards *Home*.

Craig Hammond [1]

Academic Report AR-08-12. East Lancashire Institute of Higher Education, Blackburn, UK.

Abstract- This paper examines Ernst Bloch's ideas in relation to hope and utopia, by focusing, in the main, on his ideas applied to the understanding of fairytales. Initially, the paper explores and clarifies what is to be understood by Blochian utopia; and that for Bloch, Fairytales are able to prompt a personal exploration of the utopian context of hope. It is suggested that the fairytale narrative can awaken 'traces' of memories of personal hopes, that in turn re-open the possibility of moving towards fulfilling unattained dreams (for Bloch, a function of utopia). The paper also examines the possibility that a Blochian-pedagogy can be adopted, where students are invited to create their own utopian stories of overcoming, where The Fairytale is used as an initial 'source' of hopeful contemplation. In response to the subjective revelations, students can recount and creatively express their own connections, and hopeful (utopian) connections to the startling irruptions that emerge from within the mystery of the story.

BLOCHIAN UTOPIA: THE 'ESSENCE' OF HOPE...

The work of Ernst Bloch, the German Marxist Philosopher of hope & utopia, has left a legacy of concepts and theoretical mechanisms that can be utilised both theoretically and pedagogically, to explore the personal and social relevance of utopian themes contained within the Fairytale narrative. In the books *The Utopian Function of Art &Literature*, and *The Principle of Hope (Das Prinzip Hoffnung)* [2], Bloch suggests that Fairytale themes can prompt an exploration of the utopian context of hope, as 'threads' (or *traces*) from within the Fairytale narrative are able, on a *personal* level, to awaken forgotten or latent memories of unachieved hopes and wishes. The dormant irruptions that take place within the subjective moment of astonishment are initial twinklings of the re-emergence of utopian expression.[3]

Within Blochian usage, aspects of utopia and its function(s), prove difficult to define in a traditional or specific way. Whilst Bloch deals with utopia as an objective universality, it is ultimately a fluid and shifting phenomenon, one that is expressed through multivariate characteristics. As a 'function', or indeed a fundamental 'principle', hope and hopeful expressions of the unfolding of utopia, are events that occur throughout all people – but for Bloch, manifestations are, and essentially must be, (at least initially), a profoundly subjective experience. In the first instance, the remembrance of traces of hope manifest as an 'inner' self-encounter, a moment of revelation, prompted by a personal connection to an *attractive* aspect of a cultural artefact; Bloch is never exclusive as to the type of cultural artefact that is able to provoke a revelatory self-encounter, only that the cultural source should contain a subjective strand of 'latent' utopian-memory encoded within it.[4] This is perhaps best illustrated by Bloch's recollections of certain childhood encounters in his book *Traces,* specifically in the section 'Red Window', (contained in the segment entitled 'Spirit Still Taking Shape'):

> Almost like legends were the clickers or marbles we played with; one likes to have something colourful in ones hand. They were Arabian stones, ringed with red or green, sometimes with stars, even with miniaturised lands; these we carried in our pockets ... [they] were not marbles at all, but rather bringing that distant land closer, all the more because it lay beneath. In the apothecary's store lay a plate with some dried thing labelled "China Peel"; I thought the chunk was a shard of the Chinese wall ... Eight years [old] and the most remarkable thing was the sewing box in a shop window on the way to school; it stood between skeins and mats, embroidered by feminine hands, which could interest no one. But on the box was an illustration with many dots or flecks of colour on the smooth paper, as though the paint had run. It showed a hut and

[1] School of Arts, Humanities and Social Sciences, East Lancashire Institute of Higher Education, Blackburn College.

[2] Bloch, E. (1986) 'Better Castles in the Air in Fair and Circus, in Fairytale and Colportage' in *The Principle of Hope*, Volume 1, Trans. N. & S. Plaice and P. Knight, Blackwell; pp: 352-368; Bloch, E. (1993) 'The Fairy Tale Moves on Its Own Time', in *The Utopian Function of Art & Literature*, Trans. J. Zipes & F. Mecklenburg, MIT Press; pp: 163-166.

[3] Anderson, B. (2002) 'A Principle of Hope: Recorded Music, Listening Practices and the Immanence of Utopia', *Geografiska Annaler. Series B, Human Geography*, Vol. 84, No. 3/4, Special Issue: The Dialectics of Utopia & Dystopia.

[4] Having said this, Bloch extensively explores the exceptional abilities of music and fairytales to illicit such utopian moments within people.

> much snow ... in the windows of the hut burned a red light ... at first I believed that it was a landscape on the moon, a great piece of China peel, as it were; but I felt utter turmoil looking at it that I could hardly express, and never forgot the red window.[5]

Here, Bloch describes a moment of shock or astonishment in response to a trace-revelation that shines through the 'darkness of the lived-moment'[6], a revelation that contains the latent utopian 'promise' of something-more: aspects of 'something more' that have not-yet come into being. This revelatory moment is what Bloch elsewhere describes as a 'self-encounter'[7], a subjective trace-awakening that unfolds as a result of the moment of astonishment (Staunen) - which in turn unleashes an irruptive reminder of a secret dwelling-place, an 'inner' location that is inhabited by the slumbering existence of ruptured, but embedded traces of once hopeful aspirations: a place of day-dreams harbouring expectant wishes of overcoming and imprisoned tales of victorious escape. These moments for Bloch contain the powerful potential to re-open afresh the possibility of a renewed, creative movement towards the fulfilment of the as-yet unattained, or (for Bloch, probably more accurately termed) *'not-yet-attained'*, dreams. It is this shifting material of subjective 'memory' that is the problematic territory of Blochian utopia, which further supports and clarifies the claim that a rigid definition of Blochian-utopia is a difficult (if at all necessary) pursuit: as the impact of the moment of wonder or astonishment can emerge due to seemingly insignificant or transitory influences. The nature of the revelatory catalyst is therefore potentially infinite, as any mundane artefact, due to its colour, location, image or narrative-content can serve to provoke the emergence of a latent-utopian subjective moment of astonishment, and open-up the 'cracks' and 'crevices' beneath *the* established realms of conventional everyday perception.[8] If pursued, the moment of trace-revelation can invoke a 'trace-hermeneutic'[9] process, which may crudely be described as a creative event that poses an opportunity to *mentally* sketch-out new directions towards hopeful fulfilment from within the debris of abandoned dreams. In probing the shifting sands of memory, *wishful* 'shapes' can be etched which emulate a mirage of renewed possibility. Bloch refers to the hazy appearance of the eclectic essence of all the utopian-memory-material that has *not-yet-become*, as 'Vor-Schein' (pre-appearance or anticipatory illumination)[10]; as during the subjective encounter, shards of former 'hope' become unearthed, and the irresistible 'pull' of its exotic jewels point us towards the mystery of an inner archaeological trace-expedition, an urge to set out to discover the source of the strange and yet familiar *speck of light amidst the darkness*[11].

However, Bloch's utopian process philosophy and his 'ontology of hope' should not be understood as merely (or reduced down to) a 'psychology' of utopia; in order for Blochian utopia to unfold, the initial inner encounter must find a means to externalise or concretise: essentially, there needs to take place a 'venturing beyond' or stepping over the limits foundations of the self or 'I' encounter, so as to trans-form and become an objective pursuit or 'we' encounter.[12] Ultimately, in order to *become*, 'hope' has to begin to take shape and manifest in some way outside of the self. For this to take place and develop, the trace awakening from within the impact of the moment has to be contemplated, nurtured, expressed and explored – metaphorically sculpted and articulated to others, and in-so-doing open-up ways of 'thinking beyond'. Telling stories or tales of the thought-encounters creates the potential to *lead out* and generate a contagious unearthing of astonishment,[13] to kick-start a burgeoning collectivity of subjective encounters, whose revelations and expressions lead out towards an objective utopian *event* of trace-awakenings that escalate towards achieving epidemic proportions.[14] In a Blochian sense, in order for an objective utopian pursuit to develop, the response to the

[5] Bloch, E. (2006) *Traces*, Trans. A. A. Nassar, Stanford University Press; pp: 43-44

[6] Bloch, E. (2000) *The Spirit of Utopia*, Chapter 4: 'The Shape of the Inconstruable Question' – the segment entitled: 'Again the Darkness (of the Lived Moment) and its Mutual Application to Amazement'; pp: 199-208

[7] Bloch, E. (2000) Op cited; pp: 7-9 & 165-173.

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[9] Weissberg, L. (1992) 'Philosophy and the Fairy Tale: Ernst Bloch as Narrator', *New German Critique*, No. 55; p: 28

[10] Different translators suggest alternative definitions for this term: for example, Wayne Hudson (1982) suggests pre-appearance (which is possibly a more 'direct' or literal translation); whereas P. Palmer the translator of Bloch's *Essays on The Philosophy of Music* similarly translates it as 'pre-semblance'; whereas Jack Zipes in the translators notes of *The Utopian Function of Art & Literature* suggests that the term 'anticipatory illumination' captures the more *mystical* or romantic connotations that should be associated with Bloch's original.

[11] Bloch's book *Traces* (Spuren) is an 'unorthodox' work which represents an example of utopian 'trace-hermeneutics' in action. Bloch recounts tales, memories and anecdotes that 'hint' towards utopian revelation (whilst never explicitly stating its 'actual' attainment).

[12] Bloch, E. (2000) *The Spirit of Utopia*, Chapter 4: 'The Shape of the Inconstruable Question' – the segment entitled: 'On the Metaphysics of Our Darkness, of the No-Longer-Conscious, the Not-Yet-Conscious, and the Inconstruable We-Problem'; pp: 187-198

[13] Bloch, E. (2000) *Spirit of Utopia*, (specifically the final chapter of this book: 'Karl Marx, Death and the Apocalypse: Or, the Ways in This World by which the Inward Can Become Outward and the Outward like the Inward.', where Bloch argues for a creative fusion of Messianistic redemption and the attainment of a socialist society).

[14] Although far beyond the remit of this paper to explore and respond to adequately, an important question is established: if trace-awakenings and utopian expressions are potentially infinitely subjective and transitory, how is utopia to begin to establish as 'object' (i.e. how it is to move beyond the 'self-encounter')? For Bloch, 'genius' enables certain utopian expressions to 'win through' and capture the general imagination, and also political desire and will.

self-encounter has to be a (re)-discovery the 'root' of the source of the astonishment, which is primarily (and primordially) a utopian hunger for Hope, [15] and so essentially, for the *Spirit of Utopia* to become objectively infectious, there has to be a strengthening of the expression of the inner longing, followed by a striving to reach out beyond the self towards 'something more'. The subjective awakening is of course a significant *first fruit*, and a fundamental aspect of the potential, abundant harvest of objective utopian formations, (or, the objective spirit of utopia). Therefore for Bloch, the self-encounter and its awakening can lead out and beyond the inner realms of the 'I', but not as a 'universal' and technically rigid idea to be imposed upon the 'Other', but as a sign of the potential to creatively awaken 'something' objectively. As Bloch explains, concrete utopia does not mean that a 'person' is to seize the day ('Carpe diem') on behalf of all, because the events of a person's day must always draw to a close, and so become a memory of something from the past to be recollected and reminisced in the present: Nostalgically aching for a *golden event* that 'once-was' only serves to make the darkness of the present 'now time' more 'empty' (what I want to term: 'present-past'):

> Mere Carpe diem lands at best in resignation,
> so that one cannot say to the moment: Stay
> awhile, but only: Pass away, you are so fair;
> for the best here is solely material for memory,
> not for hope and arrival.[16]

Instead, for Bloch, subjective moments of hopeful 'revelation' are where proper, authentic utopian material can begin to unveil. As trace-moments are able to recurrently reveal the 'truth' of the not-yet created future in the present; trace-moments are therefore incomplete states, and so avoid being rendered to a state of ossification. The moment of a trace-awakening presents a personalised snapshot of the human eternity of utopian longing, as traces of an eternal longing for hope that seizes all people at some point in time; where we day-dream of things that could yet come into being. Therefore, as a result of the distinction created between the regressive recollection of memories in the 'present-past', and the future oriented remembering or recognition of unfinished hope and longing in trace-moments of 'present-future', emphasis is shifted from the disappointment of a thing that once was, to a hopeful expression of a potentiality that is not-yet. Blochian trace-awakenings therefore reflect the not-yet of utopia. Bloch's pivotal and important category of the 'not-yet' presents a philosophical metaphor that opens up a creative space, and freedom to move towards new dreams, visions and linguistic possibilities: Expressions of hope via images or words can induce the articulation of the not-yet, and so invoke an initiation that progresses to give form-to 'not-yet-conscious' dreams. As the dreams and visions become articulated and externalised, they in turn begin to move beyond the inner realm and towards the ethereal territory the 'not-yet-become' essence of Hope. Hope needs to be contemplated and explored in a personal sense, as something that can be discovered within, and then developed, in order to shine through or illuminate the essence of the mystery that lies just beyond the 'dusk' or *darkness* of the lived moment (anticipatory illumination). The shifting phenomenon of Bloch's utopian-hope, serves as an 'attractant' that other empty souls gravitate towards. The unquantifiable mystery (or the Inconstruable Question) becomes the source of the attraction, as it is this, which stems from and reaches into the core of our 'empty spaces'.

SOMETHING'S MISSING…[17]

For Bloch, one possible route towards awakening the *not-yet-conscious* 'inner journey', is to defibrillate the remnant life-seeking trace-connections of utopian memories from within the 'dusk' of now, and creatively re-ignite the forward-looking light of hope, so as to begin to seek-out 'that' which is 'not-yet' here. The utopian symbolism or utopian ciphers contained within Fairytales, (with their themes of loss, imprisonment, redemption and overcoming) provide an array of possible 'enchanted entrances', entrances that are able to momentarily fuse the latent threads of distant disappointment with forward reaching *hopeful anticipations* on horizon of 'now time'. The allegoric richness of fairytale stories are therefore to be understood as utopian ciphers, or metaphors that are able to direct us towards the empty-places within. In exploring the metaphoric and 'spatial' language of fairytales, there is room to connect to them in personal ways; the simplistic and historically non-specific or unfinished nature of their metaphors can be easily refunctioned and adapted to the present in order to represent the damaged, hidden or lost spaces of Hope; it is also because of this that it becomes subjectively possible to re-conceive of new meanings and new directions towards escape and redemption. For Bloch, the fairytale is a superior utopian conduit able to subjectively unveil latent stories of *not-yet* achieved hopes, and so re-connect with once hope-full traces of dreams and memories, invoking subjective recollections of abandoned aspirations. Again, this is not to be understood as a purely regressive activity,

[15] McManus, S. (2003) 'Fabricating the Future: Becoming Bloch's Utopians', *Utopian Studies*, Vol. 14; p:

[16] Bloch, E. (1986) *The Principle of Hope*, Vol. III, Blackwell, p: 1322

[17] The title of the first chapter of Bloch's *The Utopian Function of Art & Literature*, which consists of a recorded interview between Ernst Bloch and Theodore Adorno, on the topic of Utopia.

as the moment of revelation can become pregnant with a recognition of the need to 'remember' – not a resigned reminiscence but a powerful future-oriented remembering, with the purpose of 'thinking forward and beyond' the stasis of the past and the 'dark' constraints of the present.[18] The awareness of such moments of utopian longing that emerge from within the spaces of the fairytale narrative, open up a fertile vacuum that can enable a subjective reaching-out towards the unwritten future; a reaching-out fuelled by hopeful explorations of the *not-yet-become*: a universe of places where it is possible that all forms of adversity and oppression are objectively overcome.

In light of this, the human affinity and unwavering fascination with fairytale stories, and the recurrent re-casting of their associated (or similar) themes via theatre, literature and cinematic variations, suggests a certain support for Bloch's assertion that they are able to articulate a trans-historical, 'deep' human need for utopian expression, a momentary upsurge of 'longing' to transcend contemporary limitations, a nostalgia for a utopian homeland that no-one *yet*, has ever seen.[19] Using the Blochian framework, fairytales are much more than just 'old' stories, as Jack Zipes[20] has suggested: other more rigid theoretical frameworks lack an explanatory connection to the inner, personal utopian dream-world; and so arguably, there is the potential to explore renew and re-apply a Blochian understanding of utopian symbolism in relation to the fairytale narrative.

A Blochian Pedagogy of 'Astonishment', Trace & Longing for Home: Subjective Encounters on the winding paths towards 'Hope'.

According to the Blochian framework, irrespective of previous cultural or historical readings, fairytales are able to symbiotically permeate and intertwine with the empty-spaces of our own 'contemporary' inner-worlds, and in so doing fairytales can awaken trace-promises of a beautiful, deep and distant awakening of 'something else'. Bloch's approach to the awakening of utopia through moments of astonishment, memory, trace and longing, offer fresh pedagogical opportunities: as part of my own teaching practice, Fairytales have been presented to students as an invitation to uncover their own traces. Working from an initial encounter with a Fairytale story, students are asked to consider the inception and development of their own subjective *not-yet-conscious* and *not-yet-become* utopian awakenings and journeys. As part of this open or 'process' pedagogical approach, students should independently locate a point (i.e. a theme, event or 'scene') of fascination, a mark, a trace of mysterious inspiration, or wonder from within their chosen fairytale: for example this may be The forest and/or the Wolf in Little Red Riding Hood; or loss, the forest and the search for home in Hansel & Gretel.

The purpose of the fairytale is therefore to serve as a catalyst, an initial loose point of contact, from which a subjective trace-awakening memory project can be contemplated and developed - separately (and uniquely) by each student. The 'utopian' themes that emerge can then be traced-out, towards other cultural artefacts with a view to establishing a growing awareness of the trace-revelations that emerge. Moving beyond the initial 'puncture' established by the fairytale, students can begin to incorporate (for example) certain pictures, personal photographs, key scenes from favourite films, poems, pieces of music and songs in order to progress towards more acute expressions of their own utopian longings. Influenced by the Blochian approach, it could be suggested that the 'marks' and connections that are uncovered and established during the accumulation of the revelations, represent the dawning awareness of the shadows of disappointed hope, personal loss, isolation, political helplessness; and so build a momentum towards reaching out towards a hidden or latent ache for belonging, hope, victory, utopia, home …

In providing such a pedagogical freedom, students can reach-in and reach-out towards free-associations and experience a new-found, personal creativity expressing their own connections to the startling irruptions that emerge from within the mysteries of their fairytale stories. Following the outer thread of their trace-awakening – students can creatively consider what they find there, and contemplate the nature of their moment of wonder, or astonishment. Space is created for utopian stories of overcoming to emerge from within the dormant remnants of the traces of their own memories. Importantly, the parameters of the articulations of the revelations of loss and expressions of hope and transformation are left entirely to students' imaginations' (guidance and suggestions from the tutor are to be kept, as much as is practicably possible, to an absolute minimum). As Bloch informs us, moments of wonder should not be: "… ultimately directed to that which has developed but to a question itself, passing through the world, undeveloped

[18] Vincent Geoghegan (1997) 'Remembering the Future' In: Jamie Daniel Owen & Tom Moylan (Ed's) *Not Yet: Reconsidering Ernst Bloch*, Verso; see also Bloch, E. (1998) *Literary Essays*, Trans. A. Joron et al, Stanford University Press. Section entitled 'Images of Déjà vu' pp: 200-206; see also Landman, M. (1975) 'Talking with Ernst Bloch: Korcula 1968', *Telos*, No. 25

[19] Bloch, E. (1986) *The Principle of Hope*, Vol. III, Blackwell; p: 1376

[20] Zipes, J. (2002) *Breaking the Magic Spell: Radical Theories of Folk and Fairy Tales*, Revised and Expanded Edition; The University Press of Kentucky

and unanswered."[21] A Blochian pedagogy thus opens up a challenge to move away from traditional (or empirical) forms of academic questioning and its associated assessment of students. Traditional, technical questioning in the pursuit of standardised and rigorous assessment and calculated measurement, departs from and misses the profundity of the puncture of the moment. Specific, particular and empirical questions are irrelevant in relation to the unique and personal impact of a trace that emerges from within the 'moment'. For Bloch, Empirical questions:

> "… become definite and, finally, concrete their shape is adjusted to suit what is presently available and accessible; therefore it is as if … wonder at the rain were really only an interest in the water cycle and nothing else …
> Thus the initial question, a veritable neophyte among questions which still has no idea at all what it really wants to know, can soon forget its own asking, and allow itself to be superseded by the offer of readily available thoughts and answers in the supermarket of things which have become what they are."[22]

Through a personalised and creative process of exploration, subjective wonder-arousing questioning has the potential to open-out towards as-yet, untold impassioned directions of new ideas and expression. As such, the 'freedom' of a Blochian pedagogy can prove to be an empowering experience for students; but it is essential to consider that it can also be a potentially daunting, even traumatic possibility, as students are invited to present the findings from their projects publicly, and so open-up to the unfamiliar territory of past memories, the immanence of hope and creative articulations of future possibilities.

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[21] Bloch, E. (1970) Op cited, p: 7
[22] Bloch, E. (1970) Op cited, p: 7

The East Lancashire Institute of Higher Education at Blackburn College

Innovation and collaboration in an e-learning environment

Academic Report: AR-08-13

Val Lowe[1]

May 2008

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Innovation and collaboration in an e-learning environment

Val Lowe

Report AR-08-13 East Lancashire Institute of Higher Education

INTRODUCTION

The B.A. English Language and Literary Studies is a Lancaster University degree delivered at the East Lancashire Institute of Higher Education in Blackburn, North West UK. The degree programme draws students from the local area, and covers a broad range of contemporary issues in three major strands: language, literature and literacy. Teaching and learning takes place mainly in small group situations, with sessions having a lecture/seminar format, but with a high degree of emphasis on group tasks and interaction.

The degree is validated by Lancaster University and annual reports relating to the course are produced for the University to ensure parity of academic standards. Reports about the course from the course consultant (based at Lancaster University) and the External examiner (based at a different institution) are consistently positive, and comment on the extremely good success rate and high levels of achievement of Blackburn students. The topic of this paper is a module called 'Electronic Literacies', or 'E-Literacies' for short, which students take in their third year of study. It is this module in particular that has often drawn comments from the examiners and consultants about the 'innovative', 'inventive' and 'exciting' nature of the delivery of the course.

THE E-LITERACIES MODULE

The E-Literacies module considers the impact of technology on language, literature and literacy, and the content changes frequently to reflect advances in technology and changes in society. Recent additions to the content, for example, consider the effects of social networking sites, blogs and wikis on social and power relationships, and the construction of virtual identities, both personal and corporate. The module's title reflects the fact that society's view of 'literacy' must now incorporate not only written and verbal communication, but should also consider 'visual' literacy. As Kress and van Leeuwen argue;

> Until now, language, especially written language, was the most highly valued, the most frequently analysed, the most prescriptively taught and the most meticulously policed code in our society…this is now changing in favourof visual communication, educationalists should perhaps begin to rethink what 'literacy' ought to include, and what should be taught under the heading of 'writing' in schools. (1996:32)

A consideration, therefore, of what now constitutes 'literacy' is a crucial element in the module's content, and students are encouraged to re-think traditional definitions of the term as well as problematising existing frameworks for the analysis of different kinds of textual constructs. This includes 'multi-modal' texts: i.e. 'any text whose meanings are realized through more than one semiotic code' (op.cit:183) and which might therefore include, for example, images, colours, graphics, or moving text.

ASSESSMENT OF STUDENTS ON THE E-LITERACIES MODULE: FIRST ASSIGNMENT

The assessment of the E-literacies module requires students to produce two pieces of work. The first is an essay on a topic related to the module, but presented as a hypertext document. i.e. text which is submitted electronically and which may not have a fixed narrative pathway through the site. The assessment criteria state that assessment of students should be based on the following:

- ability to produce electronic writing
- to use hypertext as a central feature of the work
- to submit work as a collection of nodes addressing a central theme
- to submit work on a disk or cd ready for publication to the web
- to include links to other sites for reference or as examples
- to ensure all links are fully working

These requirements are intended to encourage students to think about the nature of new forms of writing such as hypertext and its impact on the reading process, as hypertext is, by definition, 'non-sequential…text chunks connected by links which offer the reader different pathways' (Nelson, cited in Landow (1997:3). Whereas student essays typically are structured linearly, and are expected to be neatly 'rounded off' with an introduction and conclusion, hypertext writing can be accessed at any point by the reader and necessitates a different way of thinking about the structuring and presentation of the work. The submission of work as hypertext therefore necessitates different considerations when the work is assessed: work which is presented linearly with large stretches of unlinked text will not be as successful as essays which are truly hypertextual in nature, i.e. those which allow the reader a choice of entry points, and the ability to navigate with ease throughout the document. In addition, students can exploit the multi-modal potential of the medium, and can include, for example, icons, moving text, and images, if he or she feels it will help to communicate ideas.

The nature of the assessment criteria poses a challenge for students, not least because of the technologically demanding nature of the module, yet each year we have found that results are frequently better than average. Despite, or because of, the fact that the module constitutes a steep 'learning-curve', students talk about the rewards that follow the demanding work- load, for example:

> *The satisfaction that you feel when you create something like this for the first time is just amazing.*

Students are provided with ideas for potential topic areas for this first piece of work which include:

- utopian and dystopian views of new technology:
- the nature of hypertext writing:
- the development of hypertext
- hypertext as intertextuality
- will computer fiction ever replace the book?
- is the prospect of 'a computer in every home' feasible?
- women and computing:
- an analysis of a hypertext site:
- new forms of learning or working e.g. on-line learning or home-working using computer technology.

This list is not exhaustive however and students are encouraged to pursue an area which is of most interest to them. Due to the fact that this is a third year module, there is an expectation that students should be able show the capacity for independent thought, and be able to decide on a more specific area of study within the broad spectrum of topic areas suggested. Students are encouraged to begin work well in advance of the deadline due to the technological demands of having to submit the work in such a non-traditional format. As the nature of the module is concerned with sometimes relatively recent developments, students are expected to explore the topics on-line as well as using printed sources, and workshop time with individual lap-top computers enables students to search the Internet for sources of information, and to look at multiple examples of hypertext writing. This has an additional benefit in that in doing so, they are expected to consider the advantages of information-seeking on-line and the nature and validity of the information they obtain in the process. Although any work submitted must be subject to the same academic rigour as any other degree essay, it is conceded that the nature of the module and rapid advances in technology (and research relating to those advances) necessitates sometimes extensive reference to on-line sources.

ASSESSMENT OF STUDENTS ON THE E-LITERACIES MODULE: SECOND ASSIGNMENT

The second assignment requires students to collaborate in groups of three or more to produce their own web site. The web site must be accompanied by an evaluation which relates the work produced to theoretical frameworks covered during the module, and expects students to reflect on the process of designing and creating a website collaboratively. This task requires further skills not normally demanded of English students – the first being group responsibility for a piece of work whereas work is normally the sole responsibility of an individual; the second being the technologically demanding aspect of the submission requirements as the designing of a web site requires an even higher level of technical skill. Workshop support with a web design tutor is built in to the programme, but even so, students are understandably apprehensive about the prospect. Much emphasis is placed on learning the practical skills involved and each student has the use of an individual laptop computer during seminar sessions. One student commented on how 'scared' she felt when she was told about the module:

> *Up until now the most computer literate thing I have done is to save my assignments on to disc, and I thought that was advanced.*

Students sometimes also show resistance to the module's requirements, expressing the feeling that it is not in keeping with a traditional English degree, for example:

> *I don't imagine that I will ever have to do anything web sitey again, that's what I.T people are for. I don't enjoy e literacy and although I accept that English is moving on apace to keep up with technology, I don't need to know the technology side of it.*

Despite these concerns, results have shown that all students receive marks for this module that are at least consistent with their existing profile; indeed, in many cases marks are significantly higher. (The students above both received marks in the first class category). As a tutor my concern has always been to understand why this should be the case despite the demands of the submission requirements, and the discussion below explores possible reasons, including the nature of hypertext, individual learning styles, the effect of collaboration and its relationship to theories of learning.

THE ADVANTAGES OF HYPERTEXT FOR LEARNING

The rationale behind the form of assessment is based on the assumption that only by dealing directly with the technological aspects and the nature of hypertext writing will students be fully able to consider the implications of new advances in technology in areas such as literacy, communication and language, new literary forms, and power and marginalization. The assessment criteria state that

> Issues dealing with electronic literacy will be addressed both explicitly through the subject matter and implicitly through the medium of presentation.

In addition, hypertext reading and writing may encourage students to make otherwise unforeseen links, as a result of the 'connectivity' of hypertext (Landow:1992:232). Due to their familiarity with the Internet, students are already aware of the ways in which electronic writing invites us to follow links, make connections and see perceived similarities between sometimes unrelated ideas and concepts. By engaging in their own piece of hypertext writing, students have the potential to make links between previously unconnected material which might not otherwise have occurred to them when writing in a traditional format. In his discussion of students' experiences of working with hypertext documents, Landow notes that:

> Linking materials encourages habits of relational thinking …
>
> powerful means of teaching sophisticated critical thinking
>
> (1992:125)

Landow also comments that working in a hypertext environment encourages collaboration: that hypertext's 'essential connectivity' actively involves learners. Active learning, as opposed to the kind of passive learning that can potentially occur in the delivery of traditional lectures, facilitates the development of 'higher level skills' (ibid:232). Landow further makes the point that all learning requires collaboration, since by acknowledging and building on the information we receive, whether it is from books, the Internet or each other, we are all involved in a process of collaboration. What is most interesting for the point of this paper is the way in which peer group collaboration seems to have the potential to enable individuals to exploit their strengths to work towards a common goal, a point which will be discussed further below.

E- LITERACY AND LEARNING STYLES

In addition to the formal assessment requirements, I ask students to keep a progress diary in order to reflect on their developing technological skills, and as a tool to enable them to voice their many frustrations when coping with the demands of the practical aspects of the course. Initially this was in the form of a word document which was linked to students' home pages. More recently, I have encouraged students to keep an on-line 'blog' to document their thoughts and feelings while simultaneously involving them in the public expression of those thoughts, and to consider the implications of this on the development of their own 'virtual' identity. Some students take full advantage of the opportunity to vent their frustrations, as the following comment shows:

> *I can do the basics, but I can't do the twiddly fancy stuff, and it's driving me crazy…it is taking so much more time than I expected. I thought we'd be much further on by now.*

Not all students are comfortable with the idea of an on-line 'voice', for reasons which are beyond the scope of this paper. Because of this, a blog as such is not compulsory. However, students have voluntarily posted their comments about their progress on the BA English discussion forum which is on the college's Intranet. These comments are accessible by all students and tutors on the

degree scheme. By paying attention to what students have said about their experiences, I can attempt to understand the relationship between collaboration, creativity and technological ability in the achievement of marks in this module.

The unusual nature of the module allows students more scope for creativity and utilizes different skills than those normally required of English degree students. The designing of a web site demands a certain amount of visual awareness, something which students are helped with by colleagues from Graphic Design, and an aspect which may help those students who are more visual and kinaesthetic learners, i.e., those who prefer to use pictures or diagrams and those who prefer practical tasks and learn by 'doing'. For such students, the electronic environment and the use of hypertext and hypermedia provide an attractive working environment in contrast to the mainly text-based work normally associated with the study of English.

The format of the assignment also enables students to produce creative work that facilitates artistic expression. Students can choose to produce illustrated poems or narratives, for example, or games or educational sites, electronic magazines or a guide to student life in Blackburn, all of which combine writing skills with visual and design awareness. Students are informed that the website need not be technically sophisticated, but that they should be able to reflect on their choices and what they communicate, and to describe any ways in which their lack of technical ability or 'e-literacy' has prevented them from expressing themselves to their full potential. The combination of artistic flair and academic reflection enables all students to produce satisfying work (see Fig. 1).

Fig. 1(a): Example of art work produced by E-Literacies students.

Fig. 1(b): Example of art work produced by E-Literacies students.

COLLABORATION AND ACHIEVEMENT

The fact that the second assignment requires the students to work in a group is in some senses nothing new. The nature of the degree programme at East Lancs Institute places great emphasis on students working together to perform practical text analysis tasks and engage in problem-solving activities. The benefits of this for students are many, including the development of team membership skills, communication and, not least, moral support and bonding. Increasingly, we have seen that the ability to produce group presentations, for example, can encourage less vocal students to find their 'voice' and develop confidence: by contrast, the requirement to present individually is an often daunting prospect for some students. The aspect which may seem most problematic with the E-Literacies module is the fact that the students working together as a group are all responsible for the achievement of the mark for this piece of coursework, a mark which amounts to 30% of the overall mark. Students are given a choice of options at the outset regarding the assessment of each group's work. The first option is for all students to produce a contribution of work towards the completed web site which is the equivalent of 2500 words. Individual work is then linked to that of other group members through a common theme, and each student receives an individual mark. Alternatively, groups can choose to have a group mark for the completed web site (worth 50% of the total mark) and individual marks for their evaluation of the web site which accounts for the remaining 50%. The third option is truly collaborative in that the group produces a collaborative web site and a collaborative evaluation. In this case the

production piece **and** the evaluation will result in all members of the group receiving the same mark.

Students' responses to this prospect can differ depending on the marks they have been receiving prior to this point. Not unreasonably, some students worry that their achievement levels may be affected if they are working with students whose profile of marks is significantly lower than their own. In practice, as already noted, marks on the whole increase on this module, mainly as a result of this collaborative second assignment. Several factors may be responsible. Firstly, it is noticeable that students tend to become friendly with students who are similar to themselves in terms of intellectual ability: usually, friends seem to achieve marks that are in the same or roughly the same grade boundary. In practice too, students will discuss tasks with friends and share ideas which is a form of collaboration in itself. The fact that students choose with whom they want to collaborate on this piece of work means that they are usually working with students of more or less the same level of ability. However, it does sometimes happen that students may choose to work with a different group of students, perhaps because the topic area they have chosen to work on is more to their taste. In these cases, students of differing levels of ability may choose to work together. Where this has happened the marks of the students who may have previously been less successful than their group colleagues invariably go up. The higher level achievers usually maintain their achievements, although there are some exceptions which will be discussed below.

The table in Fig 2 shows the relative performance of some of the students on the module in 2006-7. Eight modules count towards the final degree classification. Averages are shown for coursework marks for seven modules excluding the E-Literacies modules compared with the E-Literacies module itself. The final column shows the difference between these two figures. (Names have been changed to preserve anonymity).

The figures show that 8 out of these 10 students substantially improved their performance on this module. In addition, the average of the group as a whole is 50.97% across all modules excluding the E-Literacies module, whereas the group average on the E- Literacies module is 62.50%, or a staggering 22.6% improvement in performance over the whole group working collaboratively. It seems that collaboration enables some students to perform to their optimum level of ability.

The exceptions are Barbara and Tony whose coursework averages show a decrease on this module of 1.1% and 3.2% respectively. However, this can be explained in terms of 'exit velocity', i.e. a situation where a student consistently improves their performance during the course of their studies so that marks in the final year exceed those achieved in previous years. Both students had been consistently 2:i candidates: however, their ability to write and develop increasingly sophisticated arguments was evidence of their increased knowledge base which showed itself in their work in their final year. The marks achieved in the E-Literacies module were therefore consistent with their achievement of marks prior to the end of their third year on other modules. However, both students had a keen interest in educational matters covered in one of their other third year modules and developed in their final honours dissertations, and both received high firsts for these pieces of work. They both subsequently achieved firsts overall and went on to careers in teaching.

Student	Coursework averages excluding E-Lits module	Coursework averages on E-Lits module	Differences
Naomi	41.1%	57	38% improvement
Sally	61.7%	70.50	14.2% improvement
Peter	56.7%	63	11.1% improvement
Aaron	56.5%	62.5	10.6% improvement
Alice	48.0%	59.5	24.0% improvement
Tony	67.2%	65	-3.2% decrease
Mark	55.50%	62.5	12.6% improvement
Sheila	52.78%	55.0	4.2% improvement
Rachel	58.57%	62.5	6.7% improvement
Barbara	68.32%	67.5	1.1% decrease

Fig.2: Averages of students' coursework marks 2006-7

The different skills required by the assessment criteria means that all students have strengths that can be utilised, whether it is a high level of academic argumentation or analytical skill, creative and design skills, or the ability to manage the technological aspects of the module. Below is one student's comment on the experience:

> *E-literacy assignment number two has just been completed, it's fantastic, mainly because it's a collaborative piece of work though and my collaborative team mates were awesome with e literacy!!*

By working together as a team, students can contribute their individual strengths for the achievement of a successful piece of work, an aspect which is supported by learning theories.

COLLABORATION AND THEORIES OF LEARNING

According to Vygotsky (1978 cited in Moon and Shelton Mayes (eds.) 1962:52) students are capable of performing at higher intellectual levels when asked to work in collaborative situations than when asked to work individually. Group diversity in terms of knowledge and experience contributes positively to the learning process as students support one another depending on their level of technical skill. Vygotsky's 'zone of proximal development' refers to the

> gap between what an individual can do alone and unaided and what can be achieved with the help of more knowledgeable others.
>
> (Moon and Shelton (eds.) 1962:52)

Students thus work together to solve problems and share knowledge with more competent peers, providing what is termed by Bruner as 'scaffolding', that is, 'cognitive support' for those with a lesser degree of skill (ibid:177). Additionally:

> Bruner (1985) contends that cooperative learning methods improve problem- solving strategies because the students are confronted with different interpretations of the given situation. The peer support system makes it possible for the learner to internalize both external knowledge and critical thinking skills and to convert them into tools for intellectual functioning.
>
> Gokhale (1995)

Collaboration is therefore beneficial in that students listen to alternative views and ways of solving problems, utilise one another's strengths and learn from one another. As one student wrote in her blog:

> *I'm working with two sweaty boys for the e-lits assignment...ew! Just kidding guys! They're lovely (and not sweaty at all!). I'm looking forward to it. I think we're doing a puzzle website, maybe a children's one. I'm sure we'll be fine. ...I'm sure our project will be ace, because they're hard-working and they've got some brilliant ideas.*

Due to the practical nature of the submission requirements, there is a high degree of emphasis on the development of I.T. skills and collaboration can help to make this less daunting. The opportunity to practice skills in seminar sessions is essential as only by performing tasks can students learn how to cope with the IT element when alone. The presence of a teacher is sometimes less important than having peers on hand to discuss problems encountered when performing the tasks, and developing the confidence to later perform those tasks unaided. Writing about teaching in the ICT classroom, Clarke (2006:77) contends that it is necessary to promote an 'experiential learning approach'. He argues that using IT in the classroom promotes 'active learning' and helps students to develop problem-solving skills, and enables them to 'deal with unfamiliar situations and new challenges' (ibid:82). This is also supported by Bruner's notion of 'discovery learning': students who are encouraged to explore problems and find their own solutions are better able to understand a subject, especially with the support and guidance of a teacher or more knowledgeable peer (cited in Armitage, Bryant and Dunnill *et a*l (2003). These factors enhance the collaborative learning aspect which has been found to help students to develop critical thinking skills, as Gokhale (1995) discovered in a study which compared individual learning with collaborative learning. Results showed that those who collaborated performed significantly better on the same task than those who worked alone. Gokhale gives the following explanation:

> group work helped them to better understand the material and stimulated their thinking process. In addition, the shared responsibility reduced the anxiety associated with problem- solving. The participants commented that humor too played a vital role in reducing anxiety.

It is evident that humour plays a large part in enabling students to share their experiences and reassure peers that their problems are not unique. This can serve to reduce stress levels and establish bonds not just between group participants but potentially between present and past and future students. The following entry from a student blog exemplifies this:

> *Website's almost finished. Not sure what all the fuss was about last year, but then there were a lot of girls in last year's group. Just need to make my links work as some of them stopped working when Jim moved my files around. Not sure why he did it, but I'm sure he knows better than me, and he does have such nice suits.*

Knowing that this comment will be read by all students taking the module, in addition to previous and subsequent year cohorts, collaborative group members and tutors (one of whom is 'Jim') illustrates the way in which the collaborative process extends beyond the participants involved in the immediate task.

CONCLUSION

For each new third year cohort, the E-Literacies module is perceived as difficult, daunting, and a somewhat inconvenient drain on their already limited time. In addition, the necessity of learning practical I.T. skills seems to be at odds with their expectations of what studying for an English degree entails. The fact remains, however, that we are living in a society that relies increasingly on technology, and English studies cannot ignore the effect this is having on communication and language, and the new literacy skills demanded of us all. In some ways the module is a victim of its own success: the fact that each year, students successfully produce impressive work leaves the groups to follow doubting their own ability to achieve to the same level. The availability of student progress diaries can go some way to reassure them that those who have gone before have experienced the same misgivings. It seems appropriate then to end with a student's view of the experience:

> *The E-Lits module turned out to be one of my strongest, and yet it was the one I worried the most about. I guess, not being very 'E-literate' made me work even harder than usual! Anyway the good news is ... if I can do it (with hard work and determination) then anyone can.*
> *This will be my last entry. I start my secondary school teacher training next Monday and am looking forward to the new challenges ahead.*

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A Gentle Introduction to the Boundary Element Method in Matlab/Freemat

Academic Report: AR-08-14

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A Gentle Introduction to the Boundary Element Method in Matlab/Freemat

Stephen Kirkup and Javad Yazdani

Academic Report AR-08-14. East Lancashire Institute of Higher Education, Blackburn, UK.

***Abstract*—**The Boundary Element Method is developed in its most simple form; for the solution of Laplace's equation in an interior domain with a straight line approximation to the boundary. The direct and indirect approaches to the boundary element method are included. The methods are developed in Freemat, a language similar to Matlab.

The codes for the solution of Laplace's equation in a general domain with a general (Robin) boundary condition are developed. The codes are applied to a typical test problem. The codes are made available as open source (BEMLAP-MAT package) and can be downloaded from this paper or from the websites listed below[2]. The overall package is expected to become a teaching aid in the MSc course[3] that is presently being developed by the authors.

I. Introduction

The boundary element method (BEM) is an important computational analysis technique that engineers and scientists can apply to a range of problems There are a number of textbooks on the BEM[1,2]. The purpose of this article and the accompanying software is to meet the needs of scientists and engineers who are somewhat unfamiliar with the BEM, but have an understanding of numerical methods and computer programming, or would like to apply the BEM to appropriate engineering problems with minimal fuss.

The application of the boundary element method to an appropriate scientific or engineering problem essentially requires a mesh of the boundary of the domain only, and the determination of the boundary condition on the surface. The computational solution then yields the approximate solution at selected points in the domain.

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[3] www.elihe.ac.uk

The BEM is generally more efficient to apply and element or finite difference methods. Hence the application of the BEM presents an attractive option to scientists and engineers. The authors are developing an MSc and this package is expected to act as a teaching aid on one of the modules in that course

On the other hand the underlying mathematical derivation and numerical analysis is extremely involved. Unfortunately, most textbooks on the BEM concentrate on the mathematics underlying the BEM, considering the ranges of integral equation formulation, ranges of element types, ranges of method derivation. In this article the elegance of the solution method is not lost in a mass of mathematical derivation and analysis. A simple notation is used to assist in the understanding of the development of the BEM.

In this work, the so-called *direct* and *indirect* boundary element methods for the solution of the interior Laplace equation are developed. Laplace's equation is the most straightforward problem to which the BEM can be applied. Laplace's equation also models a number of physical phenomena, such as steady state heat conduction and electrostatics. There is substantial recent research on the application of the BEM to Laplace's equation[3-10].

Over recent decades, Matlab[11] has become an increasingly important language for scientific computation. Freemat[12] is a freely available alternative compiler for Matlab. All codes are developed in Freemat, but they can be also used in the Matlab environment. Matlab/Freemat is based on Matrix arithmetic, allowing an economy of coding and naturally allows parallel processing, if it is available.

II. The Boundary Element Method

Over recent decades, the boundary element method (BEM) has received much attention from researchers and has become an important technique in the computational solution of a number of physical problems and has therefore become a widely-used technique in engineering

analysis. In common with the better-known finite element method (FEM) and finite difference method (FDM), the boundary element method is essentially a method for solving partial differential equations (PDEs) and can only be employed when the physical problem can be expressed as such. As with the other methods mentioned, the boundary element method is a numerical method and hence it is an important subject of research amongst the numerical analysis community. However, the potential advantages of the BEM have seemed so considerable that the strongest impetus behind its development has come from the engineering community, in its enthusiasm to obtain flexible and efficient computer-based solutions to a range of engineering problems. The boundary element method has found application in such diverse topics as stress analysis, potential flow, electromagnetics, fracture mechanics and acoustics.

The boundary element method is derived through the discretisation of an integral equation that is mathematically equivalent to the original partial differential equation. The essential re-formulation of the PDE that underlies the BEM consists of an integral equation that is defined on the boundary of the domain and an integral that relates the boundary solution to the solution at points in the domain. The former is termed a boundary integral equation (BIE) and the BEM is often referred to as *the boundary integral equation method* or *boundary integral method*. Over the last four decades the term *boundary element method* has become more popular. The other terms are still used in the literature however, particularly when authors wish to refer to the overall derivation and analysis of the methods, rather than their implementation or application.

An integral equation re-formulation can only be derived for certain classes of PDE. Hence the BEM is not widely applicable when compared to the near-universal adaptability of the finite element and finite difference method. However, in the cases in which the boundary element method is applicable, it often results in a numerical method that is easier to use and more computationally efficient than the competing methods.

The advantages in the boundary element method arise from the fact that only the boundary (or boundaries) of the domain of the PDE requires sub-division. (In the finite element method or finite difference method the whole domain of the PDE requires discretisation.) Thus the dimension of the problem is effectively reduced by one. For example an equation governing a three-dimensional region is transformed into one over its surface.

In cases where the domain is exterior to the boundary, as it is in potential flow past an obstacle, or the electrostatic field produced by charged surfaces in the open, the extent of the domain is infinite and hence the advantages of the BEM are even more striking; the equation governing the infinite domain is reduced to an equation over the (finite) boundary.

It is through the subdivision or meshing of the boundary into *panels* of some standard shape, and the approximation of functions on the boundary by low degree polynomials that the integral equations are converted into matrix-vector form. The solution of the discrete form of the integral equation leads to the approximate determination of the otherwise unknown boundary functions. Following this, the solution at any point in the domain can be found through numerical integration over the boundary.

Returning to the comparison with the FEM, the dimensions of the matrices in the BEM are expected to be much smaller for the given expectation of accuracy, since the BEM requires a mesh of the surface only, whereas the FEM requires a mesh of the full domain; for a given problem the FEM needs more elements. However the matrices that arise in the FEM are sparse and structured, making them amenable to special methods of solution, whereas the matrices that arise in the BEM are dense and have no particular apparent structure.

Apart from using the simplest governing equation, we are also considering only the simplest dimensional space-2D. We also use the simplest elements; flat (straight line) panels with the surface functions approximated by a constant on each panel. An empirical analysis of the boundary element method with respect to Laplace's equation is given in the first author's previous work[13].

III. THE INTERIOR LAPLACE EQUATION

The Laplace equation is the simplest elliptic partial differential equation. It is one of the equations of potential theory and they have been received extensive mathematical analysis. It also serves as model elliptic equations for learning, implementing and testing numerical methods. In this article we are using the Laplace equation in order to motivate our understanding of the properties and practice of the boundary element method.

The boundary element method in this paper is developed to solve the two-dimensional Laplace Equation

$$\frac{\partial^2 \varphi(\mathbf{p})}{\partial x^2} + \frac{\partial^2 \varphi(\mathbf{p})}{\partial y^2} = 0 \quad (\mathbf{p} \in D)$$

or in the shorthand form:

$$\nabla^2 \varphi(\mathbf{p}) = 0 \qquad (\mathbf{p} \in D) \quad (1)$$

in an interior domain D, with an enclosing boundary S, as illustrated in figure 1.

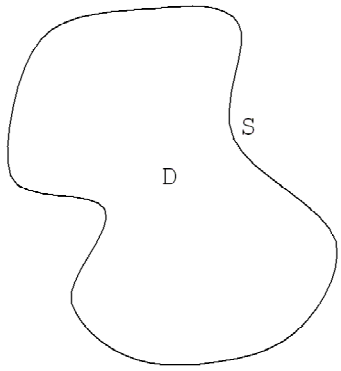

Fig 1. Illustration of the domain.

A boundary condition is determined on S. For this work we assume that the boundary condition is of the following general *Robin* or mixed form

$$a(\mathbf{p})\varphi(\mathbf{p}) + b(\mathbf{p})\frac{\partial \varphi}{\partial n_p}(\mathbf{p}) = f(\mathbf{p}) \quad (\mathbf{p} \in S), \quad (2)$$

where $a(\mathbf{p})$, $b(\mathbf{p})$ and $f(\mathbf{p})$ are real-valued functions defined on S only and n_p is the unit outward normal to the boundary at **p** (assumed to be unique). The general boundary condition includes the Dirichlet (essential) boundary condition ($a(\mathbf{p}) = 1, b(\mathbf{p}) = 0$) and Neumann (derivative) boundary condition ($a(\mathbf{p}) = 0, b(\mathbf{p}) = 1$).

Together, the governing partial differential equation within a domain (eg (1)) and the boundary condition (2) is called a boundary value problem (BVP). The solution to such a problem is principally the determination of φ (at points) in the domain D, whether by analytic or numerical methods.

IV. Integral Equation Reformulation

The first stage in the development of a boundary element method from a boundary value problem (like (1)-(2)) is to rewrite the partial differential equation as an integral equation. Traditionally, there have been two ways of doing this; the *direct* method and the *indirect* method. In this section we will go through the stages for developing the integral equation formulations..

Green's function

In order to do this it is useful to introduce an *influence function*; a function that determines the effect at a point **q** of a unit source at a point **p**, this function is also often known as a *Green's function*. For the two-dimensional Laplace equation (1), the Green's function is known to be

$$G(\mathbf{p}, \mathbf{q}) = \frac{-1}{2\pi} \ln(|\, \mathbf{p} - \mathbf{q} \,|). \quad (3)$$

The Green's function has the property

$$\nabla^2 G(\mathbf{p} - \mathbf{q}) = \delta(\mathbf{p} - \mathbf{q})$$

where δ is the Dirac delta function.

Laplace Integral Operators

As a further set of building blocks, it is also useful to define the set of *Laplace integral operators*:

$$\{L\zeta\}_\Gamma(\mathbf{p}) = \int_\Gamma G(\mathbf{p}, \mathbf{q})\zeta(\mathbf{q}) dS_q \quad (4a),$$

$$\{M\zeta\}_\Gamma(\mathbf{p}) = \int_\Gamma \frac{\partial G(\mathbf{p}, \mathbf{q})}{\partial n_q}\zeta(\mathbf{q}) dS_q \quad (4b),$$

$$\{M^t\zeta\}_\Gamma(\mathbf{p}; \mathbf{w}) = \frac{\partial}{\partial w}\int_\Gamma G(\mathbf{p}, \mathbf{q})\zeta(\mathbf{q}) dS_q = \int_\Gamma \frac{\partial G(\mathbf{p}, \mathbf{q})}{\partial w}\zeta(\mathbf{q}) dS_q$$

(4c)

$$\{N\zeta\}_\Gamma(\mathbf{p}; \mathbf{w}) = \frac{\partial}{\partial w}\int_\Gamma \frac{\partial G(\mathbf{p}, \mathbf{q})}{\partial n_q}\zeta(\mathbf{q}) dS_q$$

(4d)

where Γ is the whole or any part of S, ζ is any real-valued function, defined on Γ.

When **p**∈Γ, then we have the more particular form of M^t and N:

$$\{M^t\zeta\}_\Gamma(\mathbf{p};\mathbf{n}_p)=\frac{\partial}{\partial n_p}\int_\Gamma G(\mathbf{p},\mathbf{q})\zeta(\mathbf{q})dS_q=$$

$$\int_\Gamma \frac{\partial G(\mathbf{p},\mathbf{q})}{\partial n_p}\zeta(\mathbf{q})dS_q$$

(4e)

$$\{N\zeta\}_\Gamma(\mathbf{p};\mathbf{n}_p)=\frac{\partial}{\partial n_p}\int_\Gamma \frac{\partial G(\mathbf{p},\mathbf{q})}{\partial n_q}\zeta(\mathbf{q})dS_q$$

(4f)

Note that the derivative $\frac{\partial}{\partial n_p}$ cannot always be taken directly inside the integral in (4f), if we did then the integral can be *hypersingular*, and therefore not defined in the normal sense, when **q**=**p**. *N* is therefore not a true integral operator, but belongs to the more general class of *pseudo-differential* operators. For convenience, we will continue to refer to *L,M,M*^{t}and *N* as integral operators, but we will also keep the special case on *N* in mind.

Applying *L* and *N* to any function ζ, any boundary Γ and any vector $\mathbf{n}_p$ gives rise to a continuous function in space. However the operators *M* and *M*^{t} have jump discontinuities at the boundary:

$$\lim_{\varepsilon\to 0}\{M\zeta\}_\Gamma(\mathbf{p}-\varepsilon\mathbf{n}_p)-\frac{1}{2}\zeta(\mathbf{p})=\{M\zeta\}_\Gamma(\mathbf{p})$$

(5a)

$$\lim_{\varepsilon\to 0}\{M^t\zeta\}_\Gamma(\mathbf{p}-\varepsilon\mathbf{n}_p;\mathbf{n}_p)+\frac{1}{2}\zeta(\mathbf{p})=$$

$$\{M^t\zeta\}_\Gamma(\mathbf{p};\mathbf{n}_p)$$

(5b)

where **p**εΓ and Γ is smooth at **p**.

Direct Method

The following equation arises as a result of Green's second theorem

$$\{M\varphi\}_S(\mathbf{p})-\{Lv\}_S(\mathbf{p})=-\varphi(\mathbf{p})\quad(\mathbf{p}\varepsilon D).\quad(6a)$$

where $v=\frac{\partial\varphi(\mathbf{p})}{\partial n_p}$. For points on *S* we apply the limit (5a) in equation (6a):

$$\{M\varphi\}_S(\mathbf{p})-\{Lv\}_S(\mathbf{p})=-\frac{1}{2}\varphi(\mathbf{p})\quad(\mathbf{p}\varepsilon S).\quad(6b)$$

Given these equations, the method of solution would involve solving (6b) with the boundary condition (2) in order to find approximations to φ and *v* on the boundary and then use equation (6a) to compute φ at any chosen points in the domain.

However, there is one notable case when this method will not work as well. In the case of a pure Dirichlet boundary condition, (6a) is effectively a Fredholm integral equation of the first kind. It is well known that the numerical solution of first kind equations is not as efficient as it is for the equivalent second kind equation (which equation (6b) would otherwise be) [14].

We can easily introduce another equation, using the Laplace integral operators, that will be useful to us. Differentiating equation (6a) with respect to a vector **w**, gives:

$$\{N\varphi\}_S(\mathbf{p};\mathbf{w})-\{M^tv\}_S(\mathbf{p};\mathbf{w})=-\frac{\partial\varphi}{\partial w}(\mathbf{p})\quad(\mathbf{p}\varepsilon D).$$

(7a)

For points **p** near the boundary, with $\mathbf{n}_p$ being the unique unit outward normal at **p**, then (7a) becomes

$$\{N\varphi\}_S(\mathbf{p};\mathbf{n}_p)-\{M^tv\}_S(\mathbf{p};\mathbf{n}_p)=-\frac{\partial\varphi}{\partial n_p}(\mathbf{p})\quad(\mathbf{p}\varepsilon D)$$

(7b)

Moving the point **p** to the surface and applying the limit (5b) gives rise to the following equation on the surface:

$$\{N\varphi\}_S(\mathbf{p};\mathbf{n}_p)-\{M^tv\}_S(\mathbf{p};\mathbf{n}_p)=-\frac{1}{2}v(\mathbf{p})$$

(8)

One disadvantage in using equation (8) as a basis for solving the Laplace equation, is that it now contains the *hypersingular* operator *N*. The other disadvantage is that if we wish to solve the Neumann problem using equation (8) then we have to solve over the operator *N*, which leads to a similar loss of efficiency that is found in solving first kind equations.

In order to avoid the problems with the Dirichlet problem with equation (6b) and the Neumann problem with equation (8), a hybrid equation is proposed:

$$\{(M+\frac{1}{2}I+\mu N)\}\varphi(\mathbf{p})=\{(L+(M^t-\frac{1}{2}I))\}v(\mathbf{p}).$$

(9)

For suitable weighting parameter μ, equation (9) forms a suitable basis for solving the Robin BVP and the special cases of the Dirichlet and Neumann BVPs.
Once approximations to φ and v are found on the boundary from equation (8) with the boundary condition (2), we can use equation (6a) to determine and approximation to φ for any point (**p**) in the domain.

Indirect Method

The alternative or *indirect* approach to obtaining an integral reformulation of the PDE involves writing the solution φ as a layer potential. The most obvious way of doing this is to write

$$\varphi(\mathbf{p}) = \{L\sigma\}_S(\mathbf{p}) \quad (\mathbf{p}\varepsilon D \cup S) \tag{10a}$$

where σ is a density function defined on *S*.

It is possible to solve the Dirichlet problem from equation (10a). This would normally involve finding σ on *S* by solving the integral equation (10a). However, the same equation cannot be used for the Neumann problem and, what is more, it requires solution to be carried out over the first kind operator *L*.

By differentiating the equation (10a) with respect to any vector **w**, we obtain

$$\frac{\partial\varphi}{\partial w}(\mathbf{p}) = \frac{\partial}{\partial w}\{L\sigma\}(\mathbf{p}) = \{M^t\sigma\}(\mathbf{p};\mathbf{w}) \quad (\mathbf{p}\varepsilon D) \tag{10b}$$

As **p** approaches the boundary and we take $\mathbf{w}=\mathbf{n}_p$. and on the boundary equation (10b) becomes

$$\frac{\partial\varphi}{\partial n_p}(\mathbf{p}) = v(\mathbf{p}) = \frac{\partial}{\partial n_p}\{L\sigma\}(\mathbf{p}) = \{M^t\sigma\}(\mathbf{p};\mathbf{n}_p) + \frac{1}{2}\sigma(\mathbf{p}) \quad (\mathbf{p}\varepsilon S) \tag{10c}$$

where the jump discontinuity (5b) has been included.

Equation (10c) relates *v* on *S* to σ. Hence equation (10c) can be used as a basis for solving the Neumann problem. It is a second kind equation and so it is very suitable as a basis for solution.

We do not have a more general solution method. To do this let us introduce a hybrid single- and double-layer potential:

$$\varphi = \{L\sigma_\mu\}(\mathbf{p}) + \mu\{M\sigma_\mu\}(\mathbf{p}) \quad (\mathbf{p}\varepsilon D) \tag{11a}$$

where σ_μ is a density function that depends on the choice of μ.

By allowing the point **p** approach the boundary *S*, equation (11a) becomes:

$$\varphi = \{L\sigma_\mu\}(\mathbf{p}) + \mu\{M\sigma_\mu\}(\mathbf{p}) - \frac{\mu}{2}\sigma_\mu(\mathbf{p}). \quad (\mathbf{p}\varepsilon S) \tag{11b}$$

For $\mu\neq 0$ equation (11b) is a suitable equation to solve the Dirichlet problem since it is always a second-kind integral equation. However, for the Neumann and more general Robin problem it is useful to introduce another equation that is the outcome of differentiating equation (11a), firstly with respect to any vector **w**:

$$\frac{\partial\varphi}{\partial w}(\mathbf{p}) = \frac{\partial}{\partial w}\{L\sigma_\mu\}(\mathbf{p}) + \mu\frac{\partial}{\partial w}\{M\sigma_\mu\}(\mathbf{p}) \quad . \quad (\mathbf{p}\varepsilon D) \tag{11c}$$

Allowing **p** to approach the boundary and **w** becomes the unit outward normal to the boundary there gives the following equations:

$$\frac{\partial\varphi}{\partial n_p}(\mathbf{p}) = \frac{\partial}{\partial n_p}\{L\sigma_\mu\}(\mathbf{p}) + \mu\frac{\partial}{\partial n_p}\{M\sigma_\mu\}(\mathbf{p}) + \frac{\mu}{2}\sigma_\mu(\mathbf{p}) \quad . \quad (\mathbf{p}\varepsilon S) \tag{11d}$$

Using the operator notation, this give

$$v(\mathbf{p}) = \{M^t\sigma_\mu\}(\mathbf{p}) + \mu\{N\sigma_\mu\}(\mathbf{p}) - \frac{\mu}{2}\sigma_\mu(\mathbf{p}) \quad . \quad (\mathbf{p}\varepsilon S) \tag{11e}$$

Substituting the expressions for φ and *v* in equation (11a) and (11b) into the general Robin boundary condition (2) gives the following boundary integral equation:

$$\{\alpha(L + \mu(M - \frac{1}{2}I)) + \beta((M^t + \frac{1}{2}I) + \mu N)\}\sigma_\mu(\mathbf{p}) = f(\mathbf{p}) \tag{11e}$$

Equation (11e) is most suitable for the solution of the classes of boundary conditions considered.

The indirect boundary element method involves solving (11e) to return an approximation to σ_μ on the boundary. Equation (11a) can then be employed to compute an approximation to φ in the domain D.

V. The Discrete Operators

There is a variety of techniques for deriving the system of linear equations from a given integral equation. In general, a method can be derived by replacing the integrals in an integral equation by a quadrature formula or by a weighted residual method such as the Galerkin method. Many methods for solving integral equations can be used to develop a particular boundary element method [15]. Of all the methods the method of collocation is one of the most straightforward and most popular and it is the one that we will be using in this paper.

Collocation

The application of collocation to a boundary integral equation requires that the boundary is represented by a set of *panels*. For example a two dimensional boundary can be approximated by a set of straight lines, as illustrated in figure 2.

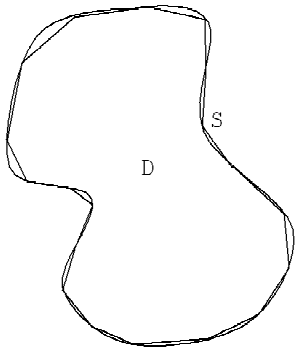

Fig 2. Illustration of the boundary divided into panels.

In order to complete the discretisation of the integral equations, the boundary functions also need to be approximated on each panel. It is the characteristics of the panel and the representation of the boundary function on the panel that together define the *element* in the boundary element method. By representing the boundary functions by a characteristic form on each panel, the boundary integral equations can be simplified into a linear system of equations. Most simply, the boundary functions can be approximated by a constant on each panel. The collocation (or representative) point is at the centre of the panel (C^{-1}collocation). The overall process is that of discretising the integral operators and the methods for carrying this out are covered in (for the more general Helmholtz equation) [16].

Let the ΔSj (for j = 1, 2, .., n) be the n panels that represent an approximation to S in the boundary element method. We may write

$$S \approx \widetilde{S} = \sum_{j=1}^{n} \Delta S_j \ . \tag{12}$$

Following from equation (4a), we may write:

$$\begin{aligned}\{L\zeta\}_S(\mathbf{p}) &= \int_S G(\mathbf{p},\mathbf{q})\zeta(\mathbf{q})dS_q \approx \int_{\widetilde{S}} G(\mathbf{p},\mathbf{q})\zeta(\mathbf{q})dS_q \\ &= \sum_{j=1}^{n} \int_{\Delta\widetilde{S}} G(\mathbf{p},\mathbf{q})\zeta(\mathbf{q})dS_q \approx \sum_{j=1}^{n} \zeta_j \int_{\Delta\widetilde{S}_j} G(\mathbf{p},\mathbf{q})dS_q \\ &= \sum_{j=1}^{n} \zeta_j \{Le\}_{\Delta S_j}(\mathbf{p})\end{aligned} \tag{13a}$$

where in the final expression we have made the approximation $\zeta(\mathbf{q}) \approx \zeta_j$ (a constant) on the j[th] panel and e is the unit function. A similar discretisation can be applied to the other integral operators:

$$\{M\zeta\}_S(\mathbf{p}) \approx \sum_{j=1}^{n} \zeta_j \{Me\}_{\Delta S_j}(\mathbf{p}) \tag{13b}$$

$$\{M^t\zeta\}_S(\mathbf{p}) \approx \sum_{j=1}^{n} \zeta_j \{M^t e\}_{\Delta S_j}(\mathbf{p}), \tag{13c}$$

and

$$\{N\zeta\}_S(\mathbf{p}) \approx \sum_{j=1}^{n} \zeta_j \{Ne\}_{\Delta S_j}(\mathbf{p}). \tag{13d}$$

For any point $\mathbf{p}$, $\{Le\}_{\Delta S_j}(\mathbf{p})$, $\{Me\}_{\Delta S_j}(\mathbf{p})$, $\{M^t e\}_{\Delta S_j}(\mathbf{p})$ and $\{Ne\}_{\Delta S_j}(\mathbf{p})$ are termed the discrete Laplace integral operators.

Simplifying the integrands

Writing G(**p**,**q**) as G(r) where r=|**r**| and **r**=**q**-**p**, the Green's function (3) can be written as follows:

$$G(r) = \frac{-1}{2\pi}\ln(r). \tag{14}$$

The derivatives of *G* with respect to r:

$$\frac{\partial}{\partial r}G(r) = \frac{-1}{2\pi}\frac{1}{r}, \tag{15}$$

and

$$\frac{\partial^2}{\partial r^2}G(r) = \frac{1}{2\pi}\frac{1}{r^2}. \tag{16}$$

The normal derivatives of *G*:

$$\frac{\partial G}{\partial n_q} = \frac{\partial G}{\partial r}\frac{\partial r}{\partial n_q}, \tag{17}$$

$$\frac{\partial G}{\partial n_p} = \frac{\partial G}{\partial r}\frac{\partial r}{\partial n_p}, \tag{18}$$

and

$$\frac{\partial^2 G}{\partial n_p \partial n_q} = \left(\frac{\partial G}{\partial r}\frac{\partial^2 r}{\partial n_p \partial n_q} + \frac{\partial^2 G}{\partial r^2}\frac{\partial r}{\partial n_p}\frac{\partial r}{\partial n_q}\right). \tag{19}$$

The normal derivatives of *r*:

$$\frac{\partial r}{\partial n_q} = -\frac{\mathbf{r}.\mathbf{n}_q}{r}, \tag{20}$$

$$\frac{\partial r}{\partial n_p} = \frac{\mathbf{r}.\mathbf{n}_p}{r}, \tag{21}$$

and

$$\frac{\partial^2 r}{\partial n_p \partial n_q} = -\frac{1}{r}\left(\mathbf{n}_p.\mathbf{n}_q + \frac{\partial r}{\partial n_p}\frac{\partial r}{\partial n_q}\right). \tag{22}$$

Evaluating the integrals

In most cases of evaluating the discrete integrals in (13a-d), the integrand is continuous and can be approximated most efficiently by Gaussian quadrature. For the case in which **p** lies on the element of integration, the integral can be evaluated by a simple formulae. Let the element Δ have length *a*+*b* with the point **p** lying a distance *a* from one end and a distance *b* from the other, as illustrated in the figure 3.

Figure 3. A general element with the collocation point **p** lying on the element.

In the case illustrated in figure 3 we can derive the following expressions:

$$\{Le\}_\Delta(\mathbf{p}) = \frac{1}{2\pi}(a+b-a\log a - b\log b) \tag{23a}$$

$$\{Me\}_\Delta(\mathbf{p}) = 0 \tag{23b}$$

$$\{M^t e\}_\Delta(\mathbf{p}) = 0 \tag{23c}$$

$$\{Ne\}_\Delta(\mathbf{p}) = \frac{1}{2\pi}\left(\frac{1}{a}+\frac{1}{b}\right) \tag{23d}$$

VI. Parallel Methods for Approximating the Discrete Laplace Operators

We develop a potentially parallel method by avoiding loops and using the in-built matrix/vector operations in Matlab or Freemat. By doing this we are effectively making each loop independent and therefore can be carried out in parallel.

Firstly, we need to set up a general purpose Gaussian quadrature rule (Gauss-Legendre). The routine gl.m sets up an 8 point rule for integration over the interval [0,1].

gl.m

```
% function [wts,pts,n]=gl()
% Sets up a Gauss-Legendre Quadrature
%  for integration over [0,1]
%  with n=8 weights (wts) and points (pts)

    function [wts,pts,n]=gl()
    n=8;
    wts= [ 5.061426814519E-02
           0.111190517227
           0.156853322939
           0.181341891689
           0.181341891689
           0.156853322939
           0.111190517227
           5.061426814519E-02];
    pts= [ 1.985507175123E-02
           0.101666761293
           0.237233795042
           0.408282678752
           0.591717321248
           0.762766204958
           0.898333238707
           0.980144928249];
```

As a most useful building block, it would be helpful to have a routine for evaluating the four Laplace integral operators, That is for any point **p**, we wish to compute $\{Le\}_{\Delta S_j}(\mathbf{p})$, $\{Me\}_{\Delta S_j}(\mathbf{p})$, $\{M^t e\}_{\Delta S_j}(\mathbf{p})$ and $\{Ne\}_{\Delta S_j}(\mathbf{p})$. Given that many of the intermediate steps for computing the operators are similar, it is more efficient to compute them simultaneously. The operators needed depend on the formulation used hence the routine has the facility for setting the required operators.

The routine for doing this is l2lc.m. The method follows the formulas given in section V. Given the routine will be called many times, its efficiency is one of the critical factors in the efficiency of the overall boundary element method. In l2lc.m, loops are avoided completely (replaced by vector operations) so that any available parallelism can be taken advantage of.

l2lc.m

```
% function
[l,m,mt,n]=l2lc(p,vecp,qa,qb,lponq,needl,needm,needmt,needn)
% Returns the discrete Laplace operators for the observation point p,
%  the derivatve at the observation point (if applicable) vecp, the
%  coordinates of the edges of the element qa and qb, lponq states
whether
%  p lies on the element (true) or not (false), and
needl,needm,needmt,needn
%  state whether the discrete operators l,m,mt and n are needed (if any
%  operator is not needed then a corresponding zero is returned.

function [l,m,mt,n]= l2lc(p,vecp,qa,qb,lponq,needl,needm,needmt,needn)

    oo2pi=0.5/pi;
    qbma=qb-qa;
    qlen=norm(qbma);
    pmqa=p-qa;
    pmqb=p-qb;
    normq(1)=-qbma(2)/qlen;
    normq(2)=qbma(1)/qlen;
    pqalen=norm(pmqa);
    pqblen=norm(pmqb);
    dnpdq=vecp*normq';

    l=0;
    m=0;
    mt=0;
    n=0;


    if (lponq)
     l=(qlen-(pqalen*log(pqalen)+pqblen*log(pqblen)))*oo2pi;
     m=0;
     mt=0;
     n=-(1/pqalen+1/pqblen)*oo2pi;
     continue
    else

     [w,x,npoints]=gl();

     onesnp=ones(1,npoints);

     delta=qbma'*x;

     qasame=[qa(1).*onesnp; qa(2).*onesnp];
     psame=[p(1)*onesnp; p(2)*onesnp];

     q=qasame+delta;
     rr=psame-q;
     srr=rr.^2;

     srr1=srr(1,1:npoints);
     srr2=srr(2,1:npoints);
     sr=srr1+srr2;
     r=sqrt(sr);

     if (needl)
      g=-oo2pi*log(r);
      l=qlen*(w*g');
     end

     if (needm|needmt|needn)
      rnqr=-normq*rr;
      rnq=rnqr./r;
      rnpr=vecp*rr;
      rnp=rnpr./r;
      gr=-oo2pi/r;
      wgr=(w.*gr);
     end

     if (needm)
       m=qlen*(wgr*rnq');
     end

     if (needmt)
        mt=qlen*(wgr*rnp');
     end

     if (needn)
      rnprnq=rnp.*rnq;
      dnpnq=vecp*normq';
      dnpnqsame=dnpnq*onesnp;
      rnpnq=-(dnpnqsame+rnprnq)./r;
      grr=oo2pi/sr;
      wgrr=w.*grr;
      n=qlen*(wgr*rnpnq'+wgrr*rnprnq');
    end
```

VII. Defining the Boundary

A method is required for defining the boundary as a set of panels. The easiest way of showing how this may be done is by example. Figure 4 shows a square of dimension 0.1 divided into 32 panels.

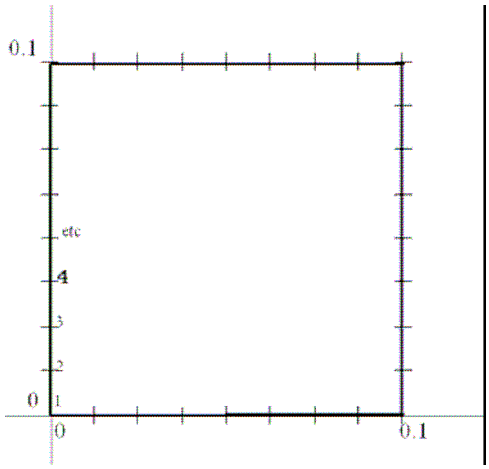

Figure 4. A square divided into 32 panels.

The description in the following Matlab/Freemat code (square.m) involves listing the coordinates of the vertices of the panels in vertpts and lists the indices of the edges of each element in elemvert.

square.m

```
% function [vertpts,elemvert]=square
% Returns a list of edges of the panels that make up the square
%  in vertpts and the list of elements that make up the boundary
%  are defined by the indices of the two vertices in elemvert.
% Note that the vertices of each element in elemvert must be
%  defined in the clockwise direction.

function [vertpts,elemvert]=square

 vertpts=[0.00000000000 0.00000000000;
        0.00000000000 0.01250000000;
        0.00000000000 0.02500000000;
        0.00000000000 0.03750000000;
        0.00000000000 0.05000000000;
        0.00000000000 0.06250000000;
        0.00000000000 0.07500000000;
        0.00000000000 0.08750000000;

        0.00000000000 0.10000000000;
        0.01250000000 0.10000000000;
        0.02500000000 0.10000000000;
        0.03750000000 0.10000000000;
        0.05000000000 0.10000000000;
        0.06250000000 0.10000000000;
        0.07500000000 0.10000000000;
        0.08750000000 0.10000000000;

        0.10000000000 0.10000000000;
        0.10000000000 0.08750000000;
        0.10000000000 0.07500000000;
        0.10000000000 0.06250000000;
        0.10000000000 0.05000000000;
        0.10000000000 0.03750000000;
        0.10000000000 0.02500000000;
        0.10000000000 0.01250000000;

        0.10000000000 0.00000000000;
        0.08750000000 0.00000000000;
        0.07500000000 0.00000000000;
        0.06250000000 0.00000000000;
        0.05000000000 0.00000000000;
        0.03750000000 0.00000000000;
        0.02500000000 0.00000000000;
        0.01250000000 0.00000000000];

elemvert=[1:32; 2:33]
elemvert(2,32)=1
```

VIII. Matrices in the Boundary Element Method

The boundary element method is derived by applying an integral equation method to the appropriate boundary integral equation. The most straightforward method to apply is that of collocation.

The initial development of the application of collocation to give expressions for the discrete Laplace operators is given in Section V. To continue the development, approximations to the (unknown) boundary functions – whether that be φ and/or v in the direct method, or σ in the indirect method – are obtained by replacing the boundary integral equation by a matrix-vector equation and then solving it. Approximations to φ in the domain can then be found by direct integration.

In the collocation method, the general point **p** in the boundary integral equation (e.g. equations (9) for the direct method or equation (11e) for the indirect method), takes the value of every central point on each panel; the collocation points: $\mathbf{p}=\mathbf{p}_{S1}, \mathbf{p}_{S2},\ldots, \mathbf{p}_{Sn}$.

For illustration, let us apply the collocation method to boundary integral equation (10a) (for $\mathbf{p}\varepsilon S$):

$$\varphi(\mathbf{p}) = \{L\sigma\}_S(\mathbf{p}) \quad (\mathbf{p}\varepsilon S) \tag{24}$$

Following the development in equation (13a), the following discrete form of equation (24) is obtained:

$$\varphi(\mathbf{p}) = \{L\sigma\}_S(\mathbf{p}) \approx \sum_{j=1}^{n} \sigma_j \{Le\}_{\Delta S_j}(\mathbf{p}) .$$

Allowing **p** to take the value of $\mathbf{p}_{Si}$, a collocation points gives the following:

$$\varphi(\mathbf{p}_{Si}) = \{L\sigma\}_S(\mathbf{p}_{Si}) \approx \sum_{j=1}^{n} \sigma_j \{Le\}_{\Delta S_j}(\mathbf{p}_{Si}) .$$

Let us now introduce the notation:

$$\varphi_{Si} = \varphi(\mathbf{p}_{Si}), v_{Si} = v(\mathbf{p}_{Si}), \sigma_{Si} = \sigma(\mathbf{p}_{Si}),$$

$$\underline{\varphi}_S = \begin{bmatrix} \varphi_{S1} \\ \varphi_{S2} \\ \vdots \\ \vdots \\ \varphi_{Sn} \end{bmatrix}, \quad \underline{v}_S = \begin{bmatrix} v_{S1} \\ v_{S2} \\ \vdots \\ \vdots \\ v_{Sn} \end{bmatrix}, \quad \underline{\sigma}_S = \begin{bmatrix} \sigma_{S1} \\ \sigma_{S2} \\ \vdots \\ \vdots \\ \sigma_{Sn} \end{bmatrix},$$

$$[\mathbf{L}_{SS}]_{ij} = \{Le\}_{\Delta S_j}(\mathbf{p}_{Si}),$$

$$[\mathbf{M}_{SS}]_{ij} = \{Me\}_{\Delta S_j}(\mathbf{p}_{Si}),$$

$$[\mathbf{M}^{\mathbf{t}}{}_{SS}]_{ij} = \{M^t e\}_{\Delta S_j}(\mathbf{p}_{Si}),$$

$$[\mathbf{N}_{SS}]_{ij} = \{Ne\}_{\Delta S_j}(\mathbf{p}_{Si}),$$

Returning to the integral equation (24): by applying the collocation method it is then replaced by the following equation:

$$\underline{\varphi}_S \approx \mathbf{L}_{SS}\underline{\sigma}_S,$$

Which can be solved for the Dirichlet case to return an approximation to σ on S. (Although basing the BEM on this first kind equation is not advised; this is meant to be purely illustrative.)

Usually, the objective is to find the solution φ in the domain. Returning to our illustrative boundary integral equation (10a) (for **p**εD)**:**

$$\varphi(\mathbf{p}) = \{L\sigma\}_S(\mathbf{p}) \; (\mathbf{p}\varepsilon D) \tag{25}$$

For points **p** in the domain, we can approximate φ(**p**) as before

$$\varphi(\mathbf{p}) = \{L\sigma\}_S(\mathbf{p}) \approx \sum_{j=1}^{n} \sigma_j \{Le\}_{\Delta S_j}(\mathbf{p}),$$

except in its application, an approximation to σ (the values of the σ_i) has been obtained.

Let the solution be sought at the *m* domain points **p** = $\mathbf{p}_{D1}, \mathbf{p}_{D2}, \ldots, \mathbf{p}_{Dm}$

$$\varphi(\mathbf{p}_{Di}) = \{L\sigma\}_S(\mathbf{p}_{Di}) \approx \sum_{j=1}^{n} \sigma_j \{Le\}_{\Delta S_j}(\mathbf{p}_{Di}).$$

Let us now introduce the notation:

$$\varphi_{Di} = \varphi(\mathbf{p}_{Di}), v_{Di} = v(\mathbf{p}_{Di}), \sigma_{Di} = \sigma(\mathbf{p}_{Di}),$$

$$\underline{\varphi}_D = \begin{bmatrix} \varphi_{D1} \\ \varphi_{D2} \\ \vdots \\ \vdots \\ \varphi_{Dm} \end{bmatrix}, \quad \underline{v}_D = \begin{bmatrix} v_{D1} \\ v_{D2} \\ \vdots \\ \vdots \\ v_{Dn} \end{bmatrix},$$

$$[\mathbf{L}_{DS}]_{ij} = \{Le\}_{\Delta S_j}(\mathbf{p}_{Di}),$$

$$[\mathbf{M}_{DS}]_{ij} = \{Me\}_{\Delta S_j}(\mathbf{p}_{Di}),$$

$$[\mathbf{M}^{\mathbf{t}}{}_{DS}]_{ij} = \{M^t e\}_{\Delta S_j}(\mathbf{p}_{Di}),$$

$$[\mathbf{N}_{DS}]_{ij} = \{Ne\}_{\Delta S_j}(\mathbf{p}_{Di}).$$

Returning back to the example integral equation (24), using this notation, approximations to the solution at the domain points can be determined by the following matrix-vector multiplication:

$$\underline{\varphi}_D \approx \mathbf{L}_{DS}\underline{\sigma}_S.$$

It can be observed that there is a general case in evaluating the required matrices; it is given a set of points and a description of the boundary, a method for evaluating the matrix components is required. The routine for doing this is lbem2.m.

lbem2.m

```
% function [L,M,Mt,N] = lbem2(m,p,vecp,n,vertpts,elemvert,p_on,
needL,needM,needMt,needN)
% Sets up the matrices required in the boundary element method
%  for m (observation) points p with a vector (derivative) direction of
%  vecp at the points p. The boundary is made up of n elements; vertpts
lists the coordinates
% of the edges of the elements and elemvert lists the pairs of vertices
%  that define each element. p_on idicates whether the point p(i) lies on
the ith panel.
%  needL,needM,needMt,needN indicate which matrices are needed by
being set to true.

function [L,M,Mt,N] =lbem2(m,p,vecp,n,vertpts,elemvert,p_on,
needL,needM,needMt,needN)

 [qa,qb]=vertices(n,vertpts,elemvert);

 for (i=1:n)
  for (j=1:n)

[L(i,j),M(i,j),Mt(i,j),N(i,j)]=l2lc(p(i,:),vecp(i,:),qa(j,:),qb(j,:),p_on&i==j,needL,
needM,needMt,needN);
   end
 end
```

Drawn from this general case is the special case in which the points lie at the centres of the elements that define the boundary. This special case is implemented by the routine lbem2_on.m.

lbem2_on.m

```
% function [L,M,Mt,N]
=lbem2(n,vertpts,elemvert,p_on,needL,needM,needMt,needN)
% Sets up the matrices required in the boundary element method
%  for a boundary made up of n elements. vertpts lists the coordinates
%  of the edges of the elements and elemvert lists the pairs of vertices
%  that define each element.needL,needM,needMt,needN indicate which
matrices
%  are needed by being set to true.

function [L,M,Mt,N] =lbem2_on(n,vertpts,elemvert,
needL,needM,needMt,needN)

 [qa,qb]=vertices(n,vertpts,elemvert);

 p=(qa+qb)/2;

 qbma=qb-qa;

 for(i=1:n)
   qlen(i)=norm(qbma(i,:));
 end

 for (i=1:n)
   normp(i,1)=-qbma(i,2)/qlen(i);
   normp(i,2)=qbma(i,1)/qlen(i);
 end

 [L,M,Mt,N]=lbem2(n,p,normp,n,vertpts,elemvert,true,
needL,needM,needMt,needN)
```

IX. Boundary Element Method

Having, developed all the building blocks we may now complete the coding for the boundary element methods. In section IV, two classes of boundary integral equation were introduced and these lead to two classes of boundary element method; the direct method and the indirect method.

Direct Method

For the chosen integral equation (9), the discrete analogue for collocation points on S is as follows:

$$[\ \mathbf{M_{SS}}+\tfrac{1}{2}\mathbf{I}+\mu\mathbf{N_{SS}}\ ]\ \underline{\varphi_S} = [\mathbf{L_{SS}}+\mu(\mathbf{M^t_{SS}}-\tfrac{1}{2}\mathbf{I})]\ \underline{v_S} \tag{25}$$

with the general Robin boundary condition

$$\alpha_i\varphi_i + \beta_i v_i = f_i \ \text{ for } i=1..n\ . \tag{26}$$

The solution of this kind of system is not a standard utility in Matlab/Freemat. Hence we introduce the routing gls.m that carries out row operations to rewrite a system like the above as a standard linear system and then solve by the inbuilt Matlab/Freemat matrix-vector solution method.

gls.m

```
% gls returns the solution x,y to a problem of the form
%                          A x = B y +c
% where A and B are n by n real matrices and c is a n-vector
% under the condition(s)
%
%          {\alpha}_i x_i + {\beta}_i y_i = f_i   for i=1..n.
%
% Clearly only one of {\alpha}_i or {\beta}_i can be zero for each i.
%
% The method employed involves forming a linear system of the form
Cz=d
% where the n by n matrix C and the vector d can be determined from A,B
% and the {\alpha}_i and {\beta}_i. A standard LU factorisation
% solution method is then employed to return a solution. From this the
actual
% solutions x,y can be determined.

function [x,y]=gls(A,B,c,n,alpha,beta,F)
  gamma=norm(B,inf)/norm(A,inf);
  test=abs(beta)>abs(gamma*alpha);

  for (i=1:n)
    if (test(i))
      Fob=F(i)/beta(i);
      aob=alpha(i)/beta(i);
      for (j=1:n)
        c(j)=c(j)+Fob*B(j,i);
        B(j,i)=-aob*B(j,i);
      end
    else
      Foa=F(i)/alpha(i);
      boa=beta(i)/alpha(i);
      for (j=1:n)
        c(j)=c(j)-Foa*A(j,i);
        A(j,i)=-boa*A(j,i);
      end
    end
  end

  A=A-B;
  y=A\c;

  for (i=1:n)
    if (test(i))
      x(i)=(F(i)-alpha(i)*y(i))/beta(i);
    else
      x(i)=(F(i)-beta(i)*y(i))/alpha(i);
    end
  end

  for (i=1:n)
    if (test(i))
      temp=x(i);
      x(i)=y(i);
      y(i)=temp;
    end
  end
  x=x';
```

Once the solution on the boundary is found to (25), (26), the solution at any domain point can be found through integrating over the boundary using equation (6a).

Matlab/Freemat routine libem2.m returns the solution in the domain and on the boundary using the direct method.

libem2.m

```
% function [phi_D,phi_S,v_S] =
libem2(n_D,p_D,n_S,vertpts_S,elemvert_S,alpha_S,beta_S,f_S)
% Returns the solution phi_D at the n_D domain points p_D and at the
collocation points.
% The boundary is made up of n elements; vertpts lists the coordinates
% of the edges of the elements and elemvert lists the pairs of vertices
% that define each element. alpha_S, beta_S and f_S determine the
Robin boundary condition.

function [phi_D,phi_S,v_S]
=libem2(n_D,p_D,n_S,vertpts_S,elemvert_S,alpha_S,beta_S,f_S)

% calculate phi_S, v_S, phi and v on the boundary
% calculate L_SS, M_SS, Mt_SS and N_SS, the discrete form of the
operators for the collocation points
  [L_SS,M_SS,Mt_SS,N_SS]
=lbem2_on(n_S,vertpts_S,elemvert_S,true,true,true,true);
  M_SSplus=M_SS+eye(n_S)/2;
  Mt_SSminus=Mt_SS-eye(n_S)/2;
  mu=norm(M_SSplus)/norm(N_SS);
  for (i=1:n_S)
    zero_S(i)=0.0;
  end
   [phi_S,v_S]=
  gls(M_SSplus+mu*N_SS,L_SS+mu*Mt_SSminus,zero_S,n_S,
alpha_S,beta_S,f_S);

% calculate phi_S, v_S, phi and v on the boundary
% calculate L_DS, M_DS, the discrete form of the operators for the
domain points
% dummy values set to vecp_D, since it is not used
  for (i=1:n_D)
    vecp_D(i,1)=1;
    vecp_D(i,2)=0;
  end
  [L_DS,M_DS,Mt_DS,N_DS]
=lbem2(n_D,p_D,vecp_D,n_S,vertpts_S,elemvert_S,false,true,true,false,f
alse);

  phi_D=L_DS*v_S-M_DS*phi_S;
```

Indirect Method

For the chosen integral equation (11e), the discrete analogue for collocation points on S is as follows:

$$\{(\mathbf{L}_{SS}+\mu(\mathbf{M}_{SS}-\tfrac{1}{2}\mathbf{I}))\mathrm{D}_{\alpha}+((\mathbf{M}^{t}_{SS}+\tfrac{1}{2}\mathbf{I})+\mu\mathbf{N}_{SS})\mathbf{D}_{\beta}\}\underline{\sigma}_{\mu}=\underline{f} \quad (27)$$

where the general Robin boundary condition is included such that $\mathbf{D\alpha}$ and $\mathbf{D}_{\beta}$ are diagonal matrices with diagonal components α_i and β_i respectively.

The solution of equation (27) gives $\underline{\sigma}_{\mu}$, the discrete equivalent of the layer potential σ_{μ} on the boundary. The solution in the domain and on the boundary can then be found by direct integration using equations (11a) and (11b). The Matlab/Freemat routine libem2_indirect.m carries out the same function as libem2, but uses the direct method.

libem2_indirect.m

```
% function [phi_D,phi_S,v_S] =
libem2_indirect(n_D,p_D,n_S,vertpts_S,elemvert_S,alpha_S,beta_S,f_S)
% Returns the solution phi_D at the n_D domain points p_D and at the
collocation points.
% The boundary is made up of n elements; vertpts lists the coordinates
% of the edges of the elements and elemvert lists the pairs of vertices
% that define each element. alpha_S, beta_S and f_S determine the
Robin boundary condition.

function [phi_D,phi_S,v_S]
=libem2_indirect(n_D,p_D,n_S,vertpts_S,elemvert_S,alpha_S,beta_S,f_
S)

% calculate the boundary density function sigma
% calculate L_SS, M_SS, Mt_SS and N_SS, the discrete form of the
operators for the collocation points
  [L_SS,M_SS,Mt_SS,N_SS]
=lbem2_on(n_S,vertpts_S,elemvert_S,true,true,true,true);
  Mt_SSplus=Mt_SS+eye(n_S)/2;
  M_SSminus=M_SS-eye(n_S)/2;
  mu=norm(Mt_SSplus)/norm(N_SS);
  matrix1=L_SS+mu*M_SSminus;
  matrix2=Mt_SSplus+mu*N_SS;
  for (i=1:n_S)
    matrix(i,:)=alpha_S(i)*matrix1(i,:)+beta_S(i)*matrix2(i,:);
  end
  sigma=matrix\f_S';

% calculate the solution on the boundary (often not necessary)
  phi_S= (L_SS+mu*(M_SS-eye(n_S)/2))*sigma;
  v_S=(Mt_SS+eye(n_S)/2+mu*N_SS)*sigma;

% calculate L_DS, M_DS, the discrete form of the operators for the
domain points
% dummy values set to vecp_D, since it is not used
  for (i=1:n_D)
    vecp_D(i,1)=1;
    vecp_D(i,2)=0;
  end
  [L_DS,M_DS,Mt_DS,N_DS]
=lbem2(n_D,p_D,vecp_D,n_S,vertpts_S,elemvert_S,false,true,true,false,f
alse);

% calculate the solution at the domain points
  phi_D=(L_DS+mu*M_DS)*sigma;
```

Weighting parameter

The value of the weighting parameter μ is arbitrary from the mathematical point of view. However, from the computational point of view, we need to avoid the equation becoming close to a first kind equation (that is if μ is small for the Dirichlet boundary condition) and we also want to avoid similar issues arising if we solve over something close to the *N* operator (that is if μ is large for the Neumann boundary condition).

The "size" or norm of the relevant matrices must also be taken into account when choosing a value for μ. A reasonable choice would therefore seem to be to choose a value of μ that balances the relevant matrices and therefore the relative contribution from the two underlying formulations. Out of the four matrices in the boundary solution, only $\mathbf{N}_{SS}$ has the property such that its norm is inversely proportional to the size of the panels; the norms of the other matrices stay approximately the same as the boundary panels become smaller. Hence in libem2 and libem2_indirect the underlying contributions from the two integral equations are balanced through applying the following values for μ:

$$\mu = \frac{\left\| \mathbf{M}^{t}{}_{SS} + \frac{1}{2}\mathbf{I} \right\|}{\left\| \mathbf{N}_{SS} \right\|} \quad \text{for the direct method and}$$

$$\mu = \frac{\left\| \mathbf{M}_{SS} + \frac{1}{2}\mathbf{I} \right\|}{\left\| \mathbf{N}_{SS} \right\|} \quad \text{for the indirect method.}$$

X. TEST PROBLEM AND RESULTS

Finally the direct and indirect boundary element methods are applied to a test problems and the results are observed. The test problem consists of a square with vertices (0,0), (0.1,0), (0.1, 0.1) and (0.1,0), as illustrated already in figure 4. The boundary condition is defined as illustrated in figure 5. A computational solution is sought at the points (0.025,0.025), (0.025,0.075), (0.075,0.075), (0.075,0.025) and (0.05,0.05), also illustrated in Figure 5.

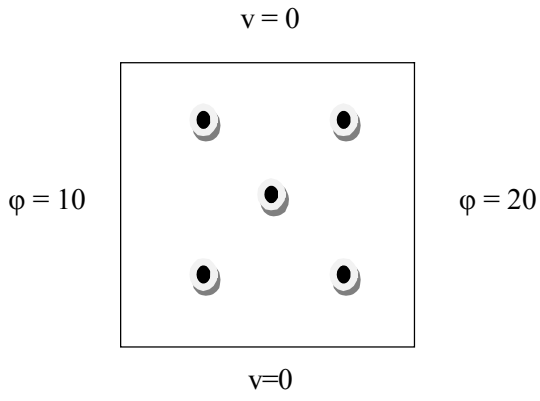

Figure 5. Boundary conditions and points where the solution is sought.

The exact solution to Laplace's equation in the domain for the problem described in figures 4 and 5 is φ=10+100*x*, so at the two points on the left φ=12.5, at the point in the middle φ=15 and at the two points on the right φ=17.5.

The program for computing the solution using the direct method is listed.

interiorsquaretest.m

```
% function [phi_D,phi_S,v_S] = interiorsquaretest
% Returns the solution phi_D, the solution at the domain points, phi_S
and v_S,
% the solution on the boundary. The boundary is defined internally by
% calling 'square' and the points are defined by calling 'points'.
function [phi_D,phi_S,v_S]= interiorsquaretest
[vertpts,elemvert]=square
% boundary condition
a(1:8)=1;
a(9:16)=0;
a(17:24)=1;
a(25:32)=0;
b(1:8)=0;
b(9:16)=1;
b(17:24)=0;
b(25:32)=1;
F(1:8)=10;
F(9:16)=0;
F(17:24)=20;
F(25:32)=0;

% interior points
points=[ 0.025, 0.025; 0.025, 0.075; 0.05, 0.05; 0.075, 0.025; 0.075,
0.075];

% computer phi_D, phi at the interior points and phi_S,v_S, phi and v on
the boundary
[phi_D, phi_S,v_S] =libem2(5,points,32,vertpts,elemvert,a,b,F);
```

For the indirect method we have the following program.

interiorsquaretest_indirect.m

```
% function [phi_D,phi_S,v_S] = interiorsquaretest_indirect
% Returns the solution phi_D, the solution at the domain points, phi_S
and v_S,
% the solution on the boundary. The boundary is defined internally by
% calling 'square' and the points are defined by calling 'points'.
function [phi_D,phi_S,v_S]= interiorsquaretest_indirect
[vertpts,elemvert]=square
% boundary condition
a(1:8)=1;
a(9:16)=0;
a(17:24)=1;
a(25:32)=0;
b(1:8)=0;
b(9:16)=1;
b(17:24)=0;
b(25:32)=1;
F(1:8)=10;
F(9:16)=0;
F(17:24)=20;
F(25:32)=0;

% interior points
points=[ 0.025, 0.025; 0.025, 0.075; 0.05, 0.05; 0.075, 0.025; 0.075,
0.075];

% computer phi_D, phi at the interior points and phi_S,v_S, phi and v on
the boundary
[phi_D,phi_S,v_S] =libem2_indirect(5,points,32,vertpts,elemvert,a,b,F);
```

The results from the two methods are given in table 1.

TABLE I
COMPUTED AND EXACT RESULTS FOR SQUARE

point	exact	direct	indirect
(0.025,0.025)	12.5	12.4709	12.4891
(0.025,0.075)	12.5	12.4709	12.4891
(0.05,0.05)	15	15.0008	14.9939
(0.075,0.025)	17.5	17.5306	17.4927
(0.075,0.075)	17.5	17.5306	17.4927

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TRAINING SKILLS GAP REPORT 2008: Meeting construction demand for skills in Pennine Lancashire 2008-2011, and breaking down the barriers of worklessness

Academic Report: AR-08-15

Andrew Weston and Andrew Platten[1]

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TRAINING SKILLS GAP REPORT 2008: Meeting construction demand for skills in Pennine Lancashire 2008-2011, and breaking down the barriers of worklessness

Andrew Weston and Andrew Platten[1]

Academic Report AR-08-15. East Lancashire Institute of Higher Education, Blackburn, UK.

I. INTRODUCTION

1.1 Aims of the Report

This report was commissioned by Elevate, one of the government's nine Housing Market Renewal Pathfinders, with LSC funding. The aim of the report is twofold: Firstly it aims to update predictions for training needs that were originally made in the *2005 F-Squared Report*, by estimating projected work force needs for construction until 2011 within Pennine Lancashire. Through the updating of this data Elevate will be able to better target training needs and ensure that the uptake of local labour is maximised by having people with the relevant skills ready to fill vacancies as they arise.

Secondly, the report aims to highlight barriers preventing workless people from accessing construction jobs in Pennine Lancashire and use the findings of the research to suggest potential routes for overcoming these barriers.

The specific objectives of the study are as follows:

- To review the true impact of construction investment over the period 2005 – 2008;
- To identify changes and future adaptations to the skills prediction issue;
- Review and update the construction investment from all sectors for the period 2008 – 2011;
- To develop predictions for new jobs, trainees and trades allocations resulting from the investment plan and to test this plan against local projects;
- To identify the barriers facing under-represented groups and to source methods to overcome them;
- To identify employer requirements for new provision including placements, mentoring and candidate preparation and trail work experience for
- disconnected communities including workless persons;
- To provide a forward plan to meet the training needs using local provision.

1.2 Focus of the Research

The research for this report has drawn together information from a variety of sources and aimed to take into account the points of view of the various parties involved in the construction industry, the construction training sector and agencies providing benefits for the workless.

Interviews were carried out with the heads of construction for the three colleges in Pennine Lancashire: Blackburn, Burnley and Accrington & Rossendale.[2] In addition a series of meetings were conduced as focus groups to investigate the questionnaire outcomes and overall direction of the study. Additional information regarding training and course provision was supplied through meetings with the director of the Pennine Lancashire Construction and Education Consortium.

To gather an employer perspective regarding worklessness and training, interviews were carried out with a number of small local firms who currently provide places for apprentices as well as the larger contractors who undertake Elevate projects and other major construction contracts in the area. Further to this, interviews were conducted with people working for Jobcentre Plus in Lancashire and a survey was conducted with workless people through Accrington Jobcentre Plus. An extensive background study was conducted through a variety of literature and online sources; in particular looking at general and national research into the workless agenda.

[1] Constructing the Future, Elevate East Lancashire, Suite 22 The Globe Centre, St. James Square, Accrington, Lancashire, BB5 0RE. www.elevate-eastlancs.co.uk

[2] See Appendices I, II and III.

II. INVESTIGATING TRAINING SKILLS GAPS

2.1 The Need For Predicting The Training Skills Gap

By ascertaining the current levels of construction employment in the region, and comparing this to the estimated number of construction workers that will be needed; it is possible to calculate potential gaps in the construction workforce. This 'training skills gap' can then be used in cooperation with colleges to ensure that areas most in need of workers are targeted for training in order for the local workforce to better fulfil the needs of investment. Through this, social and economic benefits to the local region from large-scale investments can be maximised.

There is a necessity to update the F-Squared report because many Elevate projects are just beginning or are due to start in the next three years. Since F-Squared was published in 2005, projects have been held back by planning and slowed rates of demolition. However, these problems have largely been resolved and the core building work is now commencing in the sub-region.

2.2 Previous Investigations

This report provides an update on the investigations undertaken in 2005, which through the F-Squared paper projected the number of workers needed by developing a coefficient to calculate the number of construction workers per £1million spent. From this, F-Squared proceeded to calculate the potential number of apprentices that could be comfortably supported on typical construction sites.

Projections for construction investments and future skills gaps for the industry are obtainable on a national and regional level through research by the *Construction Skills Network*. The latest report from Construction Skills gives projections for the number of employees needed for the period 2008 to 2012. Projections are given of the total number of construction workers expected to be needed and the potential training needs over the next few years. The projections for Lancashire are given in table 2.1.

However, unlike the F-Squared report of 2005, the Construction Skills report does not focus on Housing Market Renewal projects, nor does it breakdown statistics to a small enough sub-region level to give the localised data sought by this research. Nevertheless, it stands as an interesting indicator of the extent of construction investment in the North West, which provides one of the significant concentrations of construction activity in the UK. Taking into account the high levels of spend outlined in the Construction Skills data, the findings of this report seem a little cautious; yet it must be kept in mind that the coefficients used by Construction Skills are different to those used for this report, calculating for 25 employment areas in the Construction Skills estimations of workers, compared to 16 in this and the F-Squared report. In addition to this, the Construction Skills report makes projections on increasing investment year on year whereas this report assumes a set level of minimum investment over the three year period and a maximum investment level, which allows for a rough estimation of trade needs.

Sub-regional forecast for the whole of Lancashire. Data from Construction Skills Network; February 2008.

Table 2.1: Generic Lancashire Skills Data

Total employment by occupation	Actual 2006	Forecast		Annual recruitment requirement
		2008	2012	
Senior and executive managers	120	130	140	<10
Business process managers	1,170	1,230	1,270	40
Construction managers	4,720	4,960	5,200	140
Office-based staff (excl. managers)	5,210	5,470	5,680	140
Other professionals/technical staff and IT	1,310	1,480	1,450	20
Wood trades and interior fit-out	7,030	7,480	8,090	270
Bricklayers	2,370	2,490	2,720	160
Building envelope specialists	2,190	2,300	2,500	150
P&D	3,280	3,440	3,750	100
Plasterers and dry liners	1,630	1,680	1,810	50
Roofers	780	840	910	40
Floorers	1,130	1,190	1,270	20
Glaziers	1,630	1,670	1,720	30
Specialist building operatives (not elsewhere classified)	750	820	840	20
Scaffolders	500	530	580	20
Plant operatives	660	720	720	20
Plant mechanics/fitters	1,010	1,050	1,000	50
Steel erectors/structural	790	830	870	20
Labourers n.e.c.	2,590	2,760	2,900	30
Electrical trades and installation	5,010	5,290	5,670	230
Plumbing and HVAC trades	3,840	4,060	4,490	90
Logistics	960	990	1,140	10
Civil engineering operatives n.e.c.	1,440	1,470	1,670	50
Non-construction operatives	6,780	6,820	5,450	0
Construction professionals and technical staff	8,250	10,680	11,400	440
Total (SIC 45)	**56,900**	**59,700**	**61,840**	**1,710**
Total (SIC 45 and 74.2)	**65,150**	**70,380**	**73,240**	**2,150**

In order to provide a greater degree of confidence in the forward projections, Construction Skills have invested in the Construction Skills Academies across England. The academies will set targets for local and regional employers and report data back to Construction Skills to aid future skills network projections. These, in turn, will inform LSC funding. In Pennine Lancashire, three regional skills

academies are in the process of being established, including BSF, Elevate and a heritage skills pilot.
In 2004, The University of Salford produced a report concerning the East Lancashire training skills gap. This report focused on the ability of local training provision to provide sufficient workers to meet the growing demand for construction workers in the sub-region. The report concluded that in the short term, Elevate projects were likely to be reliant upon professional help and companies from outside of the East Lancashire sub-region, but that in the longer term, with training properly tuned to the needs of the projects, an increasing number of local workers would raise the profile and development of the local construction industry.[3] This report will take into account these conclusions and analyse how far the problems have been redressed to date.

2.3 How To Predict Skills Needs In Construction For Pennine Lancashire?

This report has taken projected Elevate investments from 2008 until 2011 and developed two scenarios of combined investment from Elevate and private investors to give an optimistic and a pessimistic forecast for construction spend. The coefficients developed for F-Squared have then been applied to calculate the approximate number of construction workers needed and breakdown these approximations into trade areas.
Due to the fact that private investment may vary each year, because of numerous factors, relating to the start and completion dates for projects in planning, the projection in this report can only be an approximation. To give the most informed approximation possible, this report will calculate the number of workers by trade needed using a generic data coefficient and sample data coefficient applied to an average investment and then take figures half-way between the two sets of coefficient data.

2.4 Heritage and Modern Methods of Construction Skills Predictions

It is important to acknowledge here that the estimations for the number of workers only take into account the trades listed in the breakdown of trade areas, and therefore make no allowances for heritage skills work or work using environmental technology or skills specific to Modern Methods of Construction.
To give some estimation for Heritage Skills needs a set of coefficients has been developed using the FSquared coefficients to estimate how many workers may be used on heritage refurbishment in Pendle over the next three years.

[3] Pp. 50-51. *East Lancashire Training Gap Analysis Report,* (Salford, 2004)

Of the 85,000 dwellings in the Elevate HMR area, some 41% are constructed before 1919 which represent a key demand for appropriate design solutions and a skills need on site, which to date has yet to be fully realised and that is having an impact on the progression of appropriate standards. This observation has previously been reported by Guthrie and Platten (2007).
The calculations given in this report for heritage skills concentrate on refurbishment spend for Pendle, but there is likely to be some need for heritage skills in other areas of Pennine Lancashire. In this case the coefficient omits civils and steelwork factors and increases the weighting for traditional trades. This is based upon the Elevate work specifications and approximately allocations of funding per trade. The Elevate refurbishment spend in Pendle will be approximately £1,600,000 in 2008/09; £4,600,000 in 2009/10; and £3,800,000 in 2010/11. In addition there is projected to be £5,000,000 of additional investment over the three-year period; approximately £1,700,000 per year. As there are fewer trade areas the coefficients were doubled and an average taken so as to keep the worker output closer to that taken when developing the FSquared coefficients.

Table 2.2: Heritage Trades Demand

Trade area	Coefficient	2008-09	2009-10	2010-2011	Total
Wood trades	3.98	13.1	25.1	21.9	60.1
Bricklayers	4.44	14.7	27.9	24.4	67.0
Plasterers	1.23	4.1	7.8	6.8	18.7
Roofers	0.71	2.3	4.5	3.9	10.7
Floorers	0.39	1.3	2.5	2.1	5.9
Glaziers	0.61	2.0	3.8	3.4	9.2
Other Build. ops	0.65	2.1	4.1	3.6	9.8
Scaffolders	0.29	0.9	1.8	1.6	4.3
GCO	1.55	5.1	9.8	8.5	23.4
Total	**13.85**	**45.6**	**87.3**	**76.2**	**209.1**

Due to the untried and broad assumptions being made to create the above calculations, it has been decided not to enter these statistics into general calculations for demand so as to keep the skills gap prediction as accurate as possible.
The following section shows optimistic and pessimistic projections using both the generic and sample data coefficients. From these different projections, halfway figures are then given to present an overall estimation.

	Item Costs[1]	Coefficient[2]	Number of Operatives[3]	Number of Apprentices[4]	Total number of apprentices generated by investment[5]
Joinery	3568.10	0.1012	1.3659	0.1366	4.9171
Timber Frame	7877.00	0.2234	3.0153	0.3015	10.8551
Roofing	986.63	0.0280	0.3777	0.0378	1.3596
Kitchen Fitting	894.81	0.0254	0.3425	0.0343	1.2331
Roof Tiling	974.00	0.0276	0.3728	0.0373	1.3422
Plumbing & Heating	3294.00	0.0934	1.2609	0.1261	4.5394
Electricals	1250.00	0.0354	0.4785	0.0478	1.7226
Walling Tiling	270.85	0.0077	0.1037	0.0104	0.3733
Plastering	2884.00	0.0818	1.1040	0.1104	3.9744
Painting & Decorating	844.00	0.0239	0.3231	0.0323	1.1631
PVCu	1834.57	0.0520	0.7023	0.0702	2.5282
Scaffolding	1389.00	0.0394	0.5317	0.0532	1.9141
General Ops	1145.68	0.0325	0.4386	0.0439	1.5788
Brickwork	3149.00	0.0893	1.2054	0.1205	4.3396
External Works	4905.00	0.1391	1.8776	0.1878	6.7594
Total	35,266.64	1.0000	13.5000	1.3500	48.6000

A further outcome of this study relates to the development of data that can predict sustainable construction trades such as low carbon building services installations and modern methods of construction (MMC). Elevate is instigating plans for new build activities which have commenced early in 2008, wherein all new buildings will be built to the Code for Sustainable Homes. In effect the main construction method will transfer from cavity brick and blockwork to a timber framed solution. Using the Elevate specifications for new build work, a series of tentative employment coefficients are proposed. Due to the early stage of the Elevate new build work it is too early to validate the values proposed, however it is clear that the adoption of the Sustainable Homes code will have a significant impact upon employment patterns and thereby the demand for training and apprentices.

Notes:

1. Costs estimated from typical construction costs for a timber framed dwelling
2. Weighting of spend for each category
3. Determined as a proportion of spend assuming 13.5 operatives employed per £million spend
4. Assumed to be 10% of workforce
5. total number generated for estimated combined public and private sector investment

The above figures are based upon an investment of £36 million per annum for new build domestic building, totalling public and private sector investment. The data shows a significant annual demand for timber framed production and erection. The plumbing and electrical figures are as noted but it is not possible to predict the exact nature of this demand with regard to specialist provisions.

For the main body of this report the heritage and MMC skills predictions are not taken forward, but the study presents a basis upon which to consider new areas of training demand.

2.5 Professional and Supervisory Skills

The demand for higher level is an acknowledged element of the skills prediction for the construction industry. This is evident in figure 2.1 discussed previously. Through recent projects there are acknowledged gaps wherein project supervisors who are currently employed do not hold the necessary qualifications to obtain an appropriate CSCS card or employers have simply been unable to attract new candidates to posts created. The Pennine Lancashire consortium have previously presented proposals to provide developments in this area. As part of these investigations Elevate commissioned and published studies to report the evident skills gaps (Guthrie and Platten (2007)). In this study the lack of accredited and a nationally recognised degree programme in construction management in the sub-region was noted. This was compounded with no degree level provision in studies such as Quantity

Surveying or Building Services. For many candidates studying out of the sub-region in either Bolton or Preston are not feasible due to travel distances or family commitments. The outcomes reflect the Salford University study from 2004. Using the criteria adopted by Construction Skills for the county then Pennine Lancashire should exhibit approximately 1/6th of the totals reported in table 2.1. This would give rise to 20 senior managers, 197 business process managers, approximately 800 construction managers, 880 administration staff and 221 other professional staff. How this profile translates to prospective new trainees is difficult to predict as an acknowledged trainee level is not evident for the sector. It was clear from the 2007 study that local companies did express a need for skills development and were investing in training, but often this was at a level far short of acknowledged levels. A total of some 50 places were supported by local employers for a possible September 2007 start, which demonstrates a significant demand and one that is not present in the local tertiary institutions.

III Future Projections For Construction In Pennine Lancashire

3.1 Construction Projections - Calculating Projected Investment

Elevate has secured investment for the next three years, being allocated a budget of £50,000,000 per year. For the purposes of this report it has been assumed that of all investments, ten per cent will be spent covering overheads and administrative costs; making the Elevate construction investment £45,000,000 per year.

When the F-Squared report was made in 2005, it made calculations on the assumption that Elevate investment would be fifty per cent of the total construction investment in East Lancashire, and that fourteen per cent of the total investment would be accounted for by Housing Market renewal projects.[4] In terms of spend, this report will look at three scenarios; one with a pessimistic investment where Elevate spend will make up half the total investment, and where Elevate spend will make up just a quarter of total investment and a final scenario taken midway between the other two. Therefore, taking into account overheads, the pessimistic scenario would see a construction spend of £270,000,000 over the next three years, whereas the optimistic scenario would see a construction spend of £540,000,000. From these figures we can assume an average investment of £135,000,000 per annum or £405,000,000 from 2008-2011.

These figures can be compared with the investments predicted in the recent Construction Skills Network report (2008), which states there was £8.3billion of construction output for the whole North West in 2006, set to increase by 1.4% per year until 2012.[5] The Construction Skills report cannot be compared directly with this report as it makes predictions until 2012 and makes projections for larger areas; drawing on information from the whole of Lancashire as a sub-region, not just Pennine Lancashire. Furthermore, as previously stated, Construction Skills have developed their own coefficients which require a great deal more specific detail on investments and take into account *all* construction spend, from householder spend and small individual refurbishments to large scale projects such as Building Schools for the Future. Again, it should be noted that the predictions in this section are limited to traditional employment coefficients.

3.2 Calculating Skills Needs

The F-Squared report used two coefficients to calculate construction skills needs from the projected spend figures. The first was acquired through generic data from general projects nationwide and the second through sample data from specific projects in northern England. From the two sets of calculations, a third breakdown of construction skills needed was calculated from these two estimations by taking figures between the two sets of data.

This report has done the same, using the generic data coefficients and the sample data coefficients to calculate a third, average figure. As the following tables show, the calculations were done for both the pessimistic and optimistic investment scenarios.

It must be noted that the adoption of the predictive coefficients constrains the projection to a traditional skills set of data and will not reference any new or emerging skills relating to modern methods of construction or sustainable technologies, for example.

3.3 Data and Labour Coefficients

Average number of construction trade employees by trade per £1,000,000 of construction spend is shown in table 3.1.[6]

Table 3.1: Project Investment Data

[4] Pp. 17. *Joint Investment Plan for East Lancashire, "FSquared Report"* (2005)

[5] Pp. 6-8. *Construction Skills Network: Labour Market Intelligence 2008-2012 for North West*, (2008)

[6] Table of coefficients from pp28. *F-Squared Report*. (2005)

Trade (Average number)	No. per £1m (generic data)	No. per £1m (sample data)
Wood trades	3.06	0.92
Bricklayers	1.26	3.18
Painters & Decorators	0.91	0.57
Plasterers	0.43	0.80
Roofers	0.43	0.28
Floorers	0.50	0.28
Glaziers	0.41	0.20
Other specialist building operatives	0.43	0.86
Scaffolders	0.30	0.27
Plant Operatives	0.39	0.12
Plant mechanics / Fitters	0.19	0.02
Steel erectors / structural	0.26	0.19
Other civil engineering operatives	1.00	0.54
General operatives	0.86	2.24
Electricians	1.72	0.54
Plumbers	1.29	0.49
Totals	13.45	11.52

The above coefficients are as they appear in the F-Squared report and have been applied to the two scenarios that follow.

NB. *With the above figures, as with later figures, where the totals do not quite tally this is due to rounding up or down of figures during calculations.*

By taking the average of the generic and sample data coefficients, this table shows the number of workers needed for the pessimistic projected investment of £90million per annum; £270million for 2008-2011.

By calculating the average of generic and sample data coefficients showing the number of workers for an optimistic projected investment of £180million per annum and a total of £540million is predicted for the period 2008-2011 (table 3.2).

From the tables we can comfortably say that the increased investment in construction periods over the next three years in Pennine Lancashire will create between 3371 and 6742 employment opportunities. There is clearly a large difference between these two approximations and this is obviously due to the large gap between the two investment scenarios. To give a single estimation for the number of construction jobs and the breakdown by trades, another table has been calculated and is displayed in the table 3.3a that follows

Table 3.2: Generic, Sample and Average Employment Data

	Generic data		Sample data		Average data	
Trade area	**Per year**	2008-2011	**Per year**	2008-2011	**Per Year**	2008-2011
Wood trades	275.4	826.2	82.8	248.4	179.1	537.3
Bricklayers	113.4	340.2	286.2	858.6	199.8	599.4
P&D	81.9	245.7	51.3	153.9	66.6	199.8
Plasterers	38.7	116.1	72.0	216.0	55.4	166.1
Roofers	38.7	116.1	25.2	75.6	32.0	96.0
Floorers	45.0	135.0	25.2	75.6	35.1	105.3
Glaziers	36.9	110.7	18.0	54.0	27.5	82.4
Other Building Operatives	38.7	116.1	77.4	232.2	58.1	174.2
Scaffolders	27.0	81.0	24.3	72.9	25.7	76.9
Plant Operatives	35.1	105.3	10.8	32.4	23.0	69.0
Plant mechanics/fitters	17.1	51.3	1.8	5.4	9.5	28.5
Structural/steel erectors	23.4	70.2	17.1	51.3	20.3	60.8
Civil engineering	90.0	270.0	48.6	145.8	69.3	207.9
General Operatives	77.4	232.2	201.6	604.8	139.5	418.5
Electricians	154.8	464.4	48.6	145.8	101.7	305.1
Plumbers	38.7	116.1	44.1	132.3	80.1	240.3
Total no. workers	**1210.5**	**3631.5**	**1036.8**	**3110.4**	**1123.7**	**3371.0**

Table 3.3a: Employment Data

	Generic data		Sample data		Average data	
Trade area	**Per year**	2008-2011	**Per year**	2008-2011	**Per Year**	2008-2011
Wood trades	550.8	1652.4	165.6	496.8	358.2	1074.6
Bricklayers	226.8	680.4	572.4	1717.2	399.6	1198.8
P&D	163.8	491.4	102.6	307.8	133.2	399.6
Plasterers	77.4	232.2	144.0	432.0	110.7	332.1
Roofers	77.4	232.2	50.4	151.2	63.9	191.7
Floorers	90.0	270.0	50.4	151.2	70.2	210.6
Glaziers	73.8	221.4	36.0	108.0	54.9	164.7
Other Building Operatives	77.4	323.2	154.8	464.4	116.1	348.3
Scaffolders	54.0	162.0	48.6	145.8	51.3	153.9
Plant Operatives	70.2	210.6	21.6	64.8	45.9	137.7
Plant mechanics/fitters	34.2	102.6	3.6	10.8	18.9	56.7
Structural/steel erectors	46.8	140.4	34.2	102.6	40.5	121.5
Civil engineering	180.0	540.0	97.2	291.6	138.6	415.8
General Operatives	154.8	464.4	403.2	1209.6	279.0	837.0
Electricians	309.6	928.8	97.2	291.6	203.4	610.2
Plumbers	232.2	696.6	88.2	264.6	160.2	480.6
Total no. workers	**2421.0**	**7263.0**	**2073.6**	**6220.8**	**2247.3**	**6741.9**

The two previous scenarios can be used to form a third, middle-way scenario. By taking a sum of investment half-way between the pessimistic and optimistic scenarios, and using the same criteria as above of calculating an average coefficient from the generic and sample data, another set of figures for construction trades can be calculated (see table 3.3b).

Table 3.3b: Predicted employment data

Trade	Number of employees per year @ £135,000,000 investment	Number of employees 2008-2011. Total spend of £405,000,000
Wood trades	268.7	805.9
Bricklayers	299.7	899.1
P&D	99.9	299.7
Plasterers	83.0	249.1
Roofers	47.9	143.8
Floorers	52.7	157.9
Glaziers	41.2	123.5
Other Building Operatives	87.1	261.2
Scaffolders	38.5	115.4
Plant Operatives	34.4	103.3
Plant mechanics/fitters	14.2	42.5
Structural/steel erectors	30.4	91.1
Civil engineering	104.0	311.9
General Operatives	209.3	627.8
Electricians	152.6	457.7
Plumbers	120.2	360.5
Total no. workers	**1685.5**	**5056.4**

From this table we can give an approximation of skills needs in Pennine Lancashire over the next three years. For example, the calculations reveal that there is likely to be a demand for around 806 wood trade workers, approximately 269 a year.

It can also be seen that with the large-scale construction investment in Pennine Lancashire, there will be 1686 construction jobs created per year, totalling 5056 over the three-year period from 2008 to 2011.

3.4 Training Skills Gaps and Demand

In order to ascertain what level of a skills gap exists in Pennine Lancashire it is necessary to understand what skills already exist within the workforce. Evaluating this is problematic as the constantly changing face of the workforce and the mobility of workers in Lancashire, who often travel throughout the region to work and even outside of it, make defining an accurate figure difficult.

Data held by Elevate puts the number of construction employees in the North West region at 151,050, 5% of the workforce. In the Pennine Lancashire sub-region in 2004 the figure is given as 10,967, 5.9% of the workforce and therefore less than 10% of construction workers in the North West. These figures are supported by census data from 2001, available in the public domain.

Though these figures reveal something of general construction employment in the region, it is not possible to know what areas of construction these people work in and therefore it is not possible to comment on what skills exist in the sub-region. This, inevitably, makes calculations of future skills shortages hard to predict.

Nevertheless, by making a number of assumptions it may be possible to reveal projections for future skills shortages through the data calculated above. If we assume that the 10,967 people "in construction employment, 2004" are engaged in construction work through self-employment or current construction demand, and we also assume that the majority of the £405,000,000 projected investment over the next three years will be additional to investments currently impacting on the construction industry, then it is not wholly unreasonable to take the projected trade needs figures, previously displayed above, as approximate skills shortages. This works on the assumption that the projected investment will be additional to the money currently employing construction workers. If we take into account the fact that Building Schools for the Future (BSF) alone will bring an investment additional to Elevate's of some £250,000,000 to Lancashire, then such an assumption seems entirely feasible.[7]

Therefore we could take the projected skills need of approximately 300 bricklayers per year as a skills need for Pennine Lancashire. Although this may seem like a lot, it must be remembered that there are over 150,000 construction workers in the North West and as an industry the labour force tends to be transferable and work across a region. Furthermore, the three local colleges of Blackburn, Burnley and Accrington & Rossendale train approximately 30 brickwork students each year who enter the industry, and in excess of 100 students, when counting all construction apprentices, enter the construction industry each year.

Numerous factors must also be taken into account when considering the quantity of available workers in Pennine Lancashire. Firstly, a bricklayer in Blackburn may take up work in Burnley but they may equally take work in Preston, Bolton or even Manchester – outside of the East Lancashire region. Likewise, those who live in Borough Councils outside the Elevate area may find their work predominantly in Pennine Lancashire. A second factor that needs to be considered is that each year a number of construction workers will leave the industry for various reasons.

In conclusion, the best estimation we can give of skills requirements arises from the raw calculations of trade needs from projected investment. It therefore stands that 'wood trades', 'bricklayers' and 'General Operatives' will be the construction skills areas most in demand over the next three years (see table on pp. 21). Through conversations and liaisons with employers in the construction industry, these would appear to be accurate trends. In the interviews held with several small, medium and large construction companies it was revealed that within there exists a constant and growing demand for carpenters, joiners and bricklayers. Plumbing and electrical were also highlighted by some companies. Ibbotson a local contractor for example drew attention to the fact that there are few roofers in Pennine Lancashire, forcing themselves and other contractors to sub contract this work to people outside the local area. Compounding this shortage is the fact that none of the three local colleges currently provide roofing courses, therefore the trend of contracting outside of Pennine Lancashire for roofers cannot be reversed.

Medium and large company representatives who were interviewed highlighted a steady demand for general construction operatives; paving, drainage, curbing and flagging. In one interview a particular issue regarding general construction operatives was revealed as there being few workers in this area of employment who possessed formal training or real depth of experience in their line of work; in particular an example was cited of someone skilled in flagging but having no experience of curbing.

Table 3.4: **Number of apprentices completing courses in Pennine Lancashire for the academic year 2006-2007.**

Trade area	NVQ II	NVQ III	Total numbers of apprentices per year
Brickwork	55	25	80
Carpentry & Joinery	75	59	134
Painting & Decorating	23	8	31
Plumbing	66	54	60
Electrical	34	20	54
Floor covering	14	6	20
Plastering	29	21	50
Total	**296**	**193**	**429**

The interviews support the findings of the data calculated by the coefficients. The highest demand areas will be GCO, wood trades, bricklayers, electricians, plumbers and lastly civil engineers. A particular concern regarding civil engineers is that in recent years the local area, and the nation as a whole, has had a poor turnover of higher education students trained in construction related areas.[8]

It is possible to narrow down the projected figures of a trade skill gap by taking into account the impact of yearly training output from the three local colleges.

The previous table (table 3.4) shows the number of students who completed apprenticeships at NVQ Level II and III in 2006 to 2007. The final column of the table

[7] £250million for the building of nine schools in Lancashire to be completed by 2010; the projects are currently delayed. *National Skills Academy for Construction Project*. (Jan, 2008)

[8] Demand for HE qualified construction workers in the area can be found from evidence gathered by *Construction Skills Network*.

assumes that there is a steady number each year, and totals the number of apprentices. Therefore the numbers in the final column give an estimate of the numbers from each trade entering the industry and taking up work each year from colleges.

If we assume that the number of students completing apprenticeships each year remains the same, we can subtract this number from the projected training needs previously calculated. *See following table:*

Table 3.5: Final approximations of projected skills gap per year, and 2008-2011.

Trade Area	Projected training need Per year	Projected college apprentices	Final Projected skills gap	Skills Gap 2008-2011
Brickwork	299.7	80	219.7	659.1
Carpentry & Joinery	268.7	134	134.7	404.1
Paint & Deco	99.9	31	68.9	206.7
Plumbing	120.2	60	60.2	180.6
Electrical	152.6	54	98.6	295.8
Floor covering	52.7	20	32.7	98.1
Plastering	83.0	50	33	99
Remaining trades	*559.1*	*0*	*559.1*	*1677.3*
Total	**1683.8**	**429**	**1139.6**	**3620.7**[9]

Using the number of college apprentices that left college in 2006-2007, the final number of projected workers that will be needed in Pennine Lancashire over the next three years can be estimated at 3,621. It must be remembered that this is an approximation and that the apprenticeship numbers themselves are likely to increase over the course of the next three years, not least because the government has set a target of trebling the number of apprentices nationally.[10] Furthermore, Burnley and Blackburn College are both set to move to new sites, which will develop their facilities and potential capacities. New courses such as General Construction Operatives beginning this year at Accrington & Rossendale, and the planned introduction of Heritage Skills training into the sub-region, are also likely to have some impact on the local skills gap.

The figures concerning apprentices show that colleges will be helping more than 420 trainees into construction a year. In addition to this, colleges provide other construction courses but apprentices are the only construction students more or less guaranteed to find work because their experience and on-the-job training gives them a privileged starting place within the job market, not to mention that they will already be connected to an employer.

The figures themselves suggest that Pennine Lancashire needs to double its number of apprentices. According to data held by Elevate there are approximately 11,000 construction workers in the sub-region; if we take into account the findings of the F-Squared report which determined companies could employ ten apprentices for every 100 workers then there should be scope to support in excess of 1,000 apprentices in Pennine Lancashire. At present there are less than 500.

Yet it should be noted that the 492 apprentices taken into account in the calculations above do not constitute the entire compliment of construction students in Pennine Lancashire. According to figures gathered from the Pennine Lancashire Construction and Education Consortium, the number of construction students in the sub-region totals 1,297. In comparison to apprentices, it is not possible to make reasonable assumptions as to where the students go after completing their course. In general, almost all apprentices find a job in the construction industry whereas those who do not have the job experience and high-level qualifications of an apprenticeship do not have the same employment opportunities. Therefore we can only say that of 1,297 students in Pennine Lancashire, 492 definitely enter the industry (through the apprenticeship route), approximately 296 1st year students will move into apprenticeships but that 509 students are not accurately traceable. It is inevitable that some of these 509 will perhaps decide to pursue a different career path or field of study, just as it is feasible to say that they will go on to find low skilled or self-employed work within the construction industry. Equally there is the likelihood that some of these students will continue in the education system at various levels until the age of 19 when they enter the job market and welfare state.

At present the colleges in Pennine Lancashire are training around 1,300 students per year which is their current capacity for staffing and facilities.[11] According to the study, the demand for future workers stands at 1,684 per year. If all students were able to progress successfully through their programmes and to be trained to apprentice level there would still be a skills gap of 384 workers. This gap is relatively small. A question can therefore be posed as to whether the vast majority of demand for workers could be provided for by those candidates currently entering and progressing through the education system? This itself poses another question; if training were to concentrate on transforming the 1,300 students into more highly skilled and experienced workers, through

[9] NB. Figures appear slightly altered due to rounding up and down of previous calculations given on pp. 19.

[10] Government targets and proposals for sustainable construction practices and training are laid out in *Draft strategy for sustainable construction: Consultation paper July 2007,* Department for Business, Enterprise and Regulatory Reform. (London, 2007)

[11] See breakdown of construction students in Pennine Lancashire by college and trade in Appendix VII.

apprenticeships, would this have a similar impact in the long term to focusing on training workless adults?

In order to guarantee a greater ratio of students taking up construction employment it might be argued to use the capacity of colleges to train every student to ensure a 100% progression to a successful NVQ award. However, there are numerous factors that mean this is not possible. Of the 509 students not involved in apprenticeships, some will be adults, some will decide they have no desire to pursue a career in construction, some will progress to a construction career without completing a formal qualification and others still will lack the academic abilities to complete the apprenticeship courses to a satisfactory level. To determine a precise figure for this level of attrition is impossible within the scope of this study.

If we were to state that the demand of the region requires the training of 1,684 apprentices per year then this poses the question of whether the region has the capacity to support such a level of training. As has been mentioned, the colleges are currently providing an educational experience for 1,300 students. However not all students will progress to an apprenticeship, many will take advantage of other exits or awards such as the foundation certificate or Intermediate Construction Award, in order to meet the needs of candidates with a varied range of educational abilities. The local education and training providers would need to increase their resources, especially to cater for first year apprentice study students who are in college five days a week; it must be noted that whilst second and third year students spend four days on-site as part of their education, a growth in their numbers requires a growth in the number of first year students and allowances for those who will not progress into second and third year students.

A second problem regarding local capacity is that of the ability for the local construction industry to be able to support so many apprentices; to go from 492 apprentices to in excess of 1,300 is effectively a trebling of apprentices. [12] As was previously stated, there are currently 11,000 construction workers in Pennine Lancashire suggesting that there is the possibility to support 1,100 apprentices. However, it is not unreasonable to take the future demand figures calculated in this report into account. Therefore, in 2008 to 2009, the number of workers in the region will grow by 1,684 to be approximately 12,684; this number will be added again in 2009-2010, making the total 14,368, and again in 2010-2011 so that the number of workers in the region by 2011 can be estimated at 16,052. This means, theoretically, that in 2008-2009 the region could support around 1,268 apprentices, in 2009-2010 around 1,437 apprentices and in 2010-2011 approximately 1,605 apprentices could be supported.

Table 3.6: Estimations of local employment and apprenticeships created.

	2008 / 09	2009 / 10	2010 / 11
Estimated no. of workers	12,684	14,368	16,052
Estimated no. of apprentices supportable by industry	1,268	1,437	1,605

There are numerous factors that mitigate against the closing of the skills gap by apprentices alone. Firstly, all the figures are merely based on estimations and assume continued growth. Secondly, the assumption is made that the F-Squared recommendation for local companies to support 10% of the workforce in apprentices, a figure not realised anywhere in the UK,[13] will be matched in Pennine Lancashire. Thirdly, it also assumes that the investments entering the sub-region will be used to grow local construction businesses and supply work to firms and apprentices in the local area, a factor that so far has not been realised on a large enough scale to date.

Finally, an assumption is being made that colleges are able to grow their apprenticeship course facilities, find and attract suitable candidates and link their students with the employers. Therefore, we can argue quite safely that sustainability relies upon the securing of regional investment money for the growth of local companies (through direct contracting or subcontracting of the numerous large-scale projects planned in Pennine Lancashire), a committed obligation of firms to use local labour and support local apprentices, the growth of colleges and training providers or the development of other routes to education, and finally continuing construction investment to Pennine Lancashire beyond the next three years of planned Elevate investment in the housing market.

In spite of all these questions and challenges, the fundamental point remains that the growth of investments for construction work in the Pennine Lancashire area will create continuing demand for construction workers over the next three years. The key challenge still remains, how can we most efficiently and effectively use this demand to

[12] It should be noted that this figure of trebling apprentice numbers, calculated using the projected demands proposed by this report, also matches the proposed government targets for apprentices.

[13] Roy Cavanagh, Chair for the North West Construction Skills Network.

benefit the local area and create a more sustainable future for the construction industry? Raising the skills of local people to meet the demand for construction workers locally is an important step in the right direction. The growing demand for construction workers has the potential to be used as a vehicle for growing the training and provision of apprentices within Pennine Lancashire, therefore raising the skills level; in addition we also need to ask how the demand for construction workers can help alleviate another pressing social issue in the area, through tackling worklessness and addressing the high numbers living on benefits.

IV Workless People into Construction

4.1 The Challenge Of Worklessness

The focus on tackling the 'workless agenda' in the UK is set to increase. The European Union has set targets for the period 2008-13 to instigate a reduction of those out of work and reliant on benefits.

In the UK the term 'workless' tends to refer to those over 19 and reliant on benefits. According to Labour Market Statistics from the *Labour Force Survey for all Persons* (Nov. 2007), there are 1,606,000 unemployed people in the UK with over 200,000 unemployed in the North West.[14] Breaking down statistics sub-regionally, the number of benefit claimants in Pennine Lancashire totals 6,647.[15]

Key to helping workless people off benefits and into employment is an understanding of the fact that every individual comes from a different set of circumstances and requires assistance to be tailored to their needs. As a 2006 report into worklessness in London states, "there is no universal model of intervention that will help all workless people".[16] This research will be mindful of this matter and seek to identify the numerous barriers and make educated insights into which barriers are most restricting to the general group of workless individuals in Pennine Lancashire. More specifically, it is the purpose of the research in this report to identify barriers and issues related to the construction industry to ascertain what can reasonably be done to make jobs in the construction sector more accessible to workless people. There is a need to make people on benefits "work ready" so that they can then make good use of job search and support resources that already exist.[17] This research will look at what impacts on workless people that make them unready for work and what can be done to remove such barriers.

As has been proven in the first part of this report, the investment in construction build in Pennine Lancashire is set to create a sizeable demand for workers. This presents a potential opportunity to use the demand for workers and growth of the construction industry in the area to help address the workless agenda.

4.2 General Barriers To Employment

The National Audit Office report: *Helping people from workless households into work*, (July, 2007) identifies that most people from workless households have multiple barriers to work.

The report of 2007 lists several key factors that affect workless people from being able to pursue employment:

- long-term illness or disability
- living in social housing
- low basic skills
- lack of affordable childcare
- low paid jobs (Work has to pay and reward people with more than benefits do).[18]

4.3 Health Barriers

With regard to the construction industry, the lowest skilled trade areas as well as the more 'traditional' skilled trades (such as brickwork, joinery, plumbing etc.) all rely upon workers being able to perform tasks, often outdoors, that are generally of a physical nature. Obviously this presents an insurmountable barrier to employment for anyone, who has significant health problems. Even so, as national research shows, the majority of those who claim incapacity benefit receive this service due to mental health reasons (invariably caused by stress in the workplace). Richard Layard states that there are now "more mentally ill people drawing incapacity benefits than there are unemployed people Jobseeker's Allowance".[19] 38% of those on Incapacity Benefits in 2004 claimed for reasons of mental disorder.[20] These national trends were confirmed to be the

[14] Statistics sourced in November 2007 and taken from the website: http://www.lancashire.gov.uk/office_of_the_chief_executive/lancashireprofile/unemployment/ofreg.asp?sysredir=y Accessed 6th March 2008.

[15] Burnley: 1,397; Pendle, 1,027; Hyndburn, 1,110; Rossendale, 724 and Blackburn with Darwen, 2,389. Statistics of November 2007, taken from the website: http://www.lancashire.gov.uk/office_of_the_chief_executive/lancashireprofile/unemployment/ Accessed 6th March 2008

[16] Pp. 4. *What works with tackling worklessness*, by Pamela Meadows. (London, 2006)

[17] Pp. 8. *What works with tackling worklessness*, by Pamela Meadows. (London, 2006)

[18] Pp. 26. *Helping people from workless households into work*, National Audit Office. (2007)

[19] Pp. 2. *Mental Health: Britain's Biggest Social Problem?* By Richard Layard. (LSE, 2005)

[20] Pp. 6. *Mental Health: Britain's Biggest Social Problem?* By Richard Layard. (LSE, 2005)

case through conversations with representatives of Jobcentre Plus in Lancashire. This therefore poses the difficult problem of how to identify which of those on Incapacity Benefits may be eligible to seek employment in construction. Specific details about reasons behind benefit claims are not easily ascertained and a breakdown of exact reasons for individuals receiving Incapacity Benefits is not available within the public domain. It may be possible, through Jobcentre Plus, to sift through those on Incapacity Benefit and identify those eligible for construction work, but it would require a clear criteria which can categorise specific impairments that are not a hindrance for specific construction roles and expend a good deal of time and effort by Jobcentre Plus. Identifying criteria is itself problematic and time consuming and would require significant employer and trainer involvement from those in the construction industry. It is important to note that the investigations of this report are subject to changes to Incapacity Benefits which are currently being proposed by Parliament to reduce the number of claimants. Access to Incapacity Benefit may change in the short to medium term if Government proposals to limit access to it through improved health screening and advice about alternative careers are implemented.

Overcoming the general issue of identifying those on Incapacity Benefits potentially able to do certain roles in construction still leaves a host of other barriers. This is due to the fact that most people on Incapacity Benefits have multiple reasons for not being able to work. Each workless person on benefits has their own individual situations that could present multiple barriers. Individual cases can have numerous hindrances to taking up employment, ranging from alcohol or drug dependencies to caring responsibilities as a single-parent, looking after ill and infirmed household members, or possessing a past criminal conviction.

As construction is an industry incorporating a great deal of physical and largely outdoor work, coupled with the complexities of individual reasons for claims, the number of those on Incapacity Benefits who would be eligible for construction employment are likely to be few. Furthermore, this number would be greatly reduced when those who hold no interest in, or little motivation towards, construction work are removed from the equation.

When considering generic barriers beyond physical and mental ability, one particular barrier stands out; that of a person's skill or ability to perform a job. From the research conducted through interviews the most notable barrier perceived by different groups was a lack of skills and training to help workless people compete for jobs in construction.

For those on Incapacity Benefit or moving onto it there are programmes available that aim to provide a mix of intervention in order to cater for the complex, multifaceted problems of claimants. These include:

- New Deal for Disabled People; helping those moving onto Incapacity Benefit
- Access to Work, WORKSTEP and the various roles of Remploy; all provide help to disabled people in work.
- The Pathways to Work programme.[21]

The Pathways to Work programme aims to improve support and advice for people on Incapacity Benefit and works at a local level. As such it has good links to those on Incapacity Benefit, and could potentially be used to support any drive to identify and help people off the benefit and through skills avenues to construction employment.

4.4 Is Construction A Desirable Employment Choice For The Workless?

For the reasons listed above, regarding the complexities of identifying those who could potentially be taken off Incapacity Benefits, the research for this report has concentrated on identifying the barriers facing those on Jobseekers Allowance and sought a route to get people off the Allowance and into employment. In 2006, 40% of people leaving Jobseekers Allowance made a new claim within six months, suggesting the difficulties are as much in retention as in job acquisition for those moving into work from benefits.[22]

Through a questionnaire with employers and a number of informal interviews, it was revealed that a perceived barrier was that of 'motivation'. Employers stated that there was a need for anyone seeking employment in the construction industry to be enthusiastic and motivated, because such people are generally found to have a good work-ethic and are reliable employees.

From such interviews it was decided that it would be necessary to investigate to what extent there exists a desire to work in the construction industry. Whilst it is not possible to measure peoples 'enthusiasm', it is possible through quantitative and qualitative data collection to build a picture of whether there is a section of workless people who would be interested in working in the construction industry and could potentially be 'enthused' and 'motivated' into being reliable workers.

A survey of those on Jobseekers Allowance was conducted through the Accrington Jobcentre Plus, in order to

[21] Pp.2 *Towards Skills for Jobs: 'What works' in tackling worklessness?* (LSC, 2007)

[22] Pp. 11. *What works with tackling worklessness*, by Pamela Meadows Synergy Research & Consulting. (London, September 2006).

ascertain the extent of interest in working in construction. Using the expertise of those working in Jobcentre Plus, the questionnaire was distributed to give a cross section of the benefit claimants; with around half of the questionnaires circulated aimed at those living in the most deprived Hyndburn wards. A copy of the questionnaire can be found in the appendices at the end of this report. It consisted of four questions and 53 questionnaires were returned, 31 completed by men and 22 by women.

Question one gave six employment sectors and asked for them to be numbered from 1 to six in order of preference. Only one woman marked construction as her most preferred area of employment compared to twenty men; two women marked construction as their second area of preference compared to four men. Dividing the preference in half, those who marked construction as their first, second or third preference totalled: nineteen men, but just four women.

Question two aimed to draw out perceived barriers preventing employment. Six potential barriers were listed:

- poor health
- level of training
- work experience
- gender
- ethnicity
- age

The participants were encouraged to mark more than one barrier, and in general men gave two or three barriers whilst women were more likely to highlight three or four. Out of 31 men surveyed, 24 identified training as a barrier; 19 felt that not having experience of working in an industry was a barrier. Out of 22 women surveyed, 18 highlighted training; 19 identified experience within an industry. Eleven women surveyed stated they felt that gender was a barrier to employment. In general, of those surveyed more felt that their barriers to work lay in their lack of skills and job experience than other factors. Out of the total 53 of the workless people surveyed, twelve highlighted poor health as a barrier; ten highlighted ethnicity and fourteen identified age as a barrier.

As regards the third question, there is a clear gender split. When asked whether they would be "interested in training and looking for work in the construction industry", 23 of the 31 men surveyed said that they would be interested; whereas only 5 of the 22 women surveyed expressed an interest. The reasons given in favour of training and taking up employment in construction centred around an attraction to manual labour and the opportunity to gain new skills. In comparison, many of those who said they would not like to pursue training or a career in construction gave the view that manual labour and working outdoors were negative factors, not positive.

Overall the questionnaire reveals that, particularly amongst workless men in Pennine Lancashire, there is an interest in pursuing opportunities in the construction industry and desire to take up training. This counters any argument that workless people have no interest in working in construction. How far this interest could be moulded into motivation and sustained employment within construction is impossible to tell; but the research suggests that the raw source is there to be trained, taken off benefits and brought into the local construction labour market.

4.5 Construction Specific Barriers

Taking the key barriers identified by the National Audit Office, it was decided to question different groups involved with the construction labour market, to ascertain their perceptions of which barriers most apply to the industry and to try to investigate why they thought these barriers were most prevalent. From talking to employers, representatives at Jobcentre Plus and construction course providers, the research found that the barrier most identified with preventing workless people from progressing into construction employment was a lack of skills and training.

Indeed, from a series of conversations and interviews with a wide range of local construction employers, it was discovered that the most important features for employing a worker were firstly whether the person was able and trained to perform a job; and secondly whether the person was mature enough and motivated to be a reliable member of the workforce.[23] It can thus be suggested that by training and helping to motivate and enthuse workless adults, that it would be possible to help them into construction employment.

These findings are supported by existing studies into worklessness and the tendency for Jobseekers to return to benefits within six months. It cannot be seen as a coincidence that half of those with no qualifications or poor basic skills, such as numeracy and literacy, are workless.[24] The two major reasons for people leaving a recently obtained job and returning to benefits are firstly, that the work is not deemed to pay enough compared to benefits; and secondly, that the person lacks the experience, motivation and self-confidence to remain in a particular job. With both of these reasons, training and skills can be stronger factors; the lower a person's level of skills, the lower their pay and generally the less experience they have performing a job.

[23] Also see appendices of interviews with college heads in Appendices I, II and III and Jobcentre Plus interview in Appendix IV.

[24] Pp. 118. *Leitch Report* (2006)

In addition to training and motivation, representatives of Jobcentre Plus revealed another barrier to construction employment. The concern was raised that job vacancies in the construction industry, especially regarding traditional trade areas, rarely reach the Jobcentre databases. It was suggested that within the construction industry there exists a network of contacts that fills work vacancies independent of Jobcentre agencies, particularly amongst the many small construction businesses in Pennine Lancashire. Through conversations with contractors and construction businesses, this theory was found to be accurate with the vast majority of construction businesses spoken to stating that if they are unable to find a worker through their own contacts they would place an advertisement in a local paper ahead of advertising with the Jobcentre and interviewing their pool of Jobseekers. Beyond ease the reasons given for not using Jobcentre Plus were, once again, to do with skills; from past experience they found that they received a better calibre of response from more experienced and better skilled workers through private advertisement than by dealing with the Jobcentre.[25]

An initiative was put in place by Elevate to provide an online source for companies to advertise for local workers, the Construction Agency. However to date it has had limited success matching out of work individuals with jobs. This has been largely due to the fact that those companies connected to Elevate have only recently begun the earliest stages of large construction projects and it is envisaged that the larger contractors working with Elevate projects will be using this service increasingly in the near future. Furthermore, there are plans to involve the Pennine Lancashire Construction and Education Consortium so as to link local construction course leavers and apprentices from the three Pennine Lancashire Colleges to Elevate construction projects, thus bringing more attention and use to the web service. Even so, as a means for helping to overcome barriers of finding work within construction for workless adults, the website will mainly be a source for work on large projects and do little to address the problems of small construction firms bypassing the Jobcentre. In addition, all jobs will as always rely upon those seeking work having the necessary skills and training to be able to take up the jobs.

4.6 'Training', The Greatest Barrier We Can Overcome

As stated above, the most significant perceived barrier preventing workless adults from seeking employment in the construction industry is seen on all sides as being the barrier of lack of training and skills. Pennine Lancashire is a region that has been identified as having an acute problem with skills shortages and insufficient opportunities for people to break such a low skills 'equilibrium'.[26]

The barriers of skills should be more clearly identified here. People seeking employment in the construction industry need to have a relevant qualification depending on their trade. For positions working as General Construction Operatives (GCO) or as labourers, such qualifications are not always essential though GCO workers are still well skilled. However, workers are also taken into jobs on the grounds of their experience within the industry, which naturally demonstrates they have skills linked to construction, and in addition all workers on major building sites are required to carry a CSCS card. The CSCS card requires passing a health and safety test. Representatives of Jobcentre Plus identified the CSCS card as a potential barrier, citing examples of workless adults with labouring experience on smaller construction sites being turned away from jobs on larger sites due to an absence of this card.[27]

Acquisition of the CSCS card, training and even experience are all barriers that could be potentially overcome. Within the CSCS card system itself there is a barrier for workless people, namely that of illiteracy or difficulties with dyslexia hindering people from being able to complete the health and safety tests. One key component, therefore, to help workless people into construction employment is to help them prepare for and complete tests for a trainee CSCS card to enable them to find employment that will allow the chance to take onsite assessment to gain an NVQ and subsequent permanent CSCS card.

Having identified these barriers the research looked at how workless adults could be helped to gain the training and skills that would make them more competitive within the construction job market. However, in looking further into the problem of training and course provision, several more barriers were encountered regarding the costs of course provision and the up-skilling of workless adults. It is also important to remember that training is only one barrier and

[25] Interviews with companies including Rok and McDermott & Sons. Ibbotsons stated they liked to use the Jobcentre Plus where possible as they found it direct and fast but referred to general industry practice as preferring to use own contacts, and often nepotism because then, particularly small companies, know who they are employing and what to expect.

[26] *Assessment of the existing and future economic activity within the East Lancashire Service and Construction Sectors*, by Capita Symonds, (2005)

[27] Through interviews, small and medium companies also recounted difficulties for some of their employees of struggling to pass the tests to gain a CSCS card; largely due to dyslexia and learning difficulties.

needs to be combined with assistance in finding and preparing for a job.

4.7 What Training Provisions Exist ?

Jobcentre Plus revealed that for those on Jobseekers Allowance under the age of 19, there is a right to free education and all the colleges in Pennine Lancashire now provide some provision for NEETS students.[28] However, for those over 19 there is no such provision for construction courses and thus a distinct lack of courses available for disadvantaged adults. Provisions that do exist are as follows:

- Training for Work. This is for those over 25 who have been unemployed for over six months. It provides on-the-job training support for Jobseekers, who are paid a training allowance.
- Employment Training. Offers a work placement with an employer.
- Work Based Learning for adults. Again for those over 25 who have been unemployed for six months. Only voluntary, full-time training programme.
- New Deal for Young People which is aimed at workless between 18 and 24 years old who have been unemployed for six months. Aims to help them find and keep a job by giving support from a personal advisor.[29]

Within Pennine Lancashire, Burnley College runs a 'Multi-Skills' course for disadvantaged adults. However, this gives no single, specific training and offers no qualifications. Nevertheless, it has had success in introducing workless people to the industry and has served as a steppingstone for some people, encouraging them to go on and re-skill in more specific trade areas.[30]

4.8 The Problem Of Training Workless Adults For Construction

None of the interventions previously listed enables workless adults to obtain the formal training recognised within the construction industry. To add to these problems the benefit system prevents the majority of workless adults from being able to undertake full-time construction training. The most significant problems are that those on Jobseekers Allowance are only eligible to receive their benefits provided they are in training or education for less than 16 hours per week. This is a significant barrier as college construction courses generally last for around 30 hours per week. The length of courses is a major concern for course providers. Within colleges, funding is linked to retention of students and therefore there is a preference to run more intensive courses as the rates of retention are much higher than if courses are spread out for sixteen hours per week over long periods.[31]

Another barrier is the complexity of funding adult courses. Those under 19 have their fees paid for by the Learning Skills Council (LSC) but adults (those over 19) are required to contribute some 42.5% of their fees with the remainder paid for by the LSC. Further investigation revealed that courses for workless adults cannot be sufficiently funded by Jobcentre Plus/Training West Lancashire, who can only provide £1600 per student. Interviews with the Heads of Construction for Blackburn College, Burnley College and Accrington & Rossendale College raised the point that construction courses are heavily oversubscribed. Furthermore, whilst all three heads of construction expressed support for taking on workless adults they all commented on the same difficulties facing the provision of adult workless courses. Their concerns focused upon the problems of funding and space for providing courses. A workless adult can be supported up to £1600 for training through Jobcentre Plus, however this cannot be used to pay the 42.5% contribution because LSC funding cannot be used to supplement other sources in a 'dual funding' capacity. With space and teaching time limited, colleges will naturally elect to provide courses for students under 19; any adult courses would have to be able to attract the clientele who are financially able to fund their own study.[32] When questioned further on the issue, each of the construction heads from the three local colleges said that they would be willing to provide courses or places for workless adults provided the funding per student was the same as that which could be gained for young learners.

Therefore, the provision for training could potentially be provided if the funding were available. Technically, the 42.5% contribution to fees for those adults on benefits who wish to undertake training can be waived by the LSC, and so the full fees of £3,600 per student could be obtained from the LSC. It could therefore be suggested that the concern of course providers that adult courses would not attract enough funding is not accurate. However, with regard to those on Jobseekers Allowance, a dilemma exists which prevents workless adults training in construction.

[28] NEETS stands for Not in Employment, Education or Training, and gives young disadvantaged members of the community the opportunity to study at a college for a formal qualification; this can then lead to further study including apprenticeship placements.

[29] Pp. 10. *Towards Skills for Jobs: 'What works' in tackling Worklessness?* (LSC, 2007)

[30] All information obtained from John Shaw, Head of Construction for Burnley College. See Appendix II.

[31] See interviews with college Construction Heads. Appendices I, II and III.

[32] Such adult courses have been successfully run for plumbing and also Gas and Heating certificates in Pennine Lancashire.

As previously stated, those on Jobseekers Allowance forfeit their benefits if they are in education for over 16 hours per week, therefore if they were to undertake an adult construction course of some 30 hours per week they would no longer be in receipt of benefits and, as well as having no income, would not be eligible to have their fees waived. Having Jobseekers train for only sixteen hours a week is not feasible for colleges as retention rates would be particularly low, not least because Jobseekers Allowance requires that those on benefits take employment if it arises; this would seriously harm college retention rates and consequently income. Therefore the '16 hour rule' presents an acute problem to overcoming the barrier of training for workless adults, but it is not an insurmountable problem as shall be shown.

V TRAINING WORKLESS ADULTS FOR CONSTRUCTION

5.1 Overcoming Barriers: A Potential Route Into Construction For Workless People

In identifying barriers to employment and seeking solutions to these barriers a potential route to train and up-skill those on Jobseekers Allowance has been mapped and is currently being piloted.

Through liaisons with the Pennine Lancashire Construction and Education Consortium, Training West Lancashire (TWL), the LSC and Jobcentre Plus it was determined that there is the possibility for providing the funds to train workless adult students without them losing their benefits. By targeting those on Jobseekers Allowance who enter "New Deal Gateway" it was found that these people are exempt from the sixteen hour rule, provided they still engage in a day of jobsearch and development with TWL. All those who are on Jobseekers Allowance for six months move onto New Deal Gateway, which gives them the opportunity to be more competitive and prepared for the job market. As workless adults on the Gateway programme are still on benefits and entitled to free training the colleges are able to waive the fees, meaning their training course is paid in its entirety by the LSC. It is important to note that no funding is taken from Jobcentre Plus for the training of workless adults. This is because the LSC cannot supplement other funding due to regulations on dual funding. It should also be noted that the 16 hours per week training rule is overcome because it does not apply to those on Gateway; the hours they would normally spend with TWL and their preparatory courses are merely used to study at college.

The research behind this report has found it difficult to unearth case studies of suitable programmes from other areas to bring disadvantaged adults into the construction industry. In Merseyside a pilot programme for ex-offenders involving the adoption of a mentor, actively participating employers and utilising mainstream education providers has recently been completed.[33] In Pennine Lancashire itself, a two year scheme funded through NRF / SRB has recently been completed in Burnley. This programme, again, adopted a mentor system, but with a workshop approach, on-site experience and to date it has not had the scope to directly access construction qualifications. In addition a successor scheme funded by New Deal is currently being designed and linked to RSL employers and college providers via either on-site assessment training or college based training and assessment.

In other areas of the UK programmes and schemes to tackle worklessness begun in the last few years are being continually reviewed.[34] In Wolverhampton, for example, an Intermediate Labour Market (ILM) project aims to help the unemployed into work by paying employers to provide training and job opportunities.[35] ILMs tend to make good use of employer engagement to give on-the-job training and act as a focal point for the multiple, involved agencies to ensure that each group fulfils their obligations. As such, any scheme to try and connect workless adults to construction employment in Pennine Lancashire should take into account the benefits of having an ILM in place, and the importance of giving workless adults experience of on-site work as well as training and personal support. At present there is a lack of published information in the public domain that clearly outlines the processes of schemes for addressing the workless agenda.

5.2 Pilot Programme: A Local Case Study

In a meeting between the Pennine Lancashire Construction and Education Consortium, Accrington & Rossendale College construction representatives, a Blackburn College representative, representatives of TWL, Jobcentre Plus, Elevate East Lancashire and the LSC; it was agreed to run a pilot programme training adults in General Construction Operations at Accrington & Rossendale College.[36]

[33] *Construction Transitional Employment Pilot,* by the Merseyside Employer Coalition (2008)

[34] Strategies linked to regional development in London, for example. See: *Thames Gateway: Interim Plan.* (2006) http://www.communities.gov.uk/documents/thamesgateway/pdf/153605

[35] *Wolverhampton Connects Partnership intermediate labour market project: 'new jobs that will work for you'* by "renewal.net" a case study. (Wolverhampton, 2007)

[36] For a list of meetings attended and dates see Appendix VIII.

Several other issues, additional to that of funding, were addressed in setting up the pilot course. Namely the problems of identifying those best suited and able to benefit from a construction course. It was determined that TWL would use their expertise and close contact to those on Gateway to New Deal in order to vet, select and subsequently motivate workless adults who agree to take part in the courses. To best recognise those most suitable for the GCO course, TWL were to liaise with the college staff responsible for delivering the training in order to create criteria for selection. From such cooperation other issues have come to light and been solved; the provision of regulation clothing is to be provided for the students through Jobcentre Plus and public transport costs refunded through TWL, assistance and extra provision for any dyslexic students will be addressed as individual needs arise (the college already has measures in place to help learners with dyslexia). Training West Lancashire also agreed to take responsibility for issues arising from poor attendance and plans to be in frequent contact with the course providers in order to monitor progress of the students and ensure the course runs successfully.

In essence, for the purposes of the GCO Pilot Programme, TWL is acting as the Intermediate Labour Market body. They are responsible for mentoring the students on the course and also with the subsequent connection of trained workless adults to the job market. The GCO course supplies a thorough and practical education in all areas of groundwork. Such a multi-skill approach was highlighted as important and being in general demand by employers.

An important part of the GCO pilot programme is the simulation of a working environment. The facilities for GCO courses at Accrington & Rossendale College are laid out under a poly-tunnel outside, with portable-cabins to provide a simulated construction site atmosphere (see photographs on pp. 42). This sets the GCO course apart from what students may have in mind from their past experiences of education. Furthermore the discipline levels on the course are high and strict, as they would be on a site due to reasons of health, safety and welfare.[37] This adds to the learning experience and, so it is anticipated, will better prepare the students for working in the construction industry. In terms of mentoring, TWL has taken responsibility for this as they have an existing trust built with the course candidates and an existing set of rules and boundaries instigated by New Deal Gateway.

[37] Attendance is closely monitored by TWL and general construction rules apply; no boots or any other missing equipment means no access to the site.

5.3 GCO training facilities at Accrington & Rossendale College

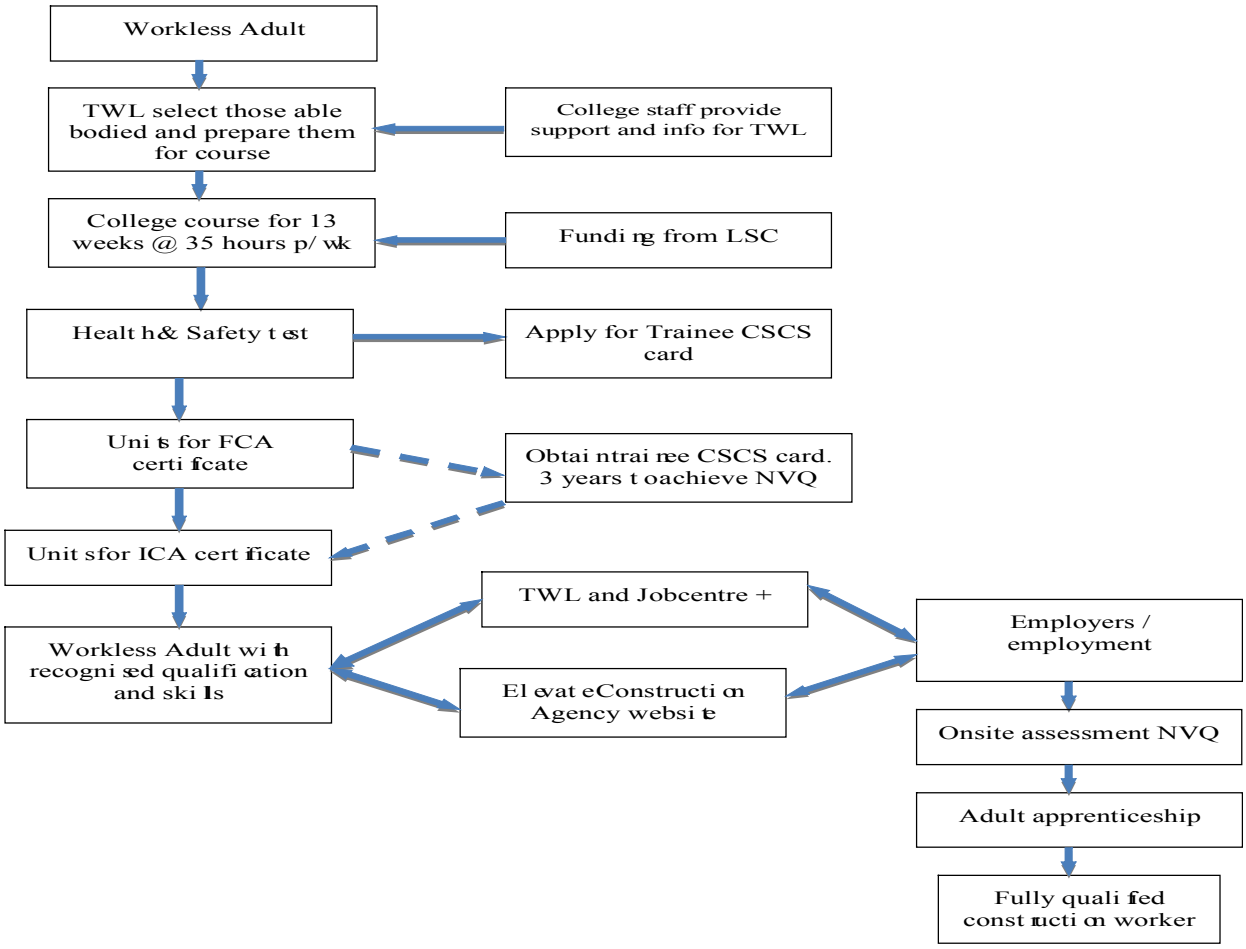
Poly tunnel

Flagging and curbing practical experience

Portable cabin in the distance and three adult trainees learning to dig and lay drains

5.4 Process Diagram: Route to construction employment

The process diagram shows the route for a workless adult on the GCO Pilot Programme. During the 13 weeks in college they will study for 455 hours, meeting college requirements to secure LSC funding for a fulltime course.[1] The target is for the adults to obtain an Intermediate Construction Award (ICA) but the scope is there for them to receive a Foundation Construction Award (FCA) if the students are less able and do not complete all units. The college enter students for health and safety tests as and when the tutor feels they are ready, once the tests are passed then they are eligible to apply for a Trainee CSCS card. Once they have a trainee CSCS card they will have three years in which time to complete an NVQ Level 1 or 2 and obtain a full CSCS card, or they will lose any opportunity to retain a CSCS card. This barrier can be overcome through them entering employment and working towards an NVQ by onsite assessment.



It might be argued that once a workless adult has attained a Trainee CSCS card they could be connected to an employer. However, the level of training must be taken into account, the better skilled a trainee the more attractive to employer. It is also clear from interviews with college construction staff that placements with employers are not easy to find and that at present it is felt that there are not enough employers willing to support apprentices and that this is in part due to difficulties faced by smaller employers in being able to take apprentices. Therefore, a significant barrier lies with employers as there need to be more employers supporting more trainees in order to help match growing skills demand. In general terms, many employers are willing to take apprentices with low skills because they pay them a trainee rate and most employers are able to access CITB grants – this presents a barrier in trying to connect a workless adult to an employer before they have a reasonable level of skills. Another barrier is that if workless adults *are* connected to an employer, as adults they are entitled to minimum wage and on receiving that pay would be deemed employed and thus cease to receive Jobseeker's Allowance but will have access to other in-work benefits. Once they are no longer in receipt of benefits, the employer will cease to receive New Deal grants and the employee may find that they face a significant fall in net income. There is a barrier in perceived loss of earnings for workless adults entering fulltime work at minimum wage level and also the barrier of completing documentation and going through a new claims process again in order to obtain in-work benefits.

A potential route to overcome the barrier of obtaining work based experience and gain a full CSCS card is to have workless adults complete a 13 week course, such as the GCO course outlined above, to obtain an ICA or FCA and then move them onto an adult apprenticeship, during which they would be connected with an employer. As adult apprentices they would still require minimum wage; this makes them less economical to an employer but from interviews with local employers it is clear that some companies and builders would prefer to employ adult apprentices as they are more physically and mentally mature. Cost is perceived as a barrier to taking on trainee adults for some employers but not for others. The most significant barriers therefore lie with the workless adult themselves; firstly in terms of motivation and secondly with the question of whether they are financially better off on benefits rather than a minimum wage whilst they train on an adult apprenticeship. For the latter, financial assistance could resolve the difficulty but for the former there is no set solution; the best course of action would be to include close mentoring throughout training, both whilst at college and whilst in the workplace.

VI CONCLUSIONS

6.1 Summary

From the study conducted it is possible to summarise the following outcomes.

Projected spend:

- The secured Elevate spend is £50,000,000 per year for the next three years. It is estimated that £45,000,000 per year will be spent on construction; 10% covering overheads.
- The average spend, taking into account private investment in the area is expected to be in excess of £135,000,000 per year or £405,000,000 over the 2008 to 2011 period.
- It is supposed that the projection of £405,000,000 investment into Pennine Lancashire is a reasonable, but conservative estimate, as Building Schools for the Future will alone bring £250,000,000 to Lancashire from 2008 to 2010.

Skills demand:

- An investment of £405,000,000 is expected to create a demand for approximately 5,000 workers from 2008-2011.
- Local colleges in Pennine Lancashire take in approximately 1,300 construction students per year; 429 of which are apprentices.
- Taking into account apprentices entering the workforce the demand for workers from 2008-2011 can be estimated at around 3,620.
- With this strong demand for work there is a need to increase training.
- It is estimated that there are some 11,000 workers in Pennine Lancashire. If the F-Squared figure of 10 apprentices for every 100 workers is assumed as feasible then the region should realistically be aiming to double its number of apprentices in the coming year and more than trebling them by 2011 when the workforce will be 16,052.
- There is nowhere in Pennine Lancashire that trains roofers and contractors contract this work outside of the sub-region.
- All skills demands looked at in this report are based on traditional methods of construction with some insight into heritage skills but no provision is made for the future demands in modern methods of construction and eco-sustainable building needs.

Workless agenda:

- There are a large number of people dependent on benefits in Pennine Lancashire
- There are multiple barriers preventing workless adults gaining employment in construction
- There is a potential to quickly up-skill Jobseekers and help them into construction
- The key to breaking down barriers is helping workless adults gain motivation and skills
- Pp. 43 shows a process diagram to help a Jobseeker become 'job ready' for the local construction industry or enter work-based learning courses

The key barriers to employment in the construction industry for many workless persons include the following:

- Health
- Skills
- CSCS card
- Motivation
- Connection of skilled/re-skilled workless people to job vacancies Transport and other support needed to ensure punctuality and attendance
- Employer commitment to the employment of apprentices

Each represent a key action for any future training and employment programme. It is also recognised that working culture forms a significant qualitative element of engendering motivation and this should form a key element of any route to work pathway.

6.2 Conclusion

The research for this report has revealed that there is likely to be a significant demand in the Pennine Lancashire sub-region for construction skills. Elevate investment, projected at £45,000,000 per year, is expected to make up only a proportion of the total spend on construction in the region. At present there are approximately 11,000 people employed in construction in Pennine Lancashire, approximately 1,300 students studying construction and 492 apprentices entering the industry per year.[38] With such large investments entering the sub-region through numerous large projects, including BSF, HMR and other public sector building schemes, the number of workers will be by no means sufficient to meet the extra demand of work. This report advises that there is likely to be a demand for around 3,600 construction workers over the next three years and that unless training is increased and continues to target the most in-demand trade areas, then the trend of employing increasing numbers of people from outside of Pennine Lancashire will unavoidably continue.

[38] For breakdown of construction students by college and trade in the region see Appendix VII.

This report shows that the areas most in demand are brickwork, wood trades, electrical, plumbing and general construction operatives.

In Pennine Lancashire there are a large number of people dependent on benefits and this report indicates that there is a potential opportunity for them to find employment in the construction industry. However, the demand for workers is as much a demand for skills as it is merely for people. The challenge, therefore, is to provide means to make the unemployed of Pennine Lancashire competitive within the job market so that there is no preference to or argument for employing construction workers from outside of the region. In order to achieve this, college courses and apprenticeships need to focus upon training workers in the skills that are most in demand; focusing courses has improved recently through the work of the Construction Skills, Skills Observatory. There also needs to be more liaising between Jobcentre Plus, training agencies and construction employers so that vacancies do not bypass the local job market.

As regards tackling worklessness, the construction industry has the potential to play an important part in helping people off benefits and into employment. The most significant barriers preventing workless adults finding employment in construction relate to the ability of someone to be able to carry out tasks effectively; namely the health of an individual, their skills and their motivation. This report suggests a possible route by which a workless adult can acquire skills and connection to the construction job market *(see progress diagram pp. 43*). It is also important to note that beyond this, depending on individual circumstances, a workless adult may need continued support to ensure they are able to retain their job and develop their skills.

Focusing on a way forward to tackle worklessness by using the growing investment in construction in Pennine Lancashire, it can be said that there is undoubtedly scope for breaking down barriers and helping jobless people into work. For this, skills and training are a key component to meeting the needs of industry through the re-skilling of local people to match employer needs. Nevertheless, the impact of training is limited by a number of factors; even once they are trained, workless people need to be better connected with the construction industry's job market, and with regard to large national and regional contractors, there needs to be an incentive and a common contractual requirement such as that adopted by the HMR pathfinder for them to make use of local labour ahead of subcontracting responsibility and filling jobs with workers from outside Pennine Lancashire.

Many of the problems faced by the construction industry in Pennine Lancashire that were highlighted in a report by

Salford University in 2004 still remain four-years later. The industry in the region still consists of small and medium companies that find it difficult, with the inability to accurately forecast work, to grow their businesses or support increasing numbers of apprentices. [39] Consequently, large contracts are won by companies from outside of Pennine Lancashire and only a few local companies have been able to make use of contracts from sub-contracting. This further compounds the difficulties of training and developing the local workforce as subcontractors from outside of Pennine Lancashire will take their apprentices from their own locale.

As this report shows, the areas most in demand within the construction industry are brickwork, wood trades, electrical and plumbing – all of which are highly skilled trades. Therefore the demand of a skilled and healthy workforce is a critical demand for access to potential hazardous working places. It is therefore important to acknowledge that routes to employment should be geared to develop both the skills and attitudes necessary for employment and that in addressing the issue of workless adults schemes should be carefully designed to address the reasons for why an individual my be out of work and how they can be rehabilitated into productive employment.

The report also presents data predicting the demand for traditional or heritage building skills and those for modern methods of construction. It is also evident that higher level skills relating to management and professional posts creates the demand for additional training and educational opportunities.

There are several construction occupations that can be skilled quickly, such as the area of 'ground work' or General Construction Operations, which is also an occupation area in high demand. Indeed the opportunity is there to help a sizeable number of people out of worklessness and into employment; it should, not be heralded as a 'magic solution' and there is a necessity that training for workless adults is not rushed or cut below the qualifications already in existence so as to make them competitive in the job market and competent on building sites. Furthermore an issue exists regarding those who are presently in construction education but not acquiring a high enough level of skills. The danger remains that this group, along with those who are being turned away from full construction courses, are likely to be the workless adults of tomorrow. Any process aiming to tackle worklessness needs to be mindful of current training capacities, in particular the pressing need to increase capacities with relation to apprentices, and whether paying to train workless adults is efficient in the longer term. All these factors need to be carefully considered so as to assess the extent and size of feasible interventions to help skill workless adults.

This report recommends that there be a strict and high-level requirement for contractors to support the training of local people, so as to move towards sustainable employment in construction for Pennine Lancashire by using the growing future demand for workers. With regard to the workless agenda, the findings of this report recommend that schemes be set up in partnership between local colleges, Training West Lancashire and Jobcentre Plus to train, mentor and aid workless adults into job placements. However, these schemes need to come in conjunction with college and course provider expansions and a growth in the number of apprentices in Pennine Lancashire; indeed an ideal vision would see adult apprenticeships following on from the training of workless adults to ICA level, in order to supplement the expansion of young apprenticeship numbers so as to close the skills gap in Pennine Lancashire.

6.3 Recommendations

- It is obvious that the 10% target for apprentices is not being met in Pennine Lancashire. There should therefore be an enforcing of contractor requirements, through more effective use of Key Performance Indicators.
- Wood trades, bricklayers, electricians, plumbers and GCO are the trade areas that will be in most demand as shown in Table 7. Wood trades Training should reflect this demand and these findings will be shared with local training providers. Comparing with 2006/07 apprenticeship figures the number of wood trades, floor covering, plumbing and plastering apprentices need to double; while brickwork, painting & decorating and electrical need to treble the number of apprentices.
- A predicted demand for heritage specialist trades is evident for the planned Elevate investment in existing homes and proposed new adaptations. In addition a projection for modern methods of construction shows a significant demand for timber frame production and erection on site. It is recommended that both of these factors should be considered in the planned training provision for the future.
- Whilst no training coefficients are available for managerial and professional skills demand form the industry supports a figure of at level 50 new recruits although how this figure is articulated into

[39] *East Lancashire Training Gap Analysis Report*, (Salford, 2004)

quantity surveyors or construction managers further work is required.

- To meet such a large demand for apprentices, it is recommended that three actions be undertaken:
    - Growth of first year numbers at college so as to increase numbers available to move into apprentices
    - A means to provide a 'second' chance system or provisions to up-skill those currently not attaining high enough academic scores to move into apprenticeships
    - A scheme to connect more students to employers; this will involve more coordination amongst training providers, points of contact for employers and some means to improve
- There should also be an increase in opportunities based on the case study outlined in 5.4 for workless adults to obtain training and then connect them to employers
- Critical that workless adults receive close mentoring
- Recognition that working culture is a necessary part of any workless training scheme; a process for preparing workless adults for courses by mentors, in order to retain students, in conjunction with a strictly disciplined education atmosphere that reflects the workplace is believed to be the best way to achieve this.
- Growth in provision and funding for adult apprentices to supplement growth of young apprenticeship places so as to close the skills gap.

Acknowledgement

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APPENDICES

APPENDIX I: INTERVIEW

Interview with Head of Construction at Blackburn College.

Interview with Howard Sharples 04.02.08

1.) What's the student intake? Does the college struggle to fill courses or are they oversubscribed?

- Approximately 420 fulltime students; 200-220 apprentices.
- Oversubscribed in terms of applicants. However, applicants often don't have high enough qualifications.
- There is scope in most areas to be selective and take those with higher than required grades.

2.) What adult construction courses are currently available at college?

- Part time course in brickwork to Level 2; 90hrs per year, 30 per week at 3hrs p/w.
- Part time course in electric to Level 2.
- "Full cost" courses, especially elec, gas and renewable energy available.
- 19+ targets are given to college. Currently slightly under target as a whole.

3.) Who pays for course fees? Where does the funding come from?

- For adults undertaking their first full Level 2, the fees are waved and paid for by LSC.
- Fulltime courses, adult students pay a nominal amount (unless on benefits).
- Part time fees can be waved.

4.) How long does a course usually last?

- Fulltime 16 hours per week for 13 weeks.
- National Diploma lasts 72 weeks.

5.) Do you prefer to have courses with fewer hours p/w for more months or more intensive courses?

- For funding purposes, prefer to take apprentices as they bring more money. But problem of getting employers involved – this restrains the opportunity to expand numbers of apprentices.
- Targets for 16 to 18 year old fulltime courses mean these courses must be provided.
- Therefore, space becomes an issue for other courses.
- For adults space is a big issue; eg. A fulltime brickwork course will take priority over a part time one because it involves a better use of space.

6.) Would the college be willing to put on courses for workless adults? If so which areas would you be willing to train for?

- Preliminarily, yes.
- Blackburn College used to do City Challenge which ran courses for workless adults (perhaps 10 years ago).
- College tied by success and retention targets/requirements. If workless still seeking work through JCP then they are required to take any jobs that come along; this would then mean them leaving a course part way through and thus detract from college retention rates. (NB Colleges funded according to retention of students.)

- Believes that college would need to look at skills gaps in the area and provide courses for those areas; shape courses to meet industry's needs.
- Would propose that it would not be favourable to put on workless courses for the most oversubscribed trade areas. Would you prefer for workless adults to onto courses in existent system/existent courses?
- This depends on numbers. Low numbers would be best suited to going into the existent training courses, larger numbers would require their own classes.
- Issue of CRB checks may be a problem if bringing adults onto courses with younger students.
- Need for an 'agent' responsible to ensure there is an outcome in terms of employment.

7.) What concerns, if any, would you have about putting on a course for workless people?
- Concerns over vetting of students; needs to be done properly (including CRB checks if necessary). This would need input of colleges and benefits agencies.

8.) How many of your young students have an apprentice place onsite?
- 200 apprentices; spread across 4 trade areas, approximately 50 in each.

9.) In your opinion, is it difficult to find apprenticeship placements for students? Why?
- Yes.
- In the local area employers tend to be small or medium enterprises. This makes it difficult finding companies with money and time, as well as inclination, to take on apprentices.
- Employers don't see the benefit of taking on apprentices.
- Bad experiences encountered by an employer is likely to put them off taking on apprentices in the future.
- Some small companies are not CITB registered, and thus won't be able to claim funds from CITB.
- Employers often find apprentices themselves, through family/friend connections (nepotism) or word of mouth and this recruitment is often done badly and leads to bad experiences.
- Difficult winning over businesses and getting them to trust colleges in selecting apprentices.

10.) Is it difficult to help students find work after training?
- College doesn't do much to find work for students.
- Blackburn is starting with plumbing to move fulltime course students at Level 1 and fit them to an employer. (Following AccRossCollege model).
- Majority in apprenticeships tend to stay on with work placements.

11.) What do you feel needs to be improved/altered in order to help more students find work?
- The college needs to have a link to employers. Must also be better recruitment for staff; not just lecturers but also recruit people who can fulfil assessment roles and work with employers.
- More needs to be done to educate construction employers so that they use colleges as recruiters, trust their judgement of young workers and take on more apprentices.
- In relation to Elevate contracts, colleges need to be linked into the KPI data and processes relating to local skills needs in order to know the skills needs and thus be able to target certain areas for training.
- Employers need to take on more apprentices to raise government targets; colleges can keep expanding and put on more apprenticeship courses but if there are not the opportunities for the students to get the experience of working then the colleges cannot fulfil success rate targets.

12.) What do you perceive to be the biggest barriers hindering workless people form training and finding work in construction?
- Not being trained or qualified. Where workless people are trained they are likely to be hurried through training; they need multiple skills to make them employable.
- Getting access to training.
- Persuading workless people back to training; often they had bad experiences of education.
- Levels of numeracy and literacy a barrier.
- Stigma attached to the workless; especially for employers.
- Need to give examples and incentives to prove to workless people that training will help them into work.
- Training for colleges and the ability to make students employable will be limited if there's no opportunity for the students to gain experience with a company.

APPENDIX II: INTERVIEW

Interview with Head of Construction at Burnley College.

Interview with John Shaw 29.01.08

1.) What's the student intake? Does the college struggle to fill courses or are they oversubscribed?
- Very oversubscribed on all courses
- Average of 3 applicants to every 1 place.
- Plumbing most oversubscribed due to perceived earnings.
- 150 currently on waiting list for 12 places in Plastering.
- Consequently, the college is very selective and in most cases test and interview prospective students.

2.) What adult construction courses are currently available at college?
- No specific courses as such
- Adult numbers are restricted by funding

- 83 adults on fulltime courses at start of year; 64 still on. Target was 35.
- For workless, through Jobcentre Plus; for those with a NEET background: Multiskills course, Level 1. Currently 80% retention.

3.) Who pays for course fees? Where is funding sourced from?
- LSC funding.
- Adults bring approximately 70% of the funding 16-18 year olds do.

4.) How long does a course usually last? (Hours p/week, months)
- Fulltime: 15 hours per week over 30 weeks (as for Multiskills) or 12.5 hours per week over 60 weeks.

5.) What is preferred, part time or fulltime courses?
- No preference.
- Focus for apprenticeship training is most important, along with a need to be flexible. Need to shape hours (especially for adults) to suit the students' needs.

6.) Would the college be willing to put on courses for workless adults? If so, what areas would they be willing to train for?
- Yes.
- Depends on how they can fit into existing systems and courses.
- Preference that workless adults just be fitted into existing courses.
- Issue of funding; college would therefore need the same money for workless adults as for these students, otherwise they'll just take the younger students.

7.) What concerns, if any, would you have about putting on a course for workless people?
- No real concerns that differ from other students.
- Would insist that they do work on literacy and numeracy as part of any course.

8.) How many of your young students have an apprentice place onsite?
- 350 apprentices, LSC funded.

9.) In your opinion, is it difficult to find apprenticeship placements for students?
- Would use the word 'challenging'; sometimes difficult.
- Companies that take on apprentices need good experience of apprentices, then they keep taking them on. Therefore a lot relies on individual experiences.
- Lack of stability within the construction industry can be a problem; companies need steady work to warrant taking on an apprentice.
- Need to convey the benefit of taking apprentices, a need for more insight from companies to see opportunities for expansion through apprentices.
- Word of mouth is an important factor in the industry, and this can mean links to colleges are slow to develop for small contractors.

10.) Is it difficult to help students find work after training?
- Not for apprentices.
- Difficulty persuading apprentices to stay at college to complete Level 3.
- For non-apprentices it is very difficult to move into work.

11.) What do you feel needs to be improved/altered in order to help more students find work?
- More apprentices would perhaps help this, however this isn't easy to expand.
- Companies need to take more apprentices; not sure they should be forced to.
- Perhaps a way to improving this maybe compulsory CSCS card ownership and frequent updating of these cards; therefore removing 'cowboys' and improving the skills in the industry and increased uptake of students through closer relation with colleges.
- Adult apprentices would be a good way forward. Employers often prefer older, more mature workers. BUT no funding available for this.
- Problem of money for apprenticeships; an adult would need minimum wage.

12.) What do you perceive as the biggest barriers hindering workless people from training and finding work in construction?
- Funding for course. For workless, issue of benefits as well as course fees.
- Is there enough work out there for them?

APPENDIX III: INTERVIEW

Interview with Head of Construction at Accrington & Rossendale College.

Interview with Maurice Gleeson 07.01.08

1.) What's the current student intake: ie. Does the college struggle to fill courses ot are they oversubscribed?
- All over subscribed.
- P&D and Plastering slightly oversubscribed; plumbing, Brickwork and C&J heavily oversubscribed.

2.) What adult construction courses are currently available at college?
- Adult. Full-cost recovery in plumbing brick etc. Less on P&D refresher courses.
- Specialist training courses provided.
- There are some core/project funded adult courses.

3.) Who pays for course fees? Where does the funding come from?

- Full cost recovery = client funded.
- Most core funded = LSC (apprentices and full college training provision)
- At Acc&Ross college there are unique Programme led Apprenticeships, whereby the first year students study full time in college but get fitted to an employer.
- Funding will change in September to "Demand Led Funding".

4.) How long does a course usually last? F/t and P/t

- Full time courses = 450hours, usually spread over 16 weeks.

Often courses take 30-35hours per week.

- Possibility for those with experience to just do technical certificates; so hours differ on these courses.

5.) Do you prefer F/T or P/T courses? Or are there certain types of courses you would prefer to put on for any reason?

- Full time and work-based learning courses are always the ones most looked to because they provide the opportunities for the most funding.
- There's a need to strike a balance for construction at the college, a balance between funding and meeting targets. Specific targets are laid out in the college 'Strategic Plan' (a copy was provided).

6.) Would the college be willing to put on courses for workless adults? If so, what areas would you be willing to train for?

- Yes. Already the GCO course is planned to be put on. Commencing around the 3rd March 2008.
- NEET course beginning on 25th Feb.

7.) What concerns, if any, would you have about putting on a course for workless people?

- Maintaining balance as previously stated of curriculum targets and income.

8.) How many of your young students have an apprentice place onsite?

- The overwhelming majority.

9.) In your opinion, is it difficult to find apprenticeship placements for students?

- Yes.
- Most difficult to grow the number of employer places for apprentices.
- Getting more employers on side and placements available on site is a big part of construction's role.
- Employers often resist because they have to pay higher insurance and the construction industry has a training levy paid to CITB; some employers may bypass this.

10.) Is it difficult to help students find work after training?

- Careers guidance is given at Acc&Ross College.
- The college has a good record; high rates due to close links with employers.

11.) what do you feel needs to be improved/altered in order to help more students find work?

- CSCS card has been a good development; needs expanding throughout industry, public recognition and understanding also needs to happen re. CSCS cards.
- Introduce legislation to compel employers to introduce more placements for apprentices. Compulsory training places within in companies and it would need to be enforced.

12.) What do you perceive as the biggest barriers hindering workless people from training and finding work in construction?

- Organisational obstructions
- The 'bidding culture'. Funds in pots obstruct provision of courses and wastes money, time and general resources. It often costs more to put together a bid than it's really worth.
- Barriers of agencies and regulations. Too many agencies and complex regulatory systems make provision of courses and access to them too complicated and often off-putting.
- Poor communication between agencies and fragmentation of funding amongst different bodies (who tread on each others toes) are also big problems for course providers.

APPENDIX IV: INTERVIEW

Interview with representative of Jobcentre Plus

Interview with Lisa Haworth.

1.) In your opinion what are the major barriers preventing workless people from pursuing employment in the construction industry?

- If workless are 18+… they are low skilled and often long-term unemployed.
- Key problem is the lack of training available to get them skilled to take up work.
- With regards to training, the benefits system is a barrier because it only allows people to take part time courses. Therefore courses take many months.
- Barrier is 16 hour per week legislation for job seekers.
- For 16-18 year olds, 35hours per week courses are available – but not for adults.

- Nothing available in the form of 'refresh courses' for construction skills.
- Those on Incapacity Benefits can train full time but problems identifying who would be eligible to work within construction industry.
- Those on IB are not seen as frequently by JCP as they are not required to do fortnightly interviews or seek work.
- Barrier of CSCS cards and Health & Safety because the cards and qualifications often can't be afforded by those just starting work.
- Are there the jobs there? Interviewee was aware that the construction industry tends to employ through word-of-mouth and this often bypasses the Jobcentre and the workless.

2.) What measures are currently in place to try and overcome these barriers? How effective are these?

- For CSCS cards and H&S, there is an Advisers Discretion Fund (ADF). This has in the past enabled JCP to give financial assistance to those starting up.
- Training is available – but mainly motivational; interview practice, CVs etc. No specific construction skills training though.
- ESF – European Social Funding applied for to provide Construction skills training.
- Self-employment assistance available for those setting up their own business.
- Wage subsidy for employers taking on New Deal to encourage the industry to support and take on workless. £60p/w incentive.
- Work Trials available. Offers unemployed opportunity to 'try out' a job for a time; benefits both employer and employee.

3.) What's the statistical breakdown of reasons for people being on IB?

- Interviewee stated that information is available but not in the public domain. However, it is used by JCP to mailshot people and groups for research into potential for employment. It would also be possible to use this information, and possibly even mailshot particular groups on Incapacity Benefits, to offer construction training or ascertain any interest amongst these groups in pursuing employment in construction.

4.) What problems are encountered at JCP in getting workless people to undertake and complete training courses(particular ref. to construction training)?

- Not really a problem for people undertaking and completing them; the problem is seen as having the courses in the first place and thus referring them to it.
- Big demand for construction training in particular? Are people interested in construction work? Yes. As far as the interviewee was aware.

5.) How effective is the New Deal in helping people from workless households to gain employment? What prevents it being more effective?

- Very effective for the majority.
- On improving the New Deal; it should be available for all with the same route. At present, people have to wait on benefits before they are available for New Deal.

6.) What do you feel are the good and bad points of the Pathways to work programme?

- Good for addressing more on IB. Good provisions for people with mental health issues.
- No bad points.

7.) What other initiatives and programmes are helping to try and bridge the skills gap and get the workless back into jobs?

- Local Employment Partnerships (LEP). Major companies give a jobs pledge, guaranteeing interviews for certain number of people on benefits.
- Involvement of LSC with this LEP.
- Lancashire Economic Partnership (also LEP).
- LSC Skills for Jobs.

8.) In your opinion what are the attitudes of companies and employers in the construction industry towards employing the workless through retraining programmes?

- Stigma of the workless not having skills.
- An apparent desire to bypass JCP; word of mouth preferred means of acquiring labour in construction industry. Workers shuffled from one site to another.

9.) What do you feel is the attitude of colleges in the area towards the provision of courses and training for the workless?

- Very positive.
- The problems lie with legislation and the benefits system; she felt that the colleges were very keen put on the courses but that JCP was restricted by legal reasons and the complexities of the benefits system.

10.) Do you feel there is enough opportunity / courses offered by institutions to cater for the workless? Give reason.

- Enough for young people but not for adults; both opportunities and courses.
- Adult workless are hindered by legislation and funding.

11.) In your opinion, what could be done to overcome problems of getting more unemployed people trained for specific jobs?

- Putting on courses but matching training to employers needs.
- Gaining a commitment from employers, like with Local Employment Partnerships.
- Need to work towards employer demand.

12.) What interaction is there between Local Authorities and JCP re worklessness?

- There is a lot. Regular meetings as part of LAA (Local Area Agreement).
- There will be more, due to WNF (Working Neighbourhoods Fund) which will shift funding to Local Authorities.

13.) What interaction is there between LAs and JCP regarding construction employment and opportunities for training? Are they adequate? Any suggestions?

- Mainly work is for the youth in construction; not adults.

14.) How do you feel negative perceptions of worklessness be overcome?

- Role models in communities
- Good news stories
- Ultimately there's no solution to this, it can only improve and this takes a lot of time.

15.) In your opinion what is the relation between local authorities and JCP – what can be improved?

- More conditions should be imposed by Local Authorities on companies investing in the area, as with LEP.
- Resources need to be better.

16.) In your opinion, what are the biggest challenges hindering JCP from being able to help more workless people into jobs?

- Resources need to be better.
- It's not compulsory that those on IB look for work; those who could be prepared for work should be prepared, supported and encouraged to seek work.
- No results from Constructing the Future. Interviewee felt it hadn't achieved anything; just a good slogan 'local jobs for local people'.
- Website recruitment from CtF hasn't worked; it doesn't overcome the problem of JCP not being informed on construction jobs that come available.

APPENDIX V: QUESTIONNIARE

Questionnaire completed by employers. Wherever possible the questionnaire was accompanied by an informal interview to ascertain more information behind their answers.

Questions to employers

Company name:
Contact details:

Your name:

1.) Do you feel there is a large supply of skilled local labour in the East Lancashire Region? Yes/no

2.) Do you feel there is a large supply of unskilled local labour in the East Lancashire Region? Yes/no

3.) Which of the following factors would most influence your employing an unemployed individual? (You may tick more than one)

a.) Skills □
b.) Level of training □
c.) Maturity □
d.) Language □

e.) Other. Please Specify:
_____

4.) List these barriers to employment from 1 to 7 with 1 being the greatest hindrance to your employing an individual, then 2, 3 etc. with 7 being the least hindrance:

a.) Poor health □
b.) Skills □
c.) Lack of training (qualifications) □
d.) Lack of maturity / working experience □
e.) Having been out of work for more than two years □
f.) Expense (wages / cost of employment) □
g.) Disability □

Please give details of any other factors that you have encountered which have impacted on the effectiveness of employees in the past.
How have you overcome any of these problems?
6.) Would you consider employing someone who has been made redundant if they were to be retrained? Yes / no.
If no please give reason why:

_____

[Question 6 continued…]

If yes please tick which of the following areas of construction you would be willing to employ retrained individuals in and give a comment to explain why:

Construction area	Yes	No	Reason for answer / comment
Labourer or General Construction Operative			
Plasterer			
Dry liner			
Bricklayer			
Floor covering			
Carpenter / joiner			
Plumber			
Painter and Decorator			
Electrician			
Roofing			

7.) Which of the following sources do you usually use for finding workers? (reasons may be given; more than one can be ticked)

a.) Jobcentre Plus
b.) Colleges
c.) Industry contacts (word of mouth)
d.) Through private agencies
e.) Other. Please specify.

_____

Why do you prefer this method?

8.) In your opinion, what skills areas are most in demand for the construction industry?

9.) Have you encountered a need for heritage skills or skills for new/modern building methods? (If so, please give examples)

APPENDIX VI: QUESTIONNAIRE

Questionnaire completed by workless through Jobcentre Plus in Accrington.

Elevate Questionnaire:

Male
Female

1.) Mark these types of employment 1-6, to show what you would most like to do.

- Retail
- Manufacturing
- Construction / building
- Transport
- Childcare
- Health sector

2.) Which of the following do you feel may stop you finding work?
(You may tick more than one)

- Poor health
- Level of training
- Past work experience
- Gender
- Ethnicity
- Age (being see as either too old or too young)

3.) Would you be interested in training and looking for work in the construction industry some time in the future?
Yes / No
Please give reason for your answer:
_____

4.) If you had to re-train for work in the construction industry, how long would you expect the training to last? (Tick one only)

a.) Less than a month
b.) One to three months
c.) Three to six months
d.) Six months to a year
e.) Over a year

Accrington & Rossendale College	Number of students			
Trade Area	**1st Year**	**2nd Year**	**3rd Year**	**Total**
Brickwork	32	32	12	76
C & J	62	38	35	135
P & D	16	9	3	28
Plastering	18	15	13	46
Floorcovering	16	18	2	36
Plumbing	35	42	35	112
Electrical	0	0	0	0
			TOTAL	**433**

Burnley College	Number of students			
Trade Area	**1st Year**	**2nd Year**	**3rd Year**	**Total**
Brickwork	49	41	16	106
C & J	56	27	16	99
P & D	24	4	2	30
Plastering	44	14	6	64
Floorcovering	0	0	0	0
Plumbing	27	30	32	89
Electrical	19	48	18	85
			TOTAL	**473**

Blackburn College	Number of students			
Trade Area	**1st Year**	**2nd Year**	**3rd Year**	**Total**
Brickwork	49	46	3	98
C & J	51	38	12	101
P & D	15	10	5	30
Plastering	0	0	0	0
Floorcovering	0	0	0	0
Plumbing	22	15	9	46
Electrical	14	24	16	54
			TOTAL	**329**

Total for all Pennine Lancs	Number of students			
Trade Area	**1st Year**	**2nd Year**	**3rd Year**	**Total**
Brickwork	130	119	31	280
C & J	169	103	63	335
P & D	55	23	10	88
Plastering	62	55	55	172
Floorcovering	16	18	2	36
Plumbing	84	87	76	247
Electrical	33	72	34	139
			TOTAL	**1297**

College construction student numbers, 2006-07[40]

[40] Statistics for all courses including apprenticeships; figures supplied by Pennine Lancashire Construction and Education Consortium.

APPENDIX VIII: LIST OF EMPLOYERS

List of employers, companies and events featured in or supportive to the research:
Lovells
B. McDermott & Son
Bramalls Construction
Ibbotsons
ROK Building Ltd.
Hambling Construction
Ensign Developments
Global Electrical
B&E Boys
Speakmans
R. Martin & Son
Chorley Community Housing
Calico
MAF Design and Build
W.N. Powell & Sons Ltd.

APPENDIX IX: MEETINGS AND FOCUS GROUP ACTIVITIES

Operational Management Board meetings held at the Globe, Accrington:
2nd January, 2008 and 10th March, 2008.
Supply Chain Clinic, held at the Globe, Accrington:
29th February, 2008.
Best Practices event: 'Site Waste Management', employers event at Turf Moor:
8th February 2008
Curriculum Managers meeting at Accrington & Rossendale College:
25th February 2008
Pennine Lancashire Consortium sub-group; working group for workless agenda. Globe, Accrington:
15th January 2008

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The East Lancashire Institute of Higher Education at Blackburn College

Fortran codes for computing the acoustic field surrounding a vibrating plate by the Rayleigh integral method

Academic Report: AR-08-16

Stephen Kirkup[1]

July 2008

Engineering Research Group
Computing Research Group

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Abstract **-** This paper describes the author's RIM3 Fortran code. RIM3 delivers a computational solution to the acoustic field produced by a vibrating plate placed on an infinite baffle. The mathematical model is based on the Rayleigh integral. The method is implemented in three-dimensions by subroutine RIM3 in Fortran, which is made freely available for download. The subroutine is applied to test cases and results are given. The software is available as open source.

I INTRODUCTION

Methods based on integral equations, or boundary element methods (BEMs) have played an important role in many areas of science and engineering [eg 1-2]. Boundary Element Methods have been developed in acoustics for several decades. The method continues to be developed and applied more widely [3-20].

In this paper, a method for computing the acoustic field surrounding a vibrating panel, the Rayleigh Integral Method, is developed in a computer code (RIM3). Although the Rayleigh Integral Method is not strictly a boundary element method, it contains the same components and hence it is a useful addition to an acoustics boundary element method library.

The purpose of this work is to develop a method and Fortran subroutine that delivers a computational solution to the acoustic field surrounding a (set of) flat plate(s) with specified acoustic properties, lying in an infinite baffle. The physical situation is illustrated in figure 1. The acoustic domain is the three-dimensional half-space. The motion of the plate is governed by a given condition on the plate. The baffle is rigid and perfectly reflecting. This model can be applied to a range of acoustic problems. For example it can model the acoustic field around the near-flat surface of an object. The Rayleigh integral [21] directly relates the velocity potential (or sound pressure) in the acoustic domain to the velocity distribution on the plate. Methods obtained in this way have been derived and applied to the problem of computing the properties of the acoustic field exterior to a flat or near-flat plate for some time. These methods are generally derived through applying a direct numerical integration method (see, for example Schenck [22]) to the Rayleigh integral. The resulting method is often termed the *simple source method*. However, the integrand of the Rayleigh integral can be singular or near-singular and it becomes increasingly oscillatory as the wavenumber increases. Hence the direct numerical integration that underlies the simple source method is expected to be a computationally inefficient means of obtaining the solution in many cases.

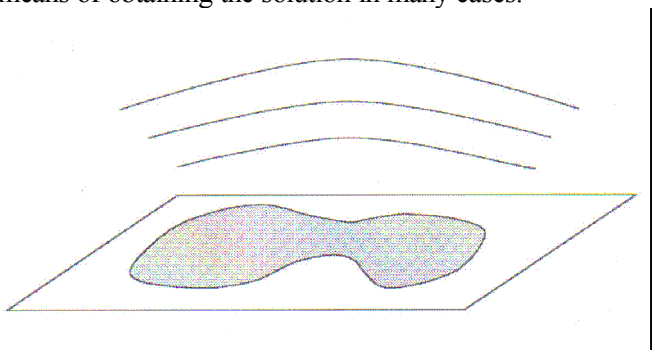

Figure 1: The plate situated in an infinite baffle.

The extension of boundary elements to include the Rayleigh integral method was set out in the author's PhD [23] and later published [24], in which the method is developed through numerical product integration of the Rayleigh integral (for the Neumann condition on the plate). The method is termed the Rayleigh integral method and it is superior to the simple source method since its accuracy is virtually unaffected by the nature of the integrand. The Rayleigh Integral Method is extended to cover similar problems but with a wider range of boundary conditions in this work.

A Fortran (Fortran 77) subroutine (RIM3) that implements the method for three-dimensional acoustic

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problems is developed. Test problems have been written to demonstrate the method. The results from a range of test problems are given. The subroutine RIM3, the test problems and the other necessary software is provided with this article as *open source* code. The codes can be downloaded from the webpages listed at the bottom of the page.

II. Mathematical Model

The acoustic radiation model consists of a vibrating plate $\prod$ of arbitrary shape lying in an infinite rigid baffle and surrounded by a semi-infinite acoustic medium E, as shown in figure 1 for the three-dimensional case. The baffle is perfectly rigid and reflecting. The problems covered in this work allow a general Robin boundary condition on the plate; modelling radiation problems with a perfectly reflecting, perfectly absorptive or an impedance boundary condition at the plate. The aim is that of determining the properties of the semi-infinite acoustic medium surrounding the plate.

Acoustic Model

The acoustic field is governed by the wave equation in *E*,

$$\nabla^2 \Psi(\mathbf{p},t) = \frac{1}{c^2}\frac{\partial^2}{\partial t^2}\Psi(\mathbf{p},t) \tag{1}$$

where Ψ is the scalar time-dependent velocity potential related to the time-dependent particle velocity *V* by

$$V(\mathbf{p},t) = \nabla\Psi(\mathbf{p},t) \tag{2}$$

and c is the propagation velocity (p and t are the spacial and time variables). The time-dependent sound pressure *Q* is given in terms of the velocity potential by

$$Q(\mathbf{p},t) = -\rho\frac{\partial\Psi}{\partial t}(\mathbf{p},t) \tag{3}$$

where ρ is the density of the acoustic medium.

Only periodic solutions to the wave equation are of interest, thus it is sufficient to consider time-dependent velocity potentials of the form:

$$\psi(\mathbf{p},t) = \varphi(\mathbf{p})e^{i\omega t} \tag{4}$$

where ω is the angular frequency (ω=2πη, where η is the frequency in hertz) and ***φ(p)*** is the (time-independent) velocity potential. The substitution of expression (4) into (1) reduces it to the Helmholtz (reduced wave) equation:

$$\nabla^2\varphi(\mathbf{p}) + k^2\varphi(\mathbf{p}) = 0 \tag{5}$$

where $k=\omega/c$ is the wavenumber.

In general, let it be assumed that we have a Robin condition on the plate of the form

$$a(\mathbf{p})\varphi(\mathbf{p}) + b(\mathbf{p})v(\mathbf{p}) = f(\mathbf{p}) \quad (\mathbf{p}\in\Pi) \tag{6}$$

where $v(\mathbf{p}) = \frac{\partial\varphi}{\partial n_p}(\mathbf{p})$ and with $f(\mathbf{p})$ given for $\mathbf{p}\in\Pi$ and $\mathbf{n}_p$ is the unit outward normal to the plate at **p**. The true velocity of the plate can be expressed as $v(\mathbf{p})e^{i\omega t}$ for $\mathbf{p}\in\Pi$.

For the problems we consider in this document, φ must also satisfy the Sommerfeld radiation condition:

$$\lim_{r\to\infty} r\left(\frac{\partial\varphi}{\partial r} - ik\varphi\right) = 0 \tag{7}$$

where *r* is the distance between the point **p** and a fixed origin.

Properties of the time-harmonic acoustic field

In this section other important acoustic properties are related to those already defined. The substitution of (4) into equation (1) gives the time-independent sound pressure:

$$P(\mathbf{p}) = i\rho\omega\varphi(\mathbf{p}) \ (\mathbf{p}\in\Pi\cup E). \tag{8}$$

The sound intensity on the plate with respect to the normal to the plate is given by the following expression:

$$I(\mathbf{p}) = \frac{1}{2}\mathrm{Re}\{P^*(\mathbf{p})v(\mathbf{p})\} \quad (\mathbf{p}\in\Pi) \tag{9}$$

where the asterix denotes the complex conjugate. The sound intensity on the baffle is zero since *v* is zero there. The sound power is given by

$$W = \int_{\Pi} I(\mathbf{p})dS_p \ . \tag{10}$$

The radiation ratio (often termed the radiation resistance or radiation efficiency) is given by the following expression:

$$\sigma_{RAD} = \frac{W}{\frac{1}{2}\rho c\int_{\Pi} v^*(\mathbf{q})v(\mathbf{q})dS_q}. \tag{11}$$

III.RAYLEIGH INTEGRAL FORMULATION

A derivation of the Rayleigh integral formulation is given in Pierce [25]. In brief, it relates the velocity potential $\varphi(\mathbf{p})$ at a point p in the exterior E, on the plate $\prod$, or on the baffle to the normal velocity v on the plate $\prod$.

In the standard integral operator notation used in integral equation methods the Rayleigh integral is stated as follows:

$$\varphi(\mathbf{p}) = -2\{L_k v\}_{\Pi}(\mathbf{p}) \quad (\mathbf{p} \in \Pi \cup E). \tag{12}$$

In equation (11) the operator L_k is defined by

$$\{L_k \mu\}_{\Gamma}(\mathbf{p}) \equiv \int_{\Gamma} G_k(\mathbf{p},\mathbf{q})\mu(\mathbf{q})dS_q \quad (\mathbf{p} \in \Pi \cup E), \tag{13}$$

where $G_k(\mathbf{p},\mathbf{q})$ is a free-space Greens function for the Helmholtz equation in three dimensions and Γ represents the whole or part of the plate. The Green's function is defined as follows:

$$G_k(\mathbf{p},\mathbf{q}) = \frac{1}{4\pi}\frac{e^{ikr}}{r}. \tag{14}$$

where $r = |\mathbf{r}|$ and $\mathbf{r} = \mathbf{q} - \mathbf{p}$ and i unit imaginary number (often also denoted by j). The Green's function (14) also satisfies the Sommerfeld radiation condition (6), ensuring that all scattered and radiated waves are outgoing in the farfield.

IV. RAYLEIGH INTEGRAL METHOD

Approximations to the properties of the acoustic medium can be found through applying numerical integration technique to equation (12). This requires us to represent the plate by a set of panels and go on to approximate the integral (12); rewriting it in discrete form.

Representation of the Plate

In order that the resulting computational method is applicable to a class or arbitrary plates there must be a facility for representing the plate as a set of panels. For example a set of triangles can be used to approximate a plate of arbitrary shape. Thus we may write

$$\Pi \approx \widetilde{\Pi} = \sum_{j=1}^{n} \Delta\Pi_j \tag{15}$$

where each $\Delta\Pi_j$ is a triangle. Triangulations of circular and square plates are illustrated in sections VII and VIII of this paper.

Simple Source Method

The velocity potential can be evaluated by using a numerical approximation of the integral in (12). Perhaps the most straightforward approach, and the one most often adopted, is to use the mid-point numerical integration rule. This method is otherwise known as the simple source method. The method is explained in Schenck [22], for example. If the mid-points of each element is $\mathbf{q_j}$ for j = 1, 2, ..,m , then the application of the mid-point rule to equation (11) gives

$$\varphi(\mathbf{p}) \approx -\frac{1}{2\pi}\sum_j area(\Delta\Pi_j)\frac{\exp(jkr_j)}{r_j}v_j$$

where *area(*$\Delta\prod_j$*)* is the area of the element $\Delta\prod_j$, $r_j = r(\mathbf{p}, \mathbf{q}_j)$ is the distance between $\mathbf{p}$ and $\mathbf{q}_j$ and $v_j = v(\mathbf{q}_j)$. Clearly, since the integrand in (12) tends to become more oscillatory with increasing k, the accuracy of this method tends to deteriorate as k increases. Furthermore, if p is near or on the plate then the numerical approximation is likely to be poor. A further difficulty with this approach is that the approximation is only directly applicable in the case of the Neumann condition.

Collocation

A more natural approach is by the use of collocation in which the potentially badly behaved weighting function $\frac{e^{jkr}}{r}$ is incorporated into the quadrature rule. The normal velocity on $\widetilde{\Pi}$ is expressed in the form

$$\widetilde{v}(\mathbf{p}) \approx \sum_{j=1}^{n} v(\mathbf{p}_j)\zeta_j(\mathbf{p}) = \sum_{j=1}^{n} v_j \zeta_j(\mathbf{p}). \tag{16}$$

where $\zeta_1, \zeta_2, .., \zeta_n$ are basis functions. In this work the basis functions are defined such that

$$\zeta_j(\mathbf{p}) = \begin{cases} 1 & \mathbf{p} \in \Delta\widetilde{\Pi}_j \\ 0 & \mathbf{p} \notin \Delta\widetilde{\Pi}_j \end{cases}$$

and $v_j = v(\mathbf{p}_j)$, the velocity at the j[th] collocation point.

The replacement of the true plate Π by the approximate plate $\widetilde{\Pi}$ and the substitution of the approximation (16) allows us to write

$$\{L_k v\}_{\Pi} = \int_{\Pi} G(\mathbf{p},\mathbf{q}) v(\mathbf{q}) dS_q \approx \int_{\widetilde{\Pi}} G(\mathbf{p},\mathbf{q}) \sum_{j=1}^{n} v_j \zeta_j(\mathbf{p}) dS_q$$

$$= \sum_{j=1}^{n} v_j \int_{\widetilde{\Pi}} G(\mathbf{p},\mathbf{q}) \zeta_j(\mathbf{p}) dS_q = \sum_{j=1}^{n} v_j \; L\zeta_j \;_{\Delta\widetilde{\Pi}\, j} \qquad (17)$$

For a particular wavenumber and a particular value of p, having calculated the $L_k \zeta_j \;_{\Delta\widetilde{\Pi}_j}$ an approximation to the velocity potential $\varphi(\mathbf{p})$ can be obtained by the summation (17).

Discretising the Lk Operator

The $\{L_k \zeta_j\}_{\Delta\widetilde{\Pi}\, j}$ can be evaluated by mapping the elements of the approximate plate onto the standard triangle with vertices (0,0), (0,1) and (1,0). When the integrands are bounded then a standard numerical integration technique can be used. Efficient methods may be obtained through the use of the Gaussian Quadrature formulae in Laursen and Gellert [26].

When $\mathbf{p} \in \Delta\widetilde{\Pi}_j$ the integrand in is singular and special techniques need to be employed. One of the most effective way of treating these integrals is to change the variables to polar coordinates, transforming them into regular integrals. The method employed for carrying this out is described in Kirkup [27], [28]. The Fortan subroutine for carrying this out is denoted H3LC.

V. Implementation of the Rayleigh Integral Method

In this section an implementation of the Rayleigh Integral Method is described. The plate may be of any shape and is assumed to be discretised into a set of planar triangles.The normal velocity distribution on the plate is described simply by its value at the centroids of the triangles.

As input, the subroutine accepts a description of the geometry of the plate (made up of triangles), the coordinates of selected points in the exterior (where the sound pressure is required), the wavenumbers under consideration and a description of the boundary condition at each wavenumber. As output, the subroutine gives, for each wavenumber, the velocity potential and surface velocity on the plate and the velocity potential at the selected exterior points.

Subroutine RIM3

```
C SUBROUTINE RIM3(K,
C * MAXNV,NV,VERTEX,MAXNPI,NPI,SELV,
C * MAXNPE,NPE,PEXT,
C * PIALPHA,PIBETA,PIF,
C * LSOL,LVALID,EGEOM,
C * PIPHI,PIVEL,PEPHI,
C * WKSPC1,WKSPC2,WKSPC3,WKSPC4,WKSPC5,WKSPC6)
C The parameters to the subroutine
C ================================
C Wavenumber (input)
C real K: Must be positive.
C Geometry of the plate {\Pi} (input)
C integer MAXNV: The limit on the number of vertices of the triangles
C that defines (approximates) {\Pi}. MAXNV>=3.
C integer NV: The number of vertices on {\Pi}. 3<=NV<=MAXNV.
C real VERTEX(MAXNV,3): The coordinates of the vertices. VERTEX(i,1),
C VERTEX(i,2), VERTEX(i,3) are the x,y,z coordinates of the i-th
C vertex. The vertices must be co-planar.
C integer MAXNPI: The limit on the number of elements describing {\Pi}.
C MAXNPI>=1.
C integer NPI: The number of elements describing {\Pi}.
1<=NPI<=MAXNPI.
C integer SELV(MAXNPI,3): The indices of the three vertices defining
C each element. The i-th element have vertices
C
(VERTEX(SELV(i,1),1),VERTEX(SELV(i,1),2)),VERTEX(SELV(i,1),3)),
C (VERTEX(SELV(i,2),1),VERTEX(SELV(i,2),2)),VERTEX(SELV(i,2),3))
and
C
(VERTEX(SELV(i,3),1),VERTEX(SELV(i,3),2)),VERTEX(SELV(i,3),3)).
C Exterior points at which the solution is to be observed (input)
C integer MAXNPE: Limit on the number of points exterior to the
www.boundary-element-method.com
C plate. MAXNPE>=1.
C integer NPE: The number of exterior points. 0<=NPE<=MAXNPE.
C real PEXT(MAXNPE,3). The coordinates of the exterior point.
C PEXT(i,1),PEXT(i,2),PEXT(i,3) are the x,y,z coordinates of the i-th
C point.
C The plate condition ({\alpha} phi + {\beta} v = f) (input)
C complex PIALPHA(MAXNPI): The values of {\alpha} at the centres
C of the elements.
C complex PIBETA(MAXNPI): The values of {\beta} at the centres
C of the elements.
C complex PIF(MAXNPI): The values of f at the centres of the
C elements.
C Validation and control parameters (input)
C logical LSOL: A switch to control whether the particular solution is
C required.
C logical LVALID: A switch to enable the choice of checking of
C subroutine parameters.
C real EGEOM: The maximum absolute error in the parameters that
C describe the geometry.
C Solution (output)
C complex PIPHI(MAXNPI): The velocity potential ({\phi}) at the
C centres of the plate elements.
C complex PIVEL(MAXNPI): The velocity (v or d{\phi}/dn where n is
C the outward normal to the plate) at the centres of the plate
C elements.
C complex PEPHI(MAXNPE): The velocity potential ({\phi}) at the
C exterior points.
C Working space
C COMPLEX*16 WKSPC1(MAXNPI,MAXNPI)
C COMPLEX*16 WKSPC2(MAXNPE,MAXNPI)
C COMPLEX*16 WKSPC3(MAXNPI,MAXNPI)
C COMPLEX*16 WKSPC4(MAXNPI)
C COMPLEX*16 WKSPC5(MAXNPI)
C LOGICAL WKSPC6(MAXNPI)
```

VI. Test Problems

In this section, the Rayleigh integral method is applied to various test problems.

Sound Pressure Field of a Circular Piston

The test problem is that of a uniformly vibrating circular piston of radius 0.1, centred at (0, 0, 0) at wavenumbers k = 10 and k = 25. If $v(\mathbf{p}) = -V \quad (\mathbf{p} \in \Pi)$ is the velocity of the piston (uniform over its surface) then the sound pressure $P(\mathbf{p})$ at a point p = (0, 0, p_3) on the axis of the piston is given by

$$P(\mathbf{p}) = \rho c V(\exp(ik(0.01 + p_3^{\,2})^{1/2} - \exp(ikp_3))$$

see, for example, Skudrzyk [29], pp631-633.

The circular piston is divided into 24 triangles, as shown in figure 2.

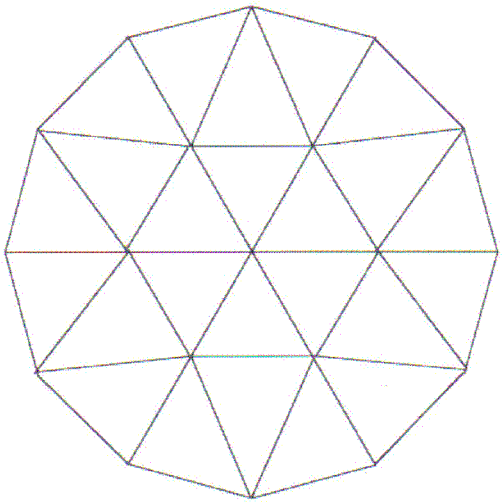

Figure 2. The circular plate divided into 24 triangular panels.

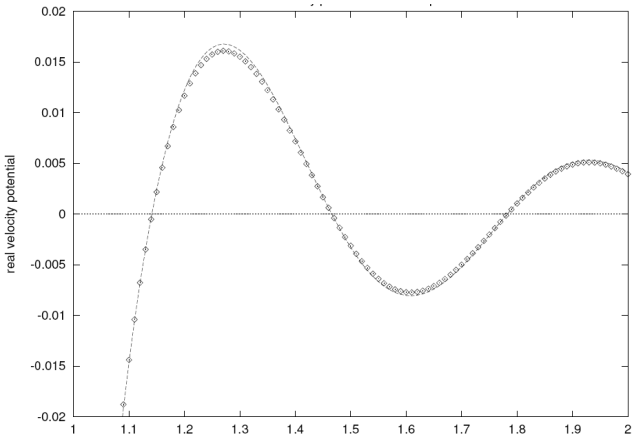

Figure 3a. Real on axis sound pressures for circular piston, k=10.

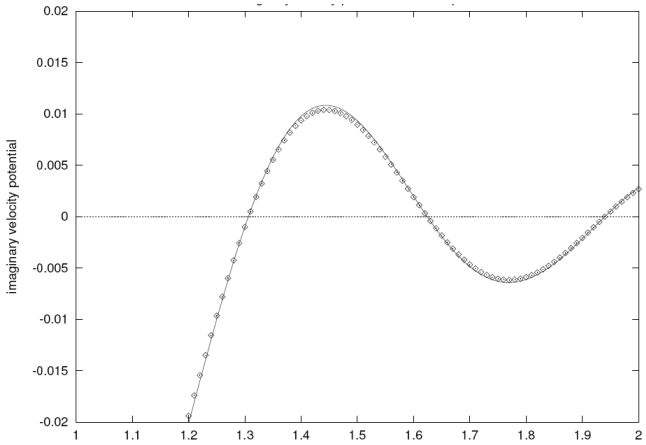

Figure 3b. Imaginary on axis sound pressures for circular piston, k=10.

Figures 3 compare the computed and exact on axis sound pressure obtained from the subroutine at twenty points with exact values for k = 10. Figures 4 compare the same but with k = 25.

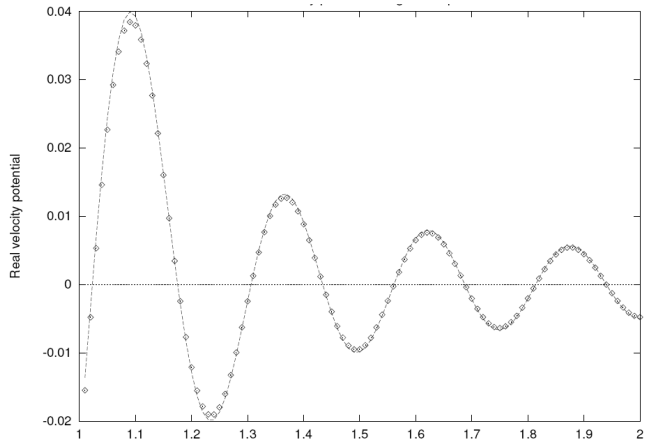

Figure 4a. Real on axis sound pressures for circular piston, k=25.

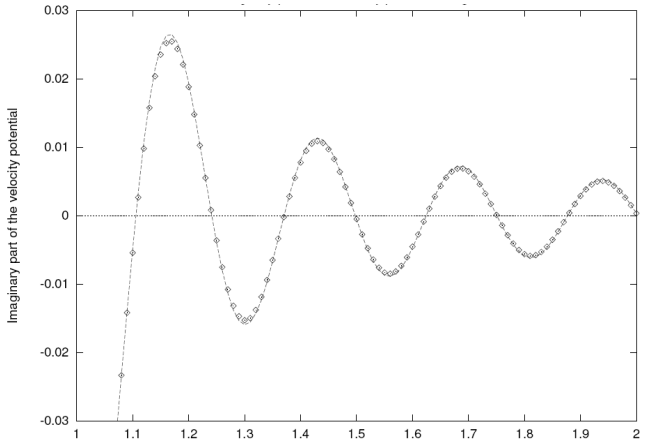

Figure 4b. Imaginary on axis sound pressures for circular piston, k=25.

Square test problem

The second test problem is that of a uniform square plate with its sides hinged onto an infinite rigid baffle. The [0, 1]×[0, 1] square is vibrating in its natural modes which are

$$v(\mathbf{p}) = \sin(lp_1)\sin(mp_2) \tag{18}$$

where l and m are integers. The property that is of interest is the radiation ratio of the plate vibrating in each of its mode shapes (18).

In order to apply the subroutine to the problem, the square plate is divided into 32 triangles, as shown in figure 5. The mode shapes considered were the sixteen given by putting l = 1 and m = 1 in (18). The wavenumbers at which the radiation ratio is computed are k = 0.0, 0.2, 0.4, ..., 34.8, 20.0 . Figures 6 show the radiation ratio curves constructed from the results of the subroutine run.

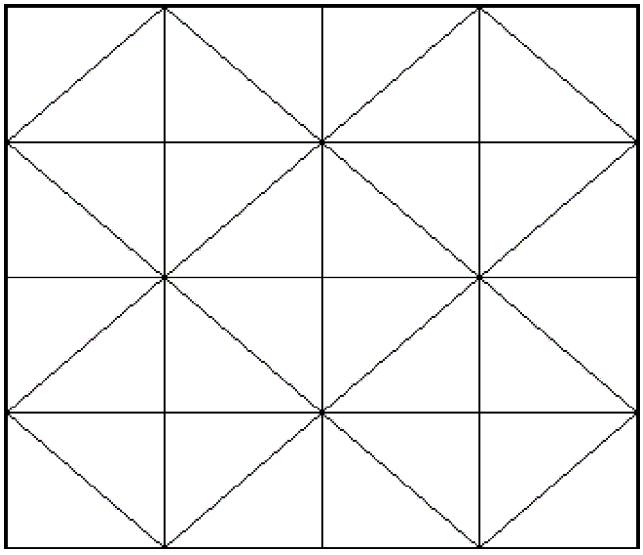

Figure 5. The square plate divided into 32 triangular panels.

The final test problem is that of the same square plate as in the previous example, having the same discretisation but with it vibrating uniformly. The radiation ratio curve for this is shown in figure 7.

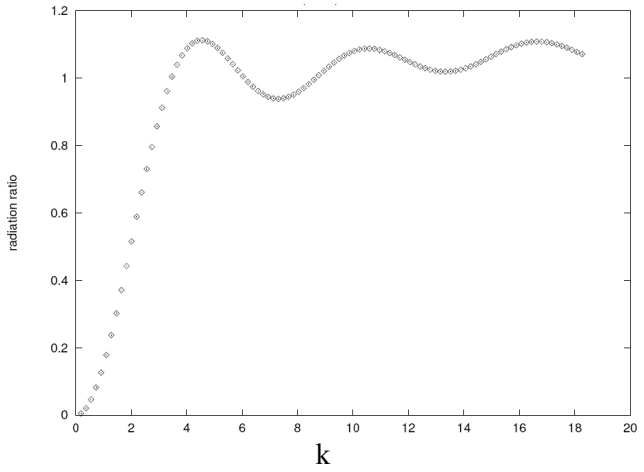

Figure 6. The radiation ratio curve for a square panel in the uniform mode.

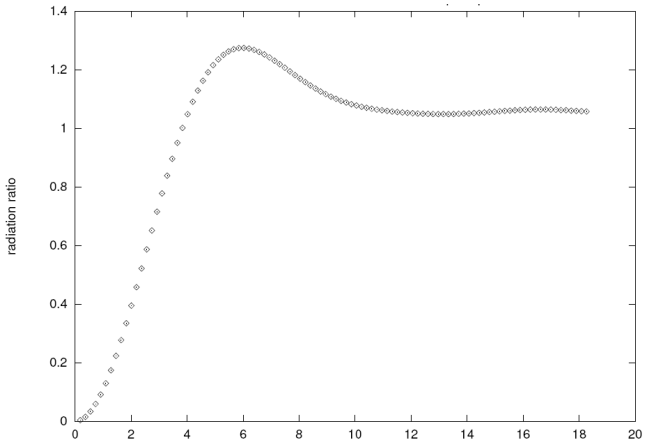

Figure 7. The radiation ratio curve for a square panel in the sin*sin mode.

VII. Concluding Discussion

The computational solution of a given acoustic radiation problem first involves the selection of an appropriate acoustic radiation model which underlies the choice of method. For example the model of a closed surface in an infinite acoustic medium underlies the boundary element method (see, for example, Kirkup [28]). Several practical acoustic problems are suitably represented by the acoustic

radiation model of a vibrating plate lying in an infinite baffle and thus a computational solution can be obtained via methods based on the Rayleigh integral. For example the Rayleigh integral model can be applied to the problem of predicting the noise radiated by the faces of an in-line engine block (see Yorke [30] or Kirkup and Tyrrell [31], for example). Computational methods based on the Rayleigh integral have been applied to certain classes of acoustic problems for some time. However, such methods have generally been based on direct numerical integration and hence they have poor numerical properties.

In this paper product integration has been applied to the Rayleigh integral to derive a more robust method, that is more in line boundary element methodology.

A particular implementation of the RIM is described in this paper. In figures 3 and 4, computed and exact sound pressures along the axis of the circular piston are compared. The results appear to be in good agreement. In figure 6 and 7 the computed radiation ratio curves for the a square plate in a simple motion are given. These may be compared with similar results given in Wallace [32].

In Kirkup and Thompson [12] a hybrid of the Boundary Element Method and the Rayleigh Integral method is introduced. This method, termed BERIM, can be used to computed the properties of a radiating open cavity.

The Rayleigh integral method is applicable to acoustic problems that include of a flat or nearly flat plate exposed to an acoustic medium on one side. Since the method requires the description of the plate as a set of elements (triangles) then the plate may be of arbitrary shape. Hence the Rayleigh integral method should serve as a useful addition to an acoustic software library.

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Electromagnetic Simulation by the FDTD method in Java

Academic Report: AR-08-17

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Electromagnetic Simulation by the FDTD method in Java

Stephen Kirkup[1], Irfan Mulla, Goodchild Ndou and Javad Yazdani

Academic Report AR-08-17. East Lancashire Institute of Higher Education, Blackburn, UK.

Abstract **-** The FDTD (Finite Difference Time Domain) is the most popular method for transient electromagnetic simulation. The FDTD method belongs in the general class of differential time domain numerical modelling methods. Maxwell's (differential form) equations are simply modified to central-difference equations and implemented in software. The FDTD program is developed in Java using object-oriented design principles and is available as open source from www.east-lancashire-research.org.uk (AR-08-17).

I Introduction

Electromagnetic fields are governed by Maxwell's equations. Through developing a computational model, electromagnetic fields can be simulated on computer and results can be visualised. The design of electrical components can be analysed through the application of computational methods. There are a number of techniques for the numerical solution of Maxwell's equations, the choice of technique depending on the particular circumstances [1]. This paper focuses on the finite difference time domain (FDTD) method and applies it to the design of a capacitor.

The FDTD algorithm is the most popular method for transient electromagnetic simulation. It is easy to understand, easy to implement in software, and since it is a time-domain technique, it can cover a wide frequency range with a single simulation run. [2].

Stephen Kirkup, Javad Yazdani and Irfan Mulla[2] are with the School of Science and Technology, ELIHE[1], Blackburn College UK. Goodchild Ndou[3] is with the Department of Computing, University of Lancaster[4]. The codes associated with this paper can be downloaded from the web pages below[5, 6].

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The purpose of this article is to introduce a particular implementation of the FDTD program in the object-oriented programming language Java [3]. The program was originally developed as one in a library of codes for simulating the electromagnetic fields in capacitor structures [4-6] and we use the example of a capacitor structure in this paper to demonstrate the program. The program is made available as *open source*[5, 6].

II The FDTD Method

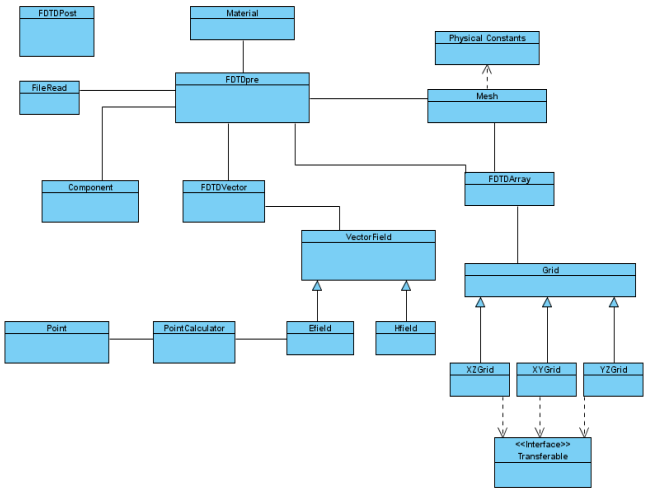
The FDTD method, in its most straightforward and popular form, was introduced in Yee [7]. The domain of interest is divided into a grid of cubes and the electric field (E) at the centres of each of the faces is related to the magnetic field (H) of the pervious half time-step. In the same way, a similar grid is formed, with the cubes being a half pitch away in space and time, but this time updating the magnetic field using the electric field of the previous half time step. Using the two meshes alternately, and starting from time t=0, we can step forward in time, applying any excitation by setting certain values within the domain at each time step.
Note that the domain of interest, mentioned earlier, is often a truncation of the true domain. This is often a necessary approximation, but should not adversely affect the model if the main electromagnetic activity is known to occur reasonable within the applied domain. For the FDTD the applied domain is most likely to be rectangular, given that Yee's method involves dividing the E and H fields into grids of cubes.
Because of the artificial boundaries introduced in the application of the method, non-physical reflections of the electromagnetic signals tend to occur. There are a number of methods for reducing reflections from the applied boundary of the domain of interest. In this work the simplest of these methods was applied, that of a first order Mur boundary condition [8].

The materials need to be specified throughout the applied domain. Typically, the material will be either free-space (air), metal, or dielectrics, any material can be used, as long as the properties of permeability, permittivity, and conductivity can be specified. [2]

Once the computational domain and the grid material are established, a source is specified. The source can be an impinging plane wave, a current on a wire, or a potential difference. Since the E and H fields are determined directly, the output of the simulation is usually the E or H field at a point or a series of point within the computational domain, or the E of H field at certain points, viewed with respect to time. [2]

III FDTD Software Design

The FDTD Java code has been developed with object-oriented design principles. In general this means that we separate responsibilities for different parts of the method or different data structure to different objects, using the object-oriented techniques of abstraction, composition and inheritance. A UML class diagram of the FDTD code is given in the following diagram. Further information is given through viewing the codes [12, 13 Academic Report AR-08-17].



The code was originally developed by Stephen Kirkup[4]; it was then re-designed by Goodchild Ndou [9] and has now been revised further by Irfan Mulla [11] to bring it up to be released (Mark 2) as open source.

IV How to use the FDTD software

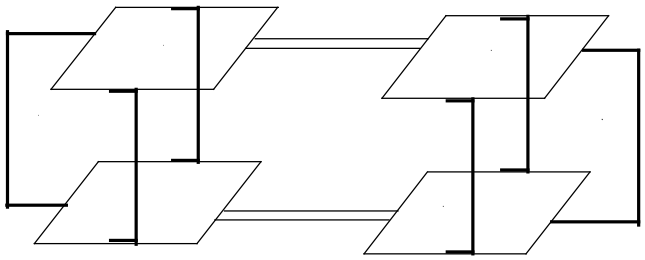
The FDTD code can simulate the electric field evolution in any cuboidal domain. The total package consists of a pre-processor which inputs a text data file and produces the electric field data files on the three central cross-sections of the domain. The text data file allows the user to define the material components of the electromagnetic domain. The components need to be defined as rectangles and the components can appear (and disappear) at defined times. The data file also allows the user to define voltage excitations within the domain. The package also includes a post-processor which reads in the electric field and outputs it to the screen.

Test problem

The electromagnetic problem is set up by the user through completing an input file. A reasonably wide range of structures along with DC voltage sources can be defined from an input file. The input file is a .dat file. Open up the file experiment.dat (a text file e.g. uses Notepad, WordPad).The experiment.dat file is a data file to describe structure, mesh and excitation used in 3D finite difference time method (FDTD). The file will be used throughout this manual to illustrate the functionality of 3D FDTD code.

For this example, the input file represents a stack of two capacitors, side-by-side, and has six inputs; the file has the name experiment.dat

To illustrate how a particular program may be described and run, we will consider the problem illustrated in the following diagram.



[11]

The example structure consists of four aluminium plates of dimensions 2mm x 0.1mm x 1mm of equal distance apart (1mm) lying in a polythene medium. An aluminium *fusegate* extends and connects the plates. For more information on capacitor design see Kirkup [6] and the relevant references therein.

A voltage excitation Ey is placed between each pair of wires (in the example the voltage source is modelled by a polythene strip over which the Ey =1000 is set so the voltage across each pair of plates is 1 V). The example is described as experiment.dat

Input file for the test problem

The input file, describing the test problem, is made up as follows.

[1]Name of Structure

In order to set up a particular electromagnetic problem, the user simply needs to insert the relevant numbers in the input file. One line 6 you can place name of the structure in text.

For the example, the name of the structure is called "Capacitor 2 pairs of plates"

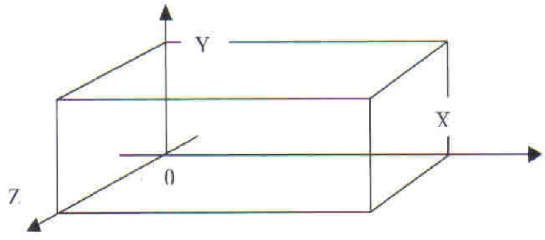
[2] Materials

The materials that make up the structure and their properties must be defined. The first line should have the name of the material and the second lien should have the properties of the material i.e. Conductivity, Relative Permittivity and Susceptibility (in that order).

In the example, the domain consists of two materials: polythene and aluminium. The properties for the material polythene are as follows Conductivity=0.0000000001, Relative Permittivity=2.25, Susceptibility=0.0. The properties for the material Aluminium are as follows Conductivity=35400000, Relative Permittivity=1.0, Susceptibility=0.000022

[3]Dimensions of the cuboidal electromagnetic domain

The domain is a cuboid with one corner at the origin. The dimensions here give the length [X] width [Y] and height [Z] in x, y and z co-ordinates. The electromagnetic domain is then [0 X, 0 Y, 0 Z]. The whole electromagnetic domain is illustrated in the following figure:



In the example, the domain is [0 0.028, 0 0.00050, 0 0.0014]

[4]Mesh

The mesh is made of cubic Yee cells which ideally should fit easily into dimensions, so that you have a finite number of cubes in each dimension

In this example, the domain is made of Yee cells of size 0.00002

[5]Material Distribution

The complete domain must be defined as a distribution of materials. Originally it is assumed that the domain is made up of material 1: this is the background material. However the background material can be overwritten by cuboidal components of other material (or the background material (no 1)). You can have as many such components as you want, the number of components must be stated. They must be listed one by one as shown with the information of the material index from which the component is composed and the region [x1 x2, y1 y2, z1 z2] that is made up of the material.

In the example above, the background material is polythene. There are four plates of material (components 1-4) and six thin strips of material (of one or two cells thick) which constitute wires that extend from plates (5-10). The wires are joined up, each pair by a thin line of polythene (11-16).

[6]Duration of Simulation

The time (in seconds) over which the simulation runs is stated. This is the physical time, related to the electromagnetism.

In the example, the duration of simulation is 0.00000000005 seconds.

[7] Excitation

Each component can be assigned a voltage excitation. The components are listed within the voltage source defined. If a zero value is placed it is taken to mean that there is no voltage excitation.

In the example, a voltage excitation is placed on the polythene strips (components 11-16). Ey = 1000.0, so the voltage is 1V.

Java programs and executing the software

The software is written in Java. Java is a free programming language. It can be downloaded from the website (http://java.sun.com). You will need this to run the codes.

To download the java compiler (for computers running windows) first go to the above website in the browser. Click on the option Products. Then click on Download NetBeans IDE. It will give you numerous NetBeans IDE bundles options for downloading. Click on the Java SE download option. Download the file and follow instructions to install file.

The main codes of the FDTD package come into files

- Pre-processor: FDTDpre.java
- Post-processor: FDTDpost.java

The pre-processor takes the input electromagnetic problem, computes the electric field and saves results to hard disk. The post-processor takes the computed electric fields form the hard disk and displays it on the screen. FDTDPre.java also links to a number of other classes, as shown in the class diagram in section 3. When the .java files are compiled they become .class files, FDTDpre and FDTDpost are then ready to be executed.

The pre-processor takes the input data from the file experiment.dat and computes the electric and magnetic

fields at the defined time steps. On completion of the execution of the pre-processor the output file x.out, y.out, z.out is produced. These files correspond to the electric field strengths on the central cross-sections of the domain; in the y-z plane, x-z plane and x-y plane.

The post-processor is to be run after the pre-processor has completed execution. The user is asked whether you want to view the results on the y-z plane, x-y plane. Following on from the answer to that question one of the files x.out, y.out, z.out is input and the results are displayed.

Monitoring File

It is possible that the pre-processor does not work as expected then there may be errors in the input file. Or you may wish to know how many time steps you have to wait before the execution is completed. After the preliminary seconds of the post-processing, the data pertaining to job is stored in the monitor or .mon file.

If the program is executing but the results are not as expected, then the monitor file is the first place to look and find out where the problem may have originated.

Errors

There are necessary limits on the size of the data structures that are included in the program, so that the software will fit in the given memory. Often the input problem will fit within these limits, but the limits may need to be changed by intervention into java codes by the user. Such changes are simple to perform. If such intervention occurs then the codes will need to be re-compiled.

Generally such problems will be flagged when you try to execute the programs. For example, you may get a message saying that "MaxNz is too small" and you will then have to intervene in the Java and increase MaxNx.

V Results and Visualisation

The pre-processor FDTDpre produces data output, with some monitoring information direct to the screen and to main results to the *.out files. The post-processor FDTDpost reads the *.out files and produces a visualisation of the evolving electromagnetic field.

Output from FDTDpre

The useful output from FDTDpre – such as the electric field strength in the central cross-sectional x-, y- and z-planes are stored in .dat files. Some direct screen output is produced whilst FDTDpre is running in order to keep the user informed. An example of screen output that is produced when the FDTDpre processor is run is shown below:-

Reading Input File
MaxNtout = 1000
Nt = 1428
Ntout = 714
Sending information to the monitoring file experiment.mon
Initialise E,H data structures to zero
1
Setting Up Material Property Data Structures
Material changes
Computing H
Mur Correction in H
Apply Excitation
5.115907697472721E-12
Computing E
truetruetruetruetruetruetruetruetruetruetruetruetruetruetruetruefalse

[11]

The final line of true/false tells us which material components are in effect on each time.

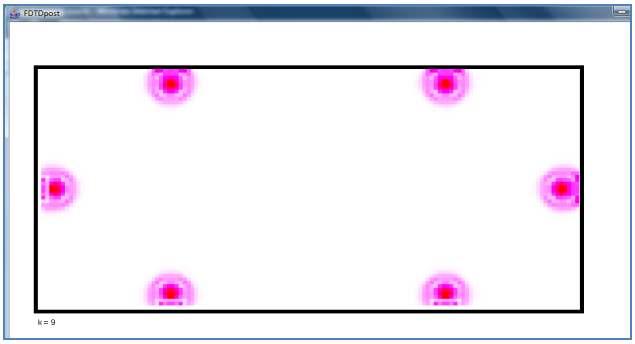
Output from FDTDpost

The FDTD post-processor reads the data files produced by FDTDpre and plots the evolving electric field to the screen. The following plots show the final outputs from the FDTD postprocessor in the horizontal cross sectional plane of the test problem. The results show the electric field strength. A colour scheme is used to illustrate the electric field strength. The colour ranges from white (low) to magenta (medium) to red (high).

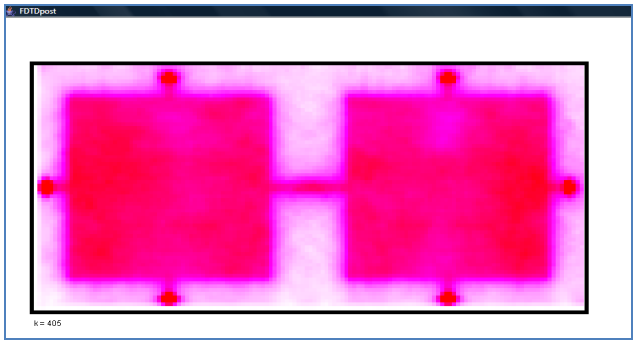
The FDTDpost processor gives a visualisation of the results. When the FDTD processor is run the following is given in the output window:-

Plane x = Plane y-z
Plane y = Plane x-z
Plane z = Plane x-y
Which plane (x, y, or z)?

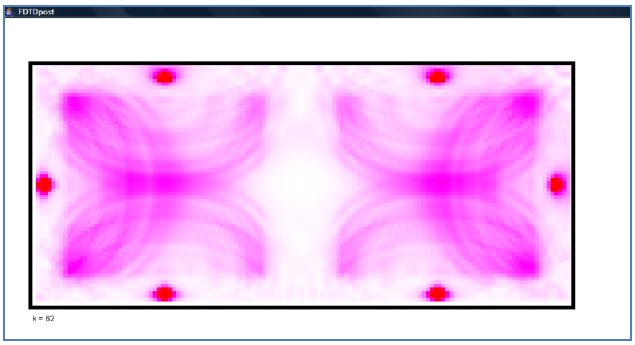
The user chooses the plane that they wish to run. In this example Plane y is chosen. The output given is seen below at different time steps (K) with the whole simulation taking about 15minutes on a standard modern PC:-



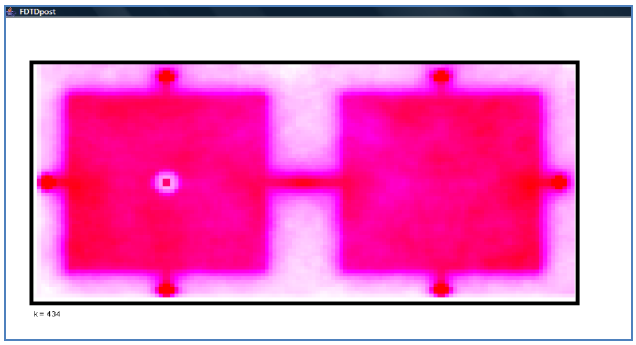
At K=9 the six voltage inputs are shown



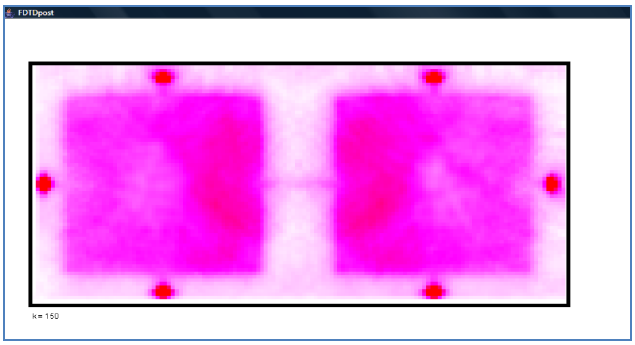
At K=405 the charge on the capacitors is increasing



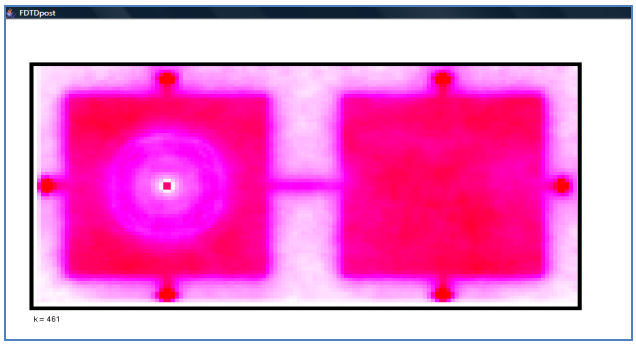
At K=62 the two capacitors are beginning to charge



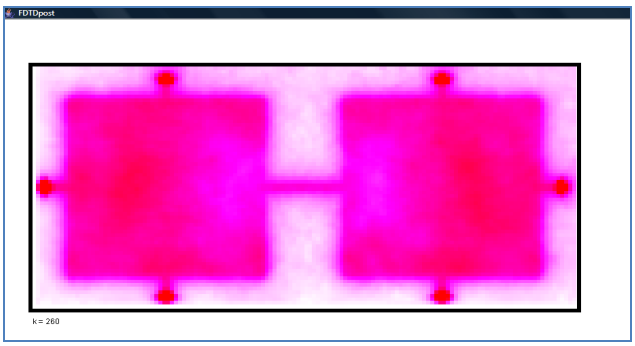
At K=434 the discharge channel in the first capacitor is visible



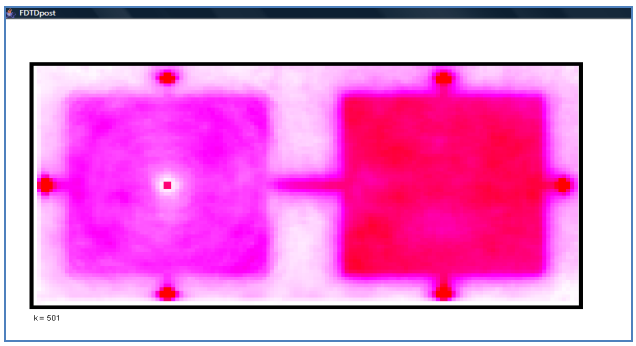
At K=150 the two capacitors are partially charged.



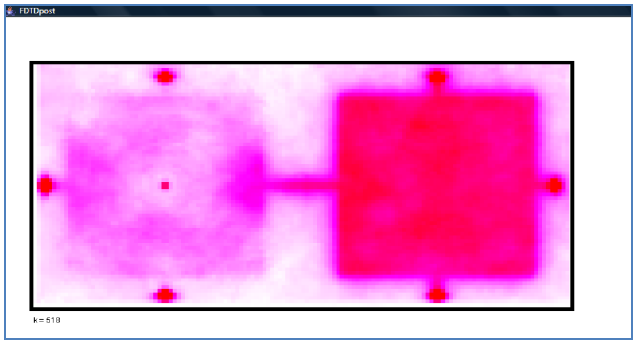
At K=461 the discharge is spreading



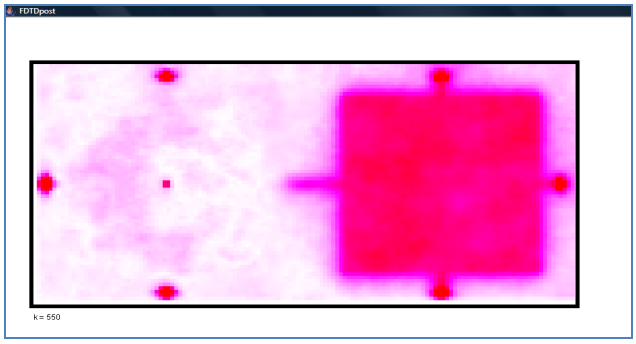
At K=260 the charge on the capacitors is increasing



At K=501 the charge on the left capacitor is clearly less than the charge on the right capacitor



At K=534 the charge on the left capacitor is weakened



At K =573 the charge on the left capacitor is very low. There are some oscillations in the charge following this

VI Conclusion

In this paper the revised Mark 2 design of our open source object-oriented Java program has been reported. It has been shown how a material domain and excitation can be defined in the .dat file, how the pre-processor FDTDpre reads the .dat file, carries out the computation of the electric and a magnetic field forward in time and sends the results to a set of .out files. It has been shown how the post-processor FDTDpost reads the .out files and produces a visualisation of the electric field strength. The program has been applied to a test problem of a capacitor structure with a change in materials to simulate a discharge channel (an inherent problem in capacitor design) and screenshots of the evolving field produced by FDTDpost are given.

There is no functional or efficiency improvement from Mark1 to Mark 2; the big change is the design of the code. The improved object-oriented design makes upgrading the software more straightforward. There are a number of areas in which the code can be improved. (i) Firstly, the method of defining the material domain and excitation could be improved; perhaps replacing the .dat file by a graphical user interface. (ii) A wider range of choices of output and a technique for allowing this in the software. (iii) Further consideration of and therefore possible improvements to the visualisation of the output. (iv) There are still aspects on the object-oriented design that could be reviewed.

As a final potential improvement, the code could be used on larger problems, that is larger domains or higher resolution of Yee cells or longer time evolution of higher resolution of time steps. However, in order to make progress in this direction, further consideration of the efficiency of the program would be needed. The code could be speeded up through using parallel or cluster machines [14] and through further consideration of the distribution of the objects.

Acknowledgement

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Modelling and Developing an Intelligent Road Lighting System using Power-Line Communication

Academic Report: AR-08-18

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Modelling and Developing an Intelligent Road Lighting System using Power-Line Communication

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Academic Report AR-08-18. East Lancashire Institute of Higher Education, Blackburn, UK.

Abstract **-** The development of a suitable system which will control street lighting ballasts depending on traffic flow, communicate data between each street light along the Power-Line and sense passing traffic. This paper offers the methodology of the system, environmental benefits, commercial benefits and safety benefits of such a unique system. It also shows topics that have been researched to date and potential future development paths this research could take.

INTRODUCTION

Current street lighting systems use vast amounts of energy to light our roads at night. The Sodium lights use between 200W and 2kW each depending on location. In some countries such as Norway, around 20% of all the electricity produced is used by road lighting. Although in the UK this figure is much lower the amount of electricity consumed is greater. By implementing a control system a large proportion of this electricity could be saved.

A lighting system allows streetlights to be dimmed or turned off when there is no benefit for them to be turned on. This is of particular importance on a rural road where traffic may only go past every 20 minutes in the middle of the night or on a dangerous stretch of road where it would not be economical to currently erect street lighting such as at an accident prone bend. No other similar system has been found to exist that could carry out this task.

AIMS AND OBJECTIVES

The aim of this project is to produce a device that can be fitted to existing street lights or integrated into future lighting ballasts. The device must be capable of detecting passing traffic through its sensor and communicating numbers to differently addressed lamp posts. The model produced can be used to demonstrate the principle of operation of the system and serve as a test bed for development of the software to control the lighting ballasts.

STANDARDS

The system currently uses narrowband transmission principles for transmission and reception of data between the lamp posts utilizing the European Committee for Electro-technical Standardization, CENELEC, EN50065, which covers the communications requirements for transmitting and receiving signals over the LVDN in the frequency range of 3 kHz to 148.5 kHz. [1],[2][3],[4],[5].

POTENTIAL COMMERCIAL BENEFITS

The cost of a system has to be effective against the amount of electricity used. If the light could be turned off for around 30% of the night the system would pay for itself in less than a year. This would entail that a car would pass down the road around every 10 minutes for the majority of the darkness hours. This is based on the model cost, current electricity prices of around 14p / kWhr and potential installation costs. Development of the project will reduce the cost from the model cost (currently around £70) and as electricity prices increase, will make the project even more viable.

POTENTIAL SAFETY BENEFITS

By making it more cost effective over both lifetime and installation costs, the project could make it viable for local councils to illuminate dangerous stretches of roads that are sporadically used in the middle of the night. This could improve safety and reduce accidents.

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[2]BEng (Hons) Graduate SoST[1]

MODEL SPECIFICATIONS

The basic model that has been produced includes 4 light units. These units communicate data along the Power-Line by using X-10 protocol. The units are controlled by PIC16F628a chips and have various visual status LED's and all the required hardware to modulate / demodulate the communication signals. Figure 1 shows the chip layout for the PIC 16F628a.

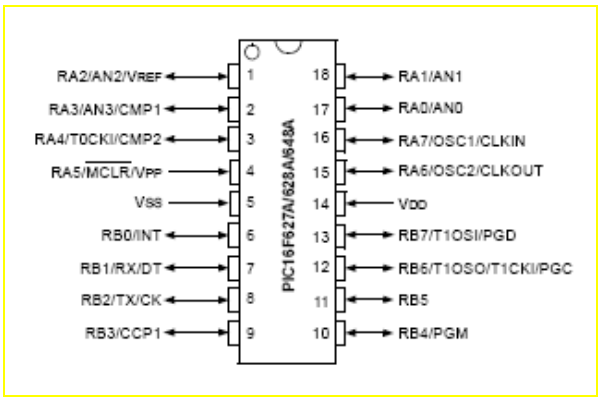

Figure 1. Chip Layout PIC 16F628a.

Contactor Ballast Regulator	AC / DC Converter	Power-line Connection
12V Distribution Bus	PIC Processor	Receive/ Transmit Filter & Oscillator
Vehicle Sensor	TTL Control Circuit	Modulator Demodulator

Figure 2. Project Block Schematic.

EXPERIMENTATION

Experiments were carried out to perform feasibility measurements on a HPS (High Pressure Sodium) lighting arrangement. This involved measuring power consumption, current consumption, power factor change and light output increase. The results from the power consumption against time were measured using a power analyser with respect to time. This is shown in Figure 3. Particular attention to power after switching shows that there is no large power spike when the lamp is turned on.

The HPS lamp used was a 400W rated Osram Son T-Plus and unbranded ballast. The light gained in intensity for about the first minute but when switched on again retains its heat and takes a shorter time to reach full brightness.

Based on these facts the project is feasible but may need to be cycled to retain the heat in the system for efficient use if used without a ballast regulator.

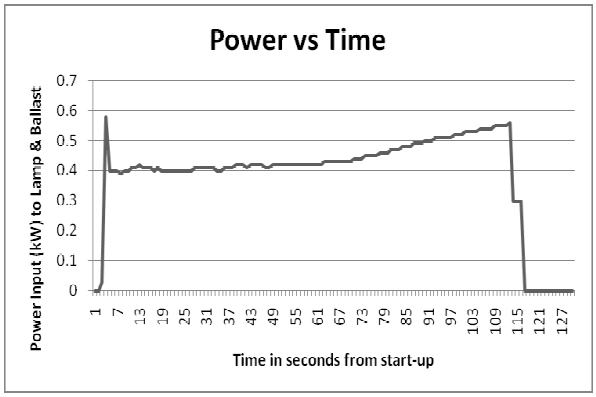

Figure 3. Power consumption of a HPS assembly.

CURRENT LAYOUT

Figure 4 shows the built up model of 4 units and a close up view of a single unit. It includes PIR sensors which could be replaced with microwave detectors on the production model but are adequate for demonstration purposes.

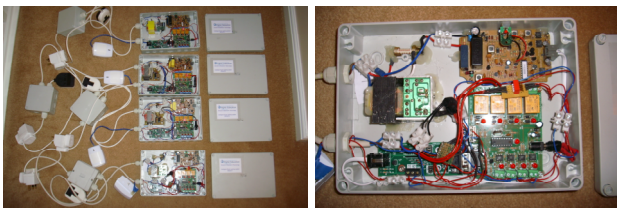

Figure 4. Built Up Model.

The circuit in each unit is identical, but each unit can be addressed by a set a four DIL switches. This only gives an address of 1 – 8 which is enough to communicate with all modules within range on the power-line. The PIC microprocessor can perform simple subtractions and send small numbers between each unit. This enables each unit to predict that a vehicle will be passing the light shortly and can illuminate when it is required to do so based on the warm up time for the bulb. The units transmit signals at low frequencies down the power-line using a further PIC. The overall circuit is shown in Figure 5.

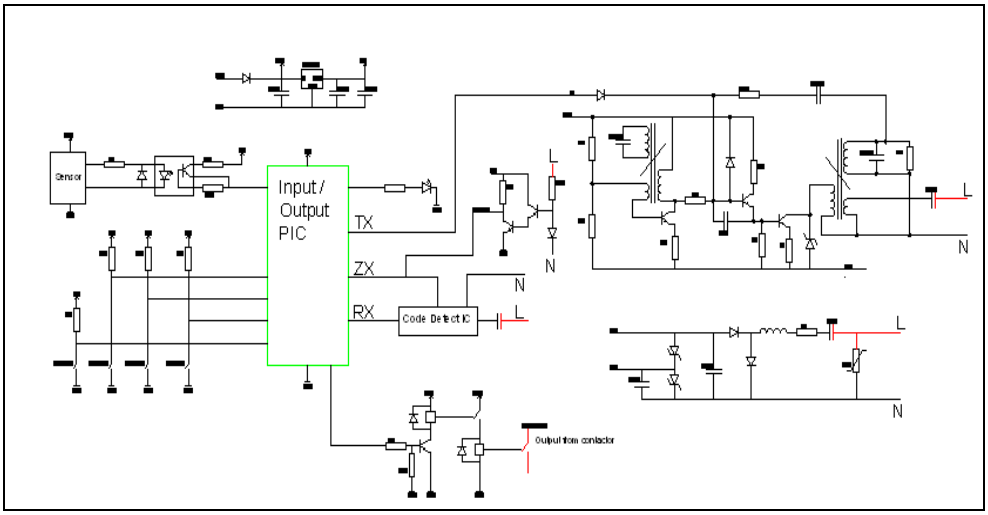

Figure 5 Circuit Schematic

CONCLUSIONS AND FUTURE WORK

Throughout this research we have not found any existing system that performs a similar task of detecting traffic in rural roads that can transmit data along the power-lines and turning on lights for the section of the road which is about to be used.

Further research is ongoing into traffic flow in various locations of British countryside to determine a suitable test road for the system. The existing system is feasible to mass produce and has merits to deliver environmental, safety and commercial benefits to both the manufacture and end user.

We have experienced that the X-10 protocol is relatively slow and the production version would need to process data faster. The design of a second model that eliminates these problems and reduces cost by around 50% is underway.

The model can also be adapted to be used in many other scenarios such as machine control and plant automation.

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[3] J. Yazdani, M. Mufti, P. Brown, and B. Honary . Modelling of an OFDM Transmission Technique for Power Line Using UNIX Based `COSSAP' and Power Line Channel Simulator. In International Symposium on Power-Line Communications and its Applications. T. Coffey and S. McGrath (editors). University of Limerick. Limerick, Ireland. 5th-7th April 2000. 1-874653-60-7. pp. 147-153.

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[5] European Telecommunications Standards, Institute (ETSI), 'Power line Telecommunications Coexistence of Access and In-House Power-line Systems', Technical Specification No. TS 101 867 v.1/1/1 (200011)

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Course Notes

Art and Design

Blackburn College/ ELIHE delivers a range of degrees in Art and Design. Courses can usually be taken full-time or part-time.

Research

The following publication by Stephen Pickles complemented his art exhibition in 2007 and it is available on the www.east-lancashire-research.org.uk website.

AR-08-02. *Catalogue of selected works 2007* by Stephen Pickles

Courses

BA (Hons) Fine Art

We take a multi disciplinary approach to Fine Art, underpinned by critical debate and sound drawing and research skills appropriate to the individual's development. Fine Art now encompasses a multitude of media, theories and practices and you can make a valid contribution to contemporary art using charcoal or the most advanced digital technology.

BA (Hons) Graphic Design

This programme aims to provide students with the necessary skills and knowledge to thrive in today's multi-faceted design environment and to take an active part in steering the future of design with energy and vision. The timetable is studio based, encouraging individual growth and development. Practical assignments are geared towards creative response and are supported by academic knowledge and critical analysis. International trips are an integral part of studying on the course, as are visits within the UK to lectures and exhibitions by contemporary designers

BA (Hons) Digital Media Design

Students on this programme will focus on individual growth and development of specialist skills. Practical assignments are designed to build on technical skills acquired on the Foundation Degree and encourage creative response. Theoretical study and critical analysis support practical work. This is a final year top-up course. Students will normally be expected to have completed a relevant ELIHE foundation degree (or an equivalent qualification).

Student Hotline: 01254 292929 Employer Hotline: 01254 292500

BA (Hons) Contemporary Textiles

This course will encourage students to challenge conventions and break down boundaries in textile design whilst addressing the needs of industry and commercial outlets. Design briefs will be set by external agencies such as design companies, textile practitioners or national competitions, and will encourage the use of print, CAD, surface pattern, stitch, embellishment and manipulation in whatever combination suits the student and the client. This is a final year top-up course. Students will normally be expected to have completed a relevant ELIHE foundation degree (or an equivalent qualification).

BA (Hons) Design for Interiors

This course will encourage students to challenge the conventions of designing for interiors whilst addressing the needs of industry and commercial outlets. Design briefs will be set by external agencies such as design companies, textile practitioners or national competitions, and will encourage the creative use of print, CAD, surface pattern, materials, textures, embellishment and manipulation in whatever combination suits the student and the client. The Professional Studies module will provide the underpinning knowledge to put the students own work into a professional context for future Employment/self employment. This is a final year top-up course. Students will normally be expected to have completed a relevant ELIHE foundation degree (or an equivalent qualification).

BA (Hons) Photographic Media

This will enable you to develop a professional portfolio of photography work though a series of creative and challenging assignments. You will have opportunities to specialise in studio or location work, fashion, journalism, advertising and fine art photography and take part in live projects and national competitions. A strong emphasis on professional practice addresses the needs of industry and provides the knowledge and skills for future careers. This is a final year top-up course. Students will normally be expected to have completed a relevant ELIHE foundation degree (or an equivalent qualification).

Other HE Courses

Foundation Degree Digital Media Design,
Foundation Degree Textile Design,
Foundation Degree Design for Interiors,
Foundation Degree Photographic Media
HNC/D Graphic Design

Further Education Courses

Blackburn College (www.blackburn.ac.uk) also offers the following courses:

A level Dance
A level Drama and Theatre Studies
A level Film Studies
A level Media Studies
A level Music
A level Performance Studies
BTEC Art, Design and Media
BTEC Art and Design
BTEC Media Production
BTEC Graphic Design
BTEC Media (Moving Image)
BTEC Photography
BTEC Textiles/Fashion
ABC Interior Design and Creative Studies
Foundation Diploma Art and Design
Foundation Diploma Media Production
Foundation Diploma Performing Musicianship
BTEC Performing Arts

Business

East Lancashire Business School in the ELIHE/ Blackburn College offer a range of business degrees, foundation degrees, higher nationals and professional qualifications.

Research

The following recent research publications are available on the www.east-lancashire-research.org.uk website.

AR-08-15. *TRAINING SKILLS GAP REPORT 2008: Meeting construction demand for skills in Pennine Lancashire 2008-2011, and breaking down the barriers of worklessness* by Andrew Weston and Andrew Platten, funded by Elevate and the Learning and Skills Council

AR-07-04. *Quality Costs in Education* by Trevor Green, also published in the *TQM Magazine*, 19(4), 308-314, (2007).

Courses

Master of Business Administration (MBA)

The MBA is an internationally recognised qualification designed for middle and senior managers to develop skills and knowledge required for further career progression. The course is up to two year's duration, and is designed to build on previously gained postgraduate knowledge and skills in the area of management and business studies.

BA (Hons) Business Studies

The aim of this honours degree is to provide the student with a firm foundation in the knowledge and skills that are required in the ever-changing field of business and management. It is a three year programme that covers basic business modules and builds into an analysis of more specific areas, which will allow you to consider specialisation in a particular field of business. This degree is made up of a variety of business related modules across three levels. Students in year 1 will study Law, Accountancy, Information Technology, Quantitative Techniques, People and Organisations and Economics. Year 2 consists of Statistics, Business Operations,

Business Information Systems, Organisational Behaviour, Marketing and Enterprise and Planning. Year 3 consists of Management Operations, International Business, Business Strategy, Strategic Marketing and a Dissertation. The course is designed to give students the skills required for a career in business.

BA Business Accounting

The aim of this honours degree is to provide the student with a firm foundation in the knowledge and skills that are required in the developing field of accounts. This is three year programme that builds from basic skills to incorporate specific areas that will allow you to develop in this particular field. This degree is made up of foundation, intermediate and advanced modules covering aspects of Business Studies with a leaning towards Accounting. Students in year 1 will study six foundation units and in year 2 will study six intermediate units. On progression to year 3 students will undertake five advanced units - one of which will be an accounting related dissertation. The course is designed to give students the analytical skills required for a career in business accountancy.

Other Higher Education Business Courses

Foundation Degree in Management
Foundation Degree in Business Studies
Foundation Degree in Financial Services and Law
HND Business
HND Business and Finance
HND Business and Information Technology
HND Business and Marketing
HND Business and Human Resources
HND Business and Law
HNC Business
HNC Quality Management
HNC/D in Business Operations

Further Education Courses

Blackburn College (www.blackburn.ac.uk) also delivers the following courses in the business/accounting area:

BTEC Business Studies
BTEC Business and Legal Studies
A level Accounting
A level Business Studies
A level Economics
UK Career Academy
Apprenticeship in Business Administration
OCR Administration
OCR Advanced Business Computing Skills
Introductory Diploma Business, Retail and Administration
OCR BCS Business Software with ECDL
OCR iTQ Business Software and Internet Skills
BTEC Business Studies
OCR/NVQ e-Administration
BTEC NC/D e-IT
ILEX Legal secretaries certificate
BTEC Skills for Working Life in Business

Computing

Blackburn College/ ELIHE offers a range of degrees, HNC/Ds and Further Education courses in Computing. Courses can usually be taken full-time or part-time.

Research

Research in Computing is supported by the Computing Research Group led by Dr Stephen Kirkup (s.kirkup@blackburn.ac.uk). Recent supporting publications are listed as follows. All AR-**-** documents are available on www.east-lancashire-research.org.uk website.

AR-08-04. *The ELIHE High-Performance Cluster* by Violeta Holmes and Terence McDonough, pp 81-89, also presented at the IPSI conference in London 2006.

AR-08-11. *Agent-Mediated Information Exchange: Child Safety Online* by Violeta Holmes and Katrinna MacFarlane, pp 155-161, presented and published in the proceedings of the VIPSI-2008 PISA: Knowledge Engineering, Tutorials and Brainstormings conference, Pisa, Italy, July 10-13, 2008.

AR-08-13. *Innovation and collaboration in an e-learning environment* by Val Lowe, pp 169-176, also presented at the Cultural Intersections Dialogue and Exchange in English Language Studies in Tarnów, Poland, 7-8 December 2007.

AR-08-14. *A Gentle Introduction to the Boundary Element Method in Matlab/Freemat* by Stephen Kirkup and Javad Yazdani, pp 177-192, to be presented at the MAMECTIS '08 conference, Corfu, Greece, October 26-28, 2008.

AR-08-16. *Fortran codes for computing the acoustic field surrounding a vibrating plate by the Rayleigh integral method* by Stephen Kirkup, pp 225-233, to be presented at the MAMECTIS '08 conference, Corfu, Greece, October 26-28, 2008.

AR-08-17. *Electromagnetic Simulation by the FDTD method in Java* by Stephen Kirkup, Irfan Mulla, Goodchild Ndou and Javad Yazdani, pp 235-242, to be presented at the MAMECTIS '08 conference, Corfu, Greece, October 26-28, 2008. AR-07-02. *DC Capacitor Simulation by the Boundary Element Method* by Stephen Kirkup, also published in *Communications in Numerical Methods in Engineering,* **23**(9), 855 - 869, (2007).

AR-07-03. *Computing the Acoustic Field of a Radiating Cavity by the Boundary Element - Rayleigh Integral Method (BERIM) with application to a Horn Loudspeaker* by Stephen Kirkup and Ambrose Thompson, also presented at the World Congress on Engineering in London 2007 and published in the proceedings 1401-1406.

AR-07-08. *Modelling, Developing and Implementing Sub-Sea Power-Line Communications Networks* by Javad Yazdani, Kevin Glanville and Preston Clarke, also presented at the 9th International Symposium on Power-Line Communications and its Applications, Vancouver, Canada 2005

Courses

MSc Multimedia & Mobile Technologies

Multimedia information exchange over wireless networks, the Internet, as well as mobile gaming and mobile commerce are nowadays the fastest growing markets in information and communication exchange. Hybrid application of wired and wireless together with ubiquitous power line infrastructure are also helping to design cost effective smart systems, intelligent home environments and, when we apply encryption/decryption techniques, they then become major tools for e-commerce, m-commerce, biomedical industries and others. Multimedia and mobile communication discipline therefore includes multimedia systems engineering, advanced networking and the internet operating systems. Availability of wireless networks has helped to realise mobile computing and indeed the development of portable devices are encouraging the engineers to apply sophisticated techniques to develop ubiquitous systems. Wireless networks are being extended to support Mobile IP and Wireless IP and GPRS. These skills are fast becoming pre-requisites for engineers securing jobs in these sectors. The course offers underpinning knowledge as to how these methods and techniques work, therefore engineers are better placed to develop, apply and adapt these techniques to a wide range of problems.

The topics available include Advanced Broadband and Mobile Multimedia, Information Coding and Secure Data Authentication, Speech Coding, Digital Vision and Advanced Digital Signal Processing with FPGA.

BSc Computing

On this course you would specialise in the *Ordinary* (second) year on topics including Formal Computer Science, Programming a Distributed System and Databases and in the *Honours* (final) year on topics such as Object-Oriented Development and the Unified Modelling Language (UML), Programming Languages, Formal Specification and Compilation. Java is the main programming language that is used.

BSc Computer Systems Engineering

On this course you would specialise in *Ordinary* (second) year on topics such as Computer Systems Architecture and Computer Communications and in the *Honours* (final) year on topics such as Parallel Computer Architecture and Mobile Communications.

BSc Internet and Information Technology

On this course you would specialise in *Ordinary* (second) year on topics such as eCommerce and Databases and in the *Honours* (final) year on topics such as Object-Oriented Development and the Unified Modelling Language (UML), Intelligent Agents and Mobile Communications.

Higher Nationals

HND Computing with Games Technology
HND Computer Networking
HND Internet & Multimedia Computing,
HND e-Business and Business & Information Technology.
HNC in Computer Studies.

Further Education Courses

Blackburn College (www.blackburn.ac.uk) also delivers the following courses in the computing/ information technology area:

BTEC National Diploma in e-IT
A level Computing
A level Information and Communications Technology
OCR Advanced Business Computing Skills
OCR BCS Business Software with ECDL
OCR iTQ Business Software and Internet Skills
Diploma in Digital Applications
BTEC Business Studies
OCR/NVQ e-Administration
BTEC NC/D e-IT
BTEC ICT
BTEC ICT System Support/Hardware
BTEC ICT System Support
BTEC ICT with web design

Construction

Blackburn College/ ELIHE offers a range of degrees, HNC/Ds and Further Education courses in Construction. Courses can usually be taken full-time or part-time.

Research

Research in Construction is supported by the Sustainable Development Research Group co-ordinated by Barry Powell (b.powell@blackburn.ac.uk). Recent supporting publications are listed as follows. All AR-**-** documents are available on www.east-lancashire-research.org.uk website.

AR-08-15. *TRAINING SKILLS GAP REPORT 2008: Meeting construction demand for skills in Pennine Lancashire 2008-2011, and breaking down the barriers of worklessness* by Andrew Weston and Andrew Platten, funded by Elevate and the Learning and Skills Council.

AR-07-05. *The Double-Headed Coin; Sustainability & Quality in the Built Environment* by Derek Deighton, Also published in the Nov 2006 edition of Environment Business and the Aug 2007 edition of Quality World.

Courses

BSc Sustainable Construction

This full-time or part-time course is for anyone wishing to study Construction to Honours Degree level. The continued development and regeneration of towns and cities in the UK is expected to lead to a continuous demand for suitably qualified professionals. The BSc in Sustainable Construction is a blend of traditional construction subjects with topics covering issues of sustainable development - considering the environmental, social and economic impact of buildings.
In this degree construction is set in the context of sustainable development. In the honours year the course is made up of construction project management and an advanced project.

BSc Construction Project Management

This course will give all the necessary knowledge required to successfully run major projects to a high standard of construction, on time and to budget. This course will instil confidence and provide the necessary personal skills required at management level.

Student Hotline: 01254 292929 Employer Hotline: 01254 292500

On these programmes construction technology and management is featured in every year, from the basics right through to modern technologies, including sustainable construction, and management techniques. The lectures will be supplemented by carefully selected external activities such as visits to major developments, meetings with professional bodies and simulation exercises.

Foundation Degree Sustainable Construction

In this degree construction is set in the context of sustainable development. The course also includes a work experience element in the second year and a group project.

Higher Nationals (HNC/HND)

HNCs and HNDs are offered in the following subjects in construction.

HND Construction
HND Interior Design with Construction
HND Sustainable Construction
HNC Construction
HNC Interior Design with Construction

Further Education

Blackburn College (www.blackburn.ac.uk) also offers the following courses related to construction:

Apprenticeship in Construction (Bricklaying, Carpentry and Joinery, Electrical Installation, Painting and Decorating, Plumbing)
City and Guilds Brickwork
City and Guilds Carpentry and Joinery
City and Guilds Painting and Decorating
City and Guilds Electrotechnical Technological Installation
City and Guilds Plumbing Studies
Preparation for Employment in Construction Industries
BTEC Construction
BTEC Construction and the Built Environment

Criminology

The School of Social Sciences and Humanities at ELIHE offers a range of courses in Criminology.

Research

Research in Criminology is supported by the Criminology Research Group led by Phil Johnson (p.johnson@blackburn.ac.uk). Recent supporting publications are listed as follows. All AR-**-** documents are available on www.east-lancashire-research.org.uk website.

AR-07-01. *Windows of Opportunity for Unpaid Work?* by Phil Johnson and Bill Ingram, also published in the *Probation Journal*, 54(1), 62-69, (2007).

AR-07-07. *Perceptions of Crime in Blackburn Town Centre* by Barry Powell, prepared for Blackburn with Darwen Community Safety Partnership.

Courses

BA Criminology

The BA initially consists of a one year full-time top-up programme, for which successful completion will result in the award of a BA (Ord) validated by Lancaster Universtiy. A further twelve months of study can then lead to the award of BA (Hons). The course aims to build on the understanding and awareness gained from the HND Criminology. There is the opportunity to specialise in a range of different subjects, particularly in the second year. On both years of the programme students are expected to participate in research projects in negotiated areas.

In the Ordinary year you will undertake introductory modules which allow you to engage in issues such as the theoretical explanations of crime, from both psychological and sociological standpoints. In the Honours year you can choose criminal justice and criminology modules to allow you to further develop your knowledge and understanding. The modules are far-reaching and include areas such as Youth in Trouble; Crime, Victims and Communities; Prisons, and Probation and Crime and the Media. The programme prides itself on giving excellent opportunities to develop research in criminology and criminal justice fields.

BA Criminology and Forensic Evidence

This degree is available on a full-time or part-time basis and is taught entirely at ELIHE. The degree is designed to help students form knowledge of how criminology provides an explanation of crime and how forensic evidence supports its investigation. It will help students to develop powers of analysis and problem solving, critical thinking, and interpersonal skills within the criminal justice field.

Other HE Courses in Criminology

Foundation Degree in Criminology and Criminal Justice
HNC/D Criminology

Further Education Courses

Blackburn College (www.blackburn.ac.uk) offers related further education courses including

A level Citizenship
A level Law.

Education

The School of Education at the ELIHE offers a range of Education courses.

Research

Research in Education is supported by the *Education Research Group* led by Dr Val Lowe (v.lowe@blackburn.ac.uk). Recent supporting publications are listed as follows. All AR-**-** documents are available on www.east-lancashire-research.org.uk website.

AR-08-05. *Language, literacies and learning: A proposed case study of an online discussion forum on an English Degree programme* by Cheryl Dunn, also presented at the Cultural Intersections Dialogue and Exchange in English Language Studies in Tarnów, Poland, 7-8 December 2007.

AR-08-13. *Innovation and collaboration in an e-learning environment* by Val Lowe, also presented at the Cultural Intersections Dialogue and Exchange in English Language Studies in Tarnów, Poland, 7-8 December 2007

AR-07-04. *Quality Costs in Education* by Trevor Green, also published in the *TQM Magazine*, 19(4), 308-314, (2007).

Courses

BA (Hons) Education Studies

This BA can be studied either full time or part time. It provides a balanced and stimulating academic programme which will encourage students to explore the education system and theories of teaching and learning.

Education PGCE and Cert Ed - (Post-Compulsory)

This course is offered full-time or part-time (in-service)

Full-time: The course is aimed at those who wish to commit themselves to an intensive year of study to acquire the skills and qualifications needed for a career in teaching or training.

Part-time: The course is in-service, aimed at those who are already in paid employment as teachers, trainers, or instructors and who want to improve their skills, broaden their thinking and acquire a qualification. The course, with half-day per week attendance, involves modular study of classroom practice and wider issues in the context of the student's own experience and practice.

Student Hotline: 01254 292929 Employer Hotline: 01254 292500

Certificate in Foundation Studies in Education

This course is aimed at those who wish to teach, or are perhaps already involved in teaching or training, and want to improve their skills and acquire a qualification. The course may be taken over one year, with attendance for one half day per week or one evening per week. There will be a combination of classroom study of practical issues with teaching practice.

Introduction to Learning and Skills

The course is aimed at those who wish to teach or may have some involvement with teaching or training and will give youa basic grounding in teaching principles and practice. The normal course pattern will be of ten weekly sessions. Students will find the programme is presented through a variety of methods to give you direct experience of different styles of teaching and learning. An informal approach is used throughout and programme members are encouraged to share experiences and learn from each other as a means of building self-confidence. The emphasis is on interaction and learners will be expected to participate fully in the range of activities which will contribute towards their portfolio. In addition learners will be required to explore a variety of Post-Compulsory learning contexts.

Foundation Degree in Teaching and Learning Support

This programme aims to produce highly skilled and well-qualified teaching assistants capable of supporting teaching and learning in a variety of settings. This flexible programme is designed to fit in with your work and other commitments. In addition to lectures and seminars at ELIHE and private study, students will also spend time working on directed tasks related to the programme in the place where the students are employed, or work as a volunteer.

Certificate in English Language Teaching to Adults (CELTA)

The Certificate in English Language Teaching to Adults (CELTA) course is aimed at those wishing to teach English to speakers of other languages. Attendance is one day per week and classes cover teaching methodologies and language awareness, as well as structured teaching practice. On completion you will be awarded the Cambridge Certificate in English Language Teaching to Adults - an internationally recognised qualification.

Further Education Courses

Blackburn College also delivers the following education-related courses:

CACHE Certificate/Diploma in Childcare and Education
BTEC National Diploma in Early Years

Student Hotline: 01254 292929 Employer Hotline: 01254 292500

Engineering

Blackburn College/ ELIHE offers a range of degrees, HNC/Ds and Further Education courses in Engineering. Courses can usually be taken full-time or part-time.

Research

Research in Engineering is supported by the Engineering Research Group led by Dr Javad Yazdani (j.yazdani@blackburn.ac.uk). Recent supporting publications are listed as follows. All AR-**-** documents are available on www.east-lancashire-research.org.uk website.

AR-08-04. *The ELIHE High-Performance Cluster* by Violeta Holmes and Terence McDonough, pp 81-89, also presented at the IPSI conference in London 2006.

AR-08-14. *A Gentle Introduction to the Boundary Element Method in Matlab/Freemat* by Stephen Kirkup and Javad Yazdani, pp 177-192, to be presented at the MAMECTIS '08 conference, Corfu, Greece, October 26-28, 2008.

AR-08-16. *Fortran codes for computing the acoustic field surrounding a vibrating plate by the Rayleigh integral method* by Stephen Kirkup, pp 225-233, to be presented at the MAMECTIS '08 conference, Corfu, Greece, October 26-28, 2008.

AR-08-17. *Electromagnetic Simulation by the FDTD method in Java* by Stephen Kirkup, Irfan Mulla, Goodchild Ndou and Javad Yazdani, pp 235-242, to be presented at the MAMECTIS '08 conference, Corfu, Greece, October 26-28, 2008.

AR-07-02. *DC Capacitor Simulation by the Boundary Element Method* by Stephen Kirkup, also published in *Communications in Numerical Methods in Engineering,* **23**(9), 855 - 869, (2007).

AR-07-03. *Computing the Acoustic Field of a Radiating Cavity by the Boundary Element - Rayleigh Integral Method (BERIM) with application to a Horn Loudspeaker* by Stephen Kirkup and Ambrose Thompson, also presented at the World Congress on Engineering in London 2007 and published in the proceedings 1401-1406.

AR-07-08. *Modelling, Developing and Implementing Sub-Sea Power-Line Communications Networks* by Javad Yazdani, Kevin Glanville and Preston Clarke, also presented at the 9th International Symposium on Power-Line Communications and its Applications, Vancouver, Canada 2005

Control of IVT-based vehicles by intelligent selection between alternative solutions by Steven Wright, PhD thesis 2007.

Courses

MSc Engineering Analysis

In modern engineering, much of the design analysis is carried out on computer. Software packages are now available that apply sophisticated techniques such as the finite element method through the meshing of the structural domain. Behind all engineering analysis techniques there lies a computational algorithm. By understanding the background to how these methods work, engineers are better placed to develop, apply and adapt these techniques to a wide range of engineering problems and to understand the validity of solutions obtained by computer.

The topics available include Scientific Computing, Problem, Solving and Simulation by Numerical Methods, Smart Control, Systems Engineering and Finite Elements, Finite Difference and, Boundary Element Methods.

MSc Multimedia & Mobile Technologies

Multimedia information exchange over wireless networks, the Internet, as well as mobile gaming and mobile commerce are nowadays the fastest growing markets in information and communication exchange. Hybrid application of wired and wireless together with ubiquitous power line infrastructure are also helping to design cost effective smart systems, intelligent home environments and, when we apply encryption/decryption techniques, they then become major tools for e-commerce, m-commerce, biomedical industries and others. Multimedia and mobile communication discipline therefore includes multimedia systems engineering, advanced networking and the internet operating systems. Availability of wireless networks has helped to realise mobile computing and indeed the development of portable devices are encouraging the engineers to apply sophisticated techniques to develop ubiquitous systems. Wireless networks are being extended to support Mobile IP and Wireless IP and GPRS. These skills are fast becoming pre-requisites for engineers securing jobs in these sectors. The course offers underpinning knowledge as to how these methods and techniques work, therefore engineers are better placed to develop, apply and adapt these techniques to a wide range of problems.

The topics available include Advanced Broadband and Mobile Multimedia, Information Coding and Secure Data Authentication, Speech Coding, Digital Vision and Advanced Digital Signal Processing with FPGA.

BEng Mechanical Engineering

Mechanical engineers work on the design and analysis of mechanical systems such as automobiles, aircraft, heating and cooling systems and industrial machinery. The Mechanical Engineering degree combines the study of applied mechanics, heat transfer and fluid mechanics together with a strong emphasis on practical skills.

BEng Electrical/Electronic Engineering

Electrical/Electronics Engineering encompasses information technology, communications, medical electronics, computers, aerospace, robotics, automation and indeed all applications of electricity. As a specialist in this field you will be able to design, build and control electrical and electronic devices from circuits to gather and process information to large items of heavy-current machinery.

BEng Mechatronics

The word mechatronics was coined in 1969 to mean the integration of precision mechanical engineering with electronics engineering. The Mechatronics degree combines practical skills together with the essential elements of mechanical, electronic, control and intelligent systems.

BEng Sustainable Engineering

This course focuses on engineering in the context of the growing concern for the environmental, social and economic impacts. In this degree you will study the environmental management of engineering processes and the sustainable design of engineering products. Further information on this course is given on pages 53 to 54.

BEng Digital Communication Systems (Telecommunications)

The Digital Communication Systems degree combines the essential elements required for a thorough understanding of communications theory and applications. It also includes the necessary electronics engineering content required to understand the design of the components and the design and implementation of communication systems. It provides a broad based training that integrates the core field of communication systems; it creates opportunities in modern communication and application of digital signal processing, digital multimedia, mobile systems and software engineering. Strong emphasis on practical skills is reinforced by technical literacy and understanding of communication concepts and trends.

Higher Nationals (HNC/HND)

HNCs and HNDs are offered in the following subjects in engineering.

Mechanical Engineering
Electrical/Electronic Engineering
Telecommunications.

Further Education

Blackburn College (www.blackburn.ac.uk) also delivers the following courses related to engineering:

BTEC National Diploma in Electrical and Electronic Engineering
BTEC National Diploma in Renewable Energy Studies
BTEC National Diploma in Science (Applied)
BTEC Automotive, Pre-Foundation Level
City and Guilds Motor Vehicle Studies
A level Mathematics
A level Further Mathematics
A level Physics
A level Chemistry
A level Biology
Apprenticeship in Motor Vehicle Studies
New engineering courses in fibre optics, wind turbines, solar heating, satellite & wireless navigation, environmental engineering and broadcast technologies are planned.
Auto Electrical Vehicle maintenance and Repair
Foundation Certificate Automotive Vehicle Maintenance
Vehicle Body and Paint Operations
Vehicle Maintenance and Repair

English

The following degrees and other courses in English are available at ELIHE in Blackburn College.

BA (Hons) English Language & Literary Studies

On this exciting and innovative programme you will cover a broad range of contemporary issues in language, literature and literacy. The major historical periods are represented, as are influential, exciting and thought-provoking texts from all the major literary genres. However, this degree is not just about Shakespeare, poetry and the rise of the novel, though these are covered in detail. You will also explore the history and diversity of the English Language, examine the impact of new media, such as the Internet and text messaging, develop your own web design skills and reflect on your own language use.

BA English & Modern History

This degree brings together the two complementary disciplines of English and History in a flexible and interesting way which allows students to pursue their own interests whilst developing a sound perspective in both subjects. The degree is designed to help students to form a deeper understanding of the relationship of the literary and linguistic, social and cultural present, with that of the past. This degree helps students develop powers of analysis and problem solving, research skills, critical thinking, team work and interpersonal skills.

BA English & Politics / BA Politics and English

The two complementary disciplines of English and Politics are combined together in a flexible way which allows students to pursue their own interests whilst developing a sound perspective in both subjects. The degree is designed to help students to form a deeper understanding of how language is used within the complex power relationships of the contemporary world, whilst developing students' own powers of analysis and problem solving, research skills, critical thinking, team work and interpersonal skills.

BA English & Sociology

Covering a broad range of critical and contemporary issues, this exciting and innovative joint programme introduces you to linguistic, sociological, literary and psychological theories, to encourage an examination of social and linguistic change, of the representations of the social and cultural forces which mould us, and of the nature of 'society' itself. Major historical periods, such as the Enlightenment, the Romantic and the Victorian are represented, as are influential, exciting and thought-provoking texts from the major literary genres, as well as other texts from key areas of social life.

BA Modern History and English

This degree brings together the two complementary disciplines of History and English. In studying the past we learn about the present and help develop our own perspectives on Who am I? And to what sort of society do I belong? Coupled with an understanding and appreciation of English Literature and Language, this combines to open a gateway on past issues and events from a range of perspectives. Learning takes place in a flexible and stimulating way which allows you to pursue your own interests whilst developing a sound perspective in both subjects. The degree is designed to help students to form a deeper understanding of the relationship of the literary, social and cultural present with that of the past. This degree helps you develop powers of analysis and problem solving, research skills, critical thinking, team work and interpersonal skills.

In the first year you will take a common core of introductory modules designed to familiarise yourself with differing approaches to the study of English and History and to help you understand key theories, concepts and ideas. At second and third level you can choose from a range of English and Modern History modules based round a series of core topics plus options in order to ensure a balance across historic and literary periods. Assignments are designed to develop a range of key critical and analytical skills, as well as subject knowledge. All students undertake at least one module on research methods and there is a related IT provision which equips you with key transferable skills. At level three, everyone undertakes personal research via a dissertation. We specialise in developing your potential through the use of small teaching groups and intensive personal support.

Further Education Courses

Blackburn College (www.blackburn.ac.uk) also offers the following courses:

A level English Language
A level English Literature
A level English Language and Literature
A level Drama and Theatre Studies
A level Film Studies
A level French
A level Media Studies
A level Spanish
BTEC Performing Arts
Foundation Diploma Media Production

Law

The School of Social Sciences and Humanities at ELIHE offers a range of degrees in Law.

LLM Masters in Law

The LLM is taught in Blackburn and is franchised by the University of Glamorgan. It provides an opportunity to build on first degree studies, thereby enhancing existing knowledge, and widening available career options. The course is particularly suited to students wishing to develop their interests and skills in the field of international commercial law and practice.

LLB (Hons) Law

The LLB is a full-time 3 year course taught at ELIHE and franchised by the University of Glamorgan. The course incorporates the Law Society and Bar Council qualifying modules, essential for those wishing to practice in the legal profession, and balances the academic study of legal principles with an understanding of the essential practical skills such as debating, mooting and presentations.

Other HE Courses in Criminology and Law

The ELIHE has the following courses: Foundation Degree in Criminology and Criminal Justice, Foundation Degree in Financial Services and Law and a HNC/D Legal Studies.

Further Education Courses

Related further education courses include A level Citizenship and A level Law.

Professional Courses

The East Lancashire Business School at ELIHE/Blackburn College offers a range of part-time (day release and evening) professional courses to fit in with work.

Chartered Institute of Management Accountants (CIMA)

This is a four year course which comprises three levels (Certificate one year, Managerial two years, and Strategic one year). It is aimed at students who are working in an accounts environment and wish to qualify as a Chartered Management Accountant. The course is run on a modular and linear basis and students can pick modules based on their individual exemptions.

Chartered Institute of Purchasing and Supply (CIPS)

The Purchasing and Supply profession is experiencing massive change as companies recognise the vital contribution which effective purchasing and supply management can make to growth and profitability. The aim of the programme is to obtain a thorough grasp of the subjects required by students determined to follow a structured plan of self-development, which leads to membership of the Chartered Institute of Purchasing and Supply (CIPS).

Foundation Diploma (Level 4): Effective Negotiation in Purchasing and Supply, Purchasing Context, Developing Contracts in Purchasing and Supply, Measuring Purchasing Performance and Managing Purchasing and Supply Relationships.

Advanced Diploma (Level 5): Management in a Purchasing Function, Risk Management in Supply Chain Vulnerability, Improving Supply Chain Performance, Storage and Distribution and Operations Management in the Supply Chain.

Graduate Diploma (Level 6): Leading and Influencing in Purchasing, Strategic Supply Chain Management, Supply Chain Management in Practice, Legal Aspects in Purchasing and Supply and Finance for Purchasers.

Chartered Institute of Personnel and Development (CIPD)

Certificate in Personnel Practice (CPP) is a skills based course designed to give students an overall insight into the basic activities undertaken in a Personnel/HR Department. It also allows for the development of the skills associated with this professional area e.g. recruitment, selection, grievance handling and hence is suitable for both junior members of a personnel department and people in a supervisory position. The Professional Development Scheme consists of Leadership and Management, People Management and Development and the specialist and generalist electives undertaken over three years to enable students to gain Graduate Membership of the Institute.

The Certificate in Personnel Practice (CPP) utilises a range of teaching methods to develop skills and also to allow students to gain necessary understanding of how the Personnel/HR department contributes to the organisation's overall mission. The Professional Development Scheme is designed to provide students with a detailed knowledge of the key areas of Personnel/HRM practice and to develop their ability to be 'thinking performers.'

Chartered Management Institute (CMI)

Candidates will be expected to attend eight workshops on Friday afternoons at three-weekly intervals. At the conclusion of each workshop, one workbook and one assignment will be issued for completion in the candidate's own time, to be returned to the next workshop session.

CMI Management Programmes & NVQs

Candidates can elect to study one of the following programmes. These are designed to be flexible and meet the needs of the modern business professional: Diploma in Management Level 4, Diploma in Quality Management Level 4, Diploma in Programme and Project Management Level, Executive Diploma in Management Level 5, Executive Diploma in Strategic Management Level 5

CMI Diploma in Programme & Project Management

This one year part-time Diploma provides comprehensive coverage of the approaches and techniques required to manage programmes and projects in organisations. The awarding body is the Chartered Management Institute, the largest professional body for managers in the United Kingdom with over 90,000 members.

Equally applicable in both the public and private sectors, Programme and Project Management (PPM) is an increasingly valuable area of knowledge and skill for those who face growing requirements for improvement, development, change and renewal. The course gives equal weighting to PPM tools and techniques and to the people and project team aspects of the subject as well as extending beyond the traditional approaches to include assessment of organisational issues for projects.

The syllabus covers the following modules: DPM01 Business Context, DPM02 Principles of Programme and Project Management, DPM03 Risk Management, DPM04 Quality Management, DPM05 Change and Configuration Management, DPM06 Managing People, DPM07 Managing Contracts, DPM12 Integrative Assessment (Project Review or Management Report), DPM08/10 Programme or Project Planning, DPM09/11 Programme or Project Monitoring and Control

CMI Diploma in Quality Management

This one year part-time Diploma provides comprehensive coverage of the approaches and techniques required to manage quality in organisations. The awarding body is the Chartered Management Institute, the largest professional body for managers in the United Kingdom with over 90,000 members.

Equally applicable in both the public and private sectors, Quality Management is an increasingly valuable area of knowledge and skill for those who face growing requirements for improvement, development, change and renewal. The course gives equal weighting to Quality Management Principles and Systems and to the People Management and Leadership aspects of the subject.

The syllabus covers the following modules: DQM41 Control of Quality, DQM42 Personal Management Style, DQM43 Planning and Controlling Work, DQM44 Meetings and Decisions, DQM45 Quality Assurance Policy, DQM46 Continuous Improvement, DQM47 Quality Systems, DQM48 Compliance and Audit, DQM49 Use of Resources, DQM40 Integrative Assignment or Report.

Institute of Quality Assurance (IQA) Diploma in Quality

The Institute of Quality Assurance (IQA) is the premier professional body for those working in quality assurance and quality improvement. The IQA examinations offer an alternative route to membership for those who do not have higher level qualifications, or many years of practical management experience.

The modules (or study units) are awarded individually but when combined, lead to the award of the IQA Professional Diploma. The level of the qualification is currently being matched to academic standards, which place the Diploma at a similar level to the Higher National award, or to the first year of a degree.

The majority of candidates study the modules over a three year period as follows: D1 Introduction to Quality Assurance (the operational and measurement aspects)**,** D2 Quality Assurance Management (the quality system and business aspects)**,** D3 Quality Tools and Techniques**,** D4 Communication and Project Management**,** D5 Project (Selecting and managing a practical project)**,** D6 Environmental Management Systems**,** D7 Information Technology and Quality Management

Executive Diploma in Management Studies (DMS)

This is a two year postgraduate programme of study validated by Lancaster University. The overall aims of the course are **t**o provide managers with a wide range of knowledge and skills to enable them to become effective members of a management team, to ensure that managers possess an up-to-date awareness of management techniques, to encourage the self development of managers so they can achieve their maximum potential, to allow managers to advance their qualifications to MBA level.

The DMS programme provides a variety of learning situations to meet the complex and varying needs of managers. By the use of workshops, the programme mixes a

more traditional teaching approach with a student-centred approach that develops the skills and attitudes required by managers today.
Over the two year course, the following topic areas will be studied: Practice of Management, The External Environment, Understanding Organisational Behaviour, Financial Management, Managing Human Resources, Managing Information, Managing Performance, Marketing and Strategy. The learning takes place through a mixture of lectures, seminars, workshops and the completion of a Management Report. In addition there is a two day residential period in both years.

Certificate in Management Studies (CMS)

This programme is designed to meet the needs of practising managers and those who aspire to a career in management. The individual units, and the programme as a whole, are structured and delivered so that they are accessible and relevant to individuals from the widest range of work and organisational environments, as well as giving access to up-to-date management theory and practices.
The aims are to provide a professional qualification for individuals who are practising managers or who wish to make a career in management, to provide the knowledge and understanding which underpins the further study of management, to develop managerial skills, to promote good practice in management, to provide progression routes to more advanced qualifications, to give participants a basis for continuing their personal development
The course is delivered in 5 modules: Managing Workplace Activities, Managing Resources, Managing Individuals and Groups, Business Information Management, Management Skills and Self Development.

Professional Certificate/Diploma in Marketing (CIM/DIM)

For those who are in junior marketing positions, aspire to a career in marketing or those moving into marketing from other backgrounds. Many of those who enrol will be Marketing Assistants or may be Personal Assistants.
Study topics include Marketing Fundamentals, Customer Communications, Marketing Environment, Marketing in Practice.

Professional Diploma in Marketing (CIM)

This qualification is ideal for marketers who are concerned with managing the marketing process at an operational level, as well as those who are looking to build on the knowledge gained at Certificate level with a future marketing management role in mind. The content of the course has been put together following consultation with employers, to ensure that students gain relevant competencies for various stages of their marketing career. Students will gain the marketing skills you need at an operational level to maximise opportunities for your company, achieve an internationally recognised, transferable qualification and become an

Associate Member of CIM (ACIM), and gain an understanding of how to write, implement and evaluate an effective marketing plan to meet your targets.
This qualification is achievable within one year of part-time study and is taught by subject. All subjects are assessed by either examination or assignment. You can choose a mode of study to suit you, including distance learning, on-line, intensive, or part-time evening classes.

Professional Postgraduate Diploma in Marketing (CIM)

For those who have gained a significant level of recent knowledge and/or experience in marketing. The focus is on the strategic aspects of marketing management and the qualification is increasingly seen as a benchmark of your competence at the highest level.
Study topics include Analysis and Evaluation, Strategic Marketing Decisions, Managing Marketing Performance, Strategic Marketing in Practice.

Introductory Certificate in Management (ILM)

This short, 33 hour programme is designed for people who are likely to become first-line managers (team leaders, or supervisors), or those who are already in post but have had little or no formal training in their role. This qualification gives a grounding in the key management knowledge and skills needed to help in job performance, as well as providing a route to career development. As a first step in management, the programme develops confidence and unlocks potential.
Candidates will be required to complete a 33 hour programme of study, four Segment Reviews, a Work Based Assignment and a Personal Development Record.

Introductory Certificate in Management for Health Care Personnel (ILM)

This short, 33 hour programme is designed for people who are likely to become Supervisors/Managers in a health care environment, or for those who are already in post, but have had little, or no formal training in their role. This qualification gives a grounding in the key management knowledge and skills needed to help in job performance, as well as providing a route to career development. As a first step in health care management, the programme develops confidence and unlocks potential.
Candidates will be required to complete a 33 hour programme of study, four Segment Reviews, a Work Based Assignment and a Personal Development Record.

AMSPAR Diploma in Primary Care Management

The programme has been designed to meet the needs of today's manager in primary care and to cover the main roles and responsibilities of the position. This programme has been designed for: **t**hose in post as Practice Managers**, t**hose in post as Deputy/Assistant Practice Managers**, t**hose in post for a minimum of two years within a health, or social care setting who will benefit from developing their capability and experience.

The programme consists of the following five modules: Managing ethics and medico-legal requirements**,** Managing staff**,** Managing processes and patient services**,** Managing healthcare resources**,** Managing data and communication in a healthcare setting.

In order to achieve the Diploma in Primary Care Management, candidates must undertake 5 assignments set by AMSPAR, marked locally and moderated by AMSPAR. You will then complete a Business Project, marked by AMSPAR and deliver an oral presentation, assessed locally by a panel of four members.

Institute of Legal Executives

This is a two part course, both parts of which lead to distinct qualifications. Students completing the Level 3 Professional Diploma in Law may choose to exit their studies with a Certificate at that stage or progress to the Level 6 Higher Professional Diploma in Law.

The Level 3 Professional Diploma in Law (Part 1) runs for two years and in each year there are two modules: Legal Principles and Legal Practice. Courses are run on a Thursday (Year 1) and Wednesday (Year 2) between 3pm and 8.30pm. For the Level 6 Higher Professional Diploma in Law (Part 2), students are required to pass three substantive Law subjects plus one specialist procedural paper. The examinations can be taken individually, altogether, or in any combination. ELIHE is an approved examination centre.

Council of Licenced Conveyancers

This is a two part course which comprise a Foundation stage and Final stage. It is aimed at students working in a legal environment and leads to Licensed Conveyancer status (subject to appropriate experience and application to the Council).

The course is taught one day per week and includes a range of modular subjects including Introduction to Licensed Conveyancing Law of Contract, Land Law, Conveyancing Practice and Accounts. Student performance is assessed by a combination of assignments and formal examinations.

Applied Psychology

Blackburn College/ ELIHE runs degree courses in BSc Applied Psychology. Courses can usually be taken full-time or part-time.

BSc (Hons) Applied Psychology (Specialising in Counselling and Health, Human-Machine Interaction, Business or Social Science)

The programme is designed to benefit those students who wish to apply their knowledge in practical situations. Understanding what makes people tick is the key to success in many fields, whether it be designing better machines, successfully marketing a new product or helping others through difficult times in their lives. Psychology helps us to achieve all these things, and Applied Psychology puts theory to practical use.

There are four different specialisms available on the programme - Counselling and Health, Human-Machine Interaction, Business and Social Science. In the first year students will study the basics of psychology, including cognitive and behavioural psychology, individual differences and others. There will also be introductory modules giving a taste of each specialism.

In the second year students will choose their area of specialisation, and most of their study will be tightly focused on relevant subjects. There will be common modules on research methods. Third year study will be made up of a project and dissertation chosen by the student and appropriate to their specialist area. Further taught modules will cover both common and specialist subjects.

Further Education Courses

Blackburn College also delivers the following psychology-related courses:

A level Psychology

Social Sciences

Blackburn College/ ELIHE offers a range of degrees, foundation degrees, HNC/Ds and Further Education courses in Social Sciences. Courses can usually be taken full-time or part-time.

Research

Research into Social Sciences is supported by the Sociological Research Group led by Dr Andrew Holden (dra.holden@blackburn.ac.uk). Recent supporting publications are listed as follows. All AR-**-** documents are available on www.east-lancashire-research.org.uk website.

AR-08-01. *THE BURNLEY PROJECT: INTERFAITH INTERVENTIONS AND COHESIVE COMMUNITIES: The effectiveness of interfaith activity in towns marked by enclavisation and parallel lives* by Andrew Holden and Alan Billings, pp 5-52, Commissioned by the Home Office and the Department for Communities and Local Government.

AR-08-03, *True to thee 'til death: why Jehovah's Witnesses refuse blood* by Andrew Holden, pp 77-79, also published in *The Journal* Monday 19 November 2007

AR-08-07, *The new American empire and the electronic revolution* by Terry McDonough, pp107-124, winner of the Lancashire Telegraph Award for Excellence in February 2008.

AR-08-09, *Religion in segregated communities* by Andrew Holden, pp 137-141, also Published in Sociology Review, April 2008, pp 18-21.

AR-08-10, *Disability and Death in Elizabeth Gaskell's 'The Three Eras of Libbie Marsh'* by Karen Coe, pp143-153, also presented at the Cultural Intersections Dialogue and Exchange in English Language Studies in Tarnów, Poland, 7-8 December 2007

AR-08-12, *Utopian Mysteries from within the Fairytale Forest: Uncovering Traces of Redemptive Journeys towards* Home, pp 163-168, by Craig Hammond, also presented at the American Comparative Literature Association (ACLA) conference, in Long Beach, California, 24th-27th April 2008.

Courses

BA (Hons) Social Sciences

In the first year, students take a common core of introductory modules designed to familiarise themselves with key theories, concepts and ideas as well as undertaking an advanced study skills module to ensure that students have the necessary range of skills for study at undergraduate level. At second and third level students can choose from over 30 modules drawn from any or all of the four master subject pathways and from the interdisciplinary Complementary Studies pathways. Modules are supplemented by the use of guest speakers, outside visits, field trips abroad and other relevant activities. The programme prides itself on its highly supportive learning culture and its ability to turn out independently minded learners, sensitive to the cultural assumptions of the world around them and guided by a sense of social responsibility.

BA Sociology & English

Covering a broad range of critical and contemporary issues, this exciting and innovative joint programme introduces students to linguistic or literary theories and to the many diverse and contentious sociological perspectives that try to explain the world around them. The modules encourage students to critically examine contemporary social change, to question the reality and representations of the social and cultural forces which mould us, and to evaluate the nature of 'society' itself. In so doing we use English Literature from major historical periods, such as the Enlightenment, the Romantic and the Victorian era alongside influential, exciting and thought-provoking texts from the major literary genres, as well as other texts from key areas of social life.

BA Sociology & Modern History

Covering a broad range of historical and contemporary sociological issues, this exciting and innovative joint programme introduces students to a comprehensive range of sociological and historical theories. This course encourages students to explore social and historical change, and to examine the many and varied social and cultural forces which have and will continue to mould and change society. The History element of the course explores the many changes occurring from the 17th century to the 21st century, giving the opportunity to study history in both depth and

breadth; whilst the Sociology element examines the nature of contemporary society and social change, thereby giving a seamless vision of Britain and British society.

BA Politics and English

Politics and English is an excellent subject combination that allows students to pursue their own interests whilst developing a sound perspective in both fields of study. The degree is designed to help students to form a deeper understanding of the Politics of Britain and the wider world, whilst exploring the world of the political, not least through the use of language within the complex power relationships of contemporary society or the contribution of literature to politics and politics to literature. This Joint Honours programme is stimulating, interesting, contemporary and quickly develops students' own powers of analysis and problem solving, research skills, critical thinking, team work and interpersonal skills.

BA Modern History and English

This degree brings together the two complementary disciplines of History and English. In studying the past we learn about the present and help develop our own perspectives on Who am I? And to what sort of society do I belong? Coupled with an understanding and appreciation of English Literature and Language, this combines to open a gateway on past issues and events from a range of perspectives.

BA Public Services

This course develops appreciation of the ever changing field of social policy in the public sector that includes health, tourism and urban regeneration. There is also the opportunity to specialise in the second year of the course, so that students will gain a BA in a field chosen from Health, Government or Leisure and Tourism.

BA Politics and History

Politics and History go so well together because they give us an understanding of both the present and the past and help us to recognise the key challenges facing earlier societies as well as our own. Within our programme the two complementary disciplines are combined together in a flexible way which allows students to pursue their own interests within the range of subject areas offered whilst developing a sound perspective across the subjects. This degree helps students develop powers of analysis and problem solving, research skills, critical thinking, team work and interpersonal skills. It offers a range of modules that focus on the local through to the international, that stretch from the 17th century to the present, that look at people as well as institutions and forces and that above all else, are not just interesting but also fun!

BA (Hons) in Health and Social Care

This course enables students to specialise in childcare, care of adults, including residential care, care of the mentally ill and care of those with learning disabilities. Modules such as Values and Principles of Care, Holistic Care and Care Planning are developed further and enable students to engage in contemporary issues in Care from theoretical and vocational perspectives.

BA (Hons) Working with Children and Young People

The course is delivered over four terms and offers two routes to completion which enable you to concentrate on specific aspects of working with children and young people, as relevant to their career development. The Early Years route addresses the needs for Early Years Professional Status (EYPS) while the Young People route places emphasis on working with children and young people of eight years and above. Both routes will ensure that the principles of Every Child Matters are fully embedded and each pathway consists of six ten credit units and one sixty credit dissertation. The structure facilitates team working and peer group learning and further develops reflective practice and work based learning.

Other Higher Education courses

Foundation Degree in Care Practice (with Health & Social Care)
Foundation Degree in Positive Practice with Children and Young People
Foundation Degree in Early Years Child Care and Education
Foundation Degree in Public Services
Foundation Degree in Sports Recreation Management
Foundation Degree in Sports Coaching
Foundation Degree in Exercise and Fitness Management
Foundation Degree in Travel and Tourism Management
Foundation Degree in Hospitality Management
Foundation Degree in Complementary Medicine
Foundation Degree in Housing Studies
Foundation Degree in Neighbourhood Management
HNC/D Travel and Tourism Management
HNC/D Public Services
HNC/D Hospitality Management

Student Hotline: 01254 292929 Employer Hotline: 01254 292500

Further Education Courses

Blackburn College (www.blackburn.ac.uk) also offers the following courses in the social sciences area:

BTEC Early Years
BTEC Health Care and Public Services
BTEC Public Services
BTEC National Diploma in Sport
BTEC Travel and Tourism
A level Government and Politics
A level Citizenship
A level History
A level Law
A level Physical Education
A level Religious Studies
A level Sociology
Apprenticeship in Hairdressing
Apprenticeship in Nail Services
Apprenticeship in Social Care
CACHE Preparation for Childcare
CACHE Caring for Children
CACHE Childcare and Education
BTEC Children's Care, Learning and Development
OCR Health and Social Care
OCR Health, Social Care and Early Years
NVQ Beauty Therapy
NVQ Nail Services
NVQ Hairdressing
VTCT Holistic Therapies
City and Guilds Hospitality and Catering
NVQ Hospitality and Culinary Arts
BTEC Public Services
BTEC Skills for Working Life (Sport and Recreation)
BTEC Sport and Leisure
BTEC Sport
BTEC Sport (Fitness and Development)
OCR NVQ Instructing Exercise and Fitness
BTEC Travel and Tourism

Student Hotline: 01254 292929 Employer Hotline: 01254 292500

East Lancashire Research 2007

AR-07-01. Windows of Opportunity for Unpaid Work?
by Phil Johnson and Bill Ingram,
Criminology Research Group,
also published in the *Probation Journal*, 54(1), 62-69, (2007).

AR-07=02. DC Capacitor Simulation by the Boundary Element Method
by Stephen Kirkup,
Engineering Research Group,
also published in *Communications in Numerical Methods in Engineering* **23**(9), 855 - 869, (2007).

AR-07-03. Boundary Element - Rayleigh Integral Method (BERIM) with application to a Horn Loudspeaker
by Stephen Kirkup and Ambrose Thompson,
Engineering Research Group,
also presented at the World Congress on Engineering in London 2007 and published in the proceedings 1401-1406.

AR-07-04. Quality Costs in Education
by Trevor Green,
also published in the *TQM Magazine*, **19**(4), 308-314, (2007).

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All reports can be downloaded from www.east-lancashire-research.org.uk

Main Campus

KEY

- VISITOR PARKING
- PARKING ENTRANCE
- COLLEGE CAR PARKS
- PUBLIC PAY AND DISPLAY CAR PARKS
- ST PAUL'S GARDENS
- PEDESTRIAN WALKWAY
- ONE WAY STREET
- DEVELOPMENT SITE

- AD Art & Design Centre
- B/BS Blakey Moor Centre
  - 1 BM's Café Bar
- CH College House
- CT Construction Technology Centre
- F Feilden Centre
  - 2 Feildens Fitness Centre
  - 3 Library
  - 4 Main Reception
  - 5 Student Services
  - 6 Motor Vehicle Workshops
  - 7 Feildens Restaurant
  - 8 Theatre/Main Hall
  - 9 Registry
  - 10 Travel Shop
  - 11 Prayer Room
- FY Foyer Building
- G Gateway Centre
- H Higher Education Centre
  - 12 Duke's Restaurant
- NV New Victoria Centre
  - 13 Academy Hair & Beauty Studios
  - 14 Scholars Restaurant
  - 15 St Paul's Coffee Bar
- SP St Paul's Centre
  - 16 Sixth Form Reception
  - 17 Computing Centre Reception
  - 18 Courtyard Café
  - 19 Prayer Room
- V Victoria Centre

Blackburn College