Conference Report: Digital Heritage - new technology for the historic environment

The IHBC North West Branch Annual Day Conference took place in October on the theme of digital technologies for historic buildings. It was held in The Co-operative Group's Headquarters, at 1 Angel Square, in Manchester.

There is great potential to use innovative digital applications for the surveying, recording, refurbishment and interpretation of heritage assets, but these technologies are often misunderstood and hence underused.

The conference highlighted examples of best practice to enable delegates to develop a better understanding of how to conserve and present the historic environment more effectively. Case studies were presented from the public and private sectors which meant the conference was of interest to conservation and heritage specialists, architects, planners and surveyors.

Paul Hartley, the IHBC NW Branch Chair, welcomed the delegates and introduced the Day Conference Chair: Drew Hemment. Hemment is Founder and CEO of FutureEverything, the award winning innovation lab and festival established in 1995.

Hemment explained that the impact of the 'digital turn' was far reaching. He was from an arts background, but there was a lot of work going on in the field of digital culture and so he had worked alongside a wide range of disciplines and with various bodies including: cartographers, planners, the Met Office and museums & archives. He was interested in ways of capturing the heritage of the future. Although historic buildings were a new area for Hemment, he was not surprised that these technologies were being promoted for use in the historic environment. The day conference would highlight the opportunities and threats that innovative digital applications presented.

The first session of the day conference focussed on Surveying and Recording. It started with a presentation on Digital Recording. The speaker was Paul Bryan - the Geospatial Imaging Manager leading the Remote Sensing Team in English Heritage's Investigation and Analysis Division. The team assists in the implementation of the National Heritage Protection Plan (NHPP). Bryan also takes the corporate lead on the application of modern image and laser based metric survey approaches applicable to cultural heritage.

Remote sensing itself can be defined as acquiring information about an object or phenomenon, without making physical contact. It involves geospatial imaging. Geospatial means: *"of or relating to the relative position of things on the earth's surface"* and geospatial imaging refers to technologies that are used to acquire geospatial information from remotely sensed imagery and other raster data types (i.e., digital image represented by reducible and enlargeable grids).

The Remote Sensing Team, based at Swindon and York, is involved in aerial reconnaissance and aerial investigation and mapping to identify archaeological remains as part of the National Mapping Programme. The Geospatial Imaging Team at York comprises three members. They were formerly the Photogrammetry Unit &

Metric Survey Team. In the acquisition of information, English Heritage uses a range of techniques.

Rectified photography is based on scale photographs. Its advantages are that it is an image based approach which is quick, easy and cheap. The disadvantages with rectified photography are that it only suits 2D work and it lacks detail; in digital work accuracy is essential.

Panoramic imaging is quick an easy, it produces 360 degree images, 'consumer-grade' cameras can be used with panorama 'stitching' software and the high resolution solutions are now being used in the survey process; also it provides potential for measurement. The problem is that without the software imagery cannot be accurately stitched, it is difficult to illuminate internal spaces in 360 degrees and laser scanning already provides digital information.

Photogrammetry is for 2D and 3D surfaces and stereo-photography provides excellent archival records. It can provide data that is accurate in millimetres. Specialist cameras are no longer required and lower cost PC based solutions are now available.

Structure from Motion (SfM) is making photogrammetry fashionable again. The new version of SfM can capture a wide range of multiple images, using any camera. It is a less specialised approach that is applicable to 2D and 3D. It is modern, easy and PC based. It does have its disadvantages though: it requires stereo or overlapping photography; and drawn data is often viewed as being subjective and objects are removed from their surrounding context. There are also questions regarding how complimentary it is to laser scanning.

Laser scanning is applicable on all 2D and 3D surfaces and is very fast, which is useful with historic buildings with large surface areas. It produces high resolution records which can be integrated with CAD and digital imaging and it is ideal for recording, modelling and visualisation. The disadvantages are that: it produces very large data files which make viewing difficult without high-end computers and dedicated viewers; scanners are still expensive; and sophisticated software is needed to generate useable outputs.

Bryan then went on to discuss the applications of these techniques. The first case study was the Ironbridge, which has spanned the Severn in Shropshire since its construction in 1779. The monument was recorded in 1999 as part of a re-painting project, using traditional survey techniques and even some early laser scanning.

In 2012 laser scanning was undertaken to facilitate structural analysis and strength assessment. The option of re-using the existing survey data was considered but the accuracy of that data was deemed insufficient for the new purpose.

The second case study was Harmondsworth Barn, in Middlesex. This 15th century barn located near Heathrow airport is the largest intact medieval timber-framed barn in England: dubbed "the Cathedral of Middlesex". The building has a number of on-going structural and conservation problems, as a result of years of neglect. EH acquired the barn in 2012 to address these issues.

There was a fairly comprehensive existing archive of measured survey data. These records were supplemented by laser scanning and photogrammetry (SfM)) in 2012, to assist engineers, in the presentation of the site and for Building Information Modelling (BIM).

Bryan then focussed on BIM as the final example of the application of digital recording. He did not consider BIM to be 'the next big thing'; rather he saw it as a process which the government had been promoting through its Construction Strategy, published in 2011. BIM does aid recording and it aids analysis, which facilitates the understanding of how a building works. Consequently, BIM is being used in conservation.

BIM is being used to secure long-term economic sustainability of listed buildings and sites, adaptive reuse and regeneration suggestions. It is also being used with Heritage at Risk surveys. Using BIM has highlighted knowledge gaps in terms of: building condition & ecological surveys and measured surveys.

Bryan then turned his attention to archives, having made the point earlier that he was pleased archives had been mentioned in the Chair's introduction to the day conference.

All the digital recording techniques were being applied across the entire EH estate. Data was generated by in-house survey teams, but resources were limited and so some work being was contracted out. EH used performance based specification: "Metric Survey Specifications for Cultural Heritage".

Survey information was stored in EH's archive historic plan room; digital imagery was stored on image servers; and laser scan output was stored too. It was important to decide what information was required and what survey style was appropriate. Bryan said we needed to remember that the data collection of today was the archive of tomorrow.

The second presentation, entitled "Modelling of archaeological monuments and landscapes", was delivered by Jamie Quartermaine, a Senior Project Manager with Oxford Archaeology North.

Quartermaine began by extending on some of the themes of the previous speaker. He explained that photogrammetry was a very old technique, which dated back to Leonardo da Vinci. It had been very 'big' in the 1960s, but had become an antiquated technology. By contrast Quartermaine described Structure for Motion (SfM) as a wonderful technique, although it was a terrible name! Advances in technology had meant that photogrammetry had been updated. Oxford Archaeology North made use of photoscan, which was very reliable and a good modelling tool.

A Digital Terrain Model (DTM) had been created of the excavated Stocks in Bowland Church. The DTM had been generated from multiple photographs taken from a mast and the final textured image. Photographic masts can extend up to a maximum height of 10m but are only useful for recording small sites. The same technique had been used at Stainton East, Carlisle Northern Development Route. Although the

mast was useful in this case it was only able to map small elements of a very large excavation site.

A programme of excavation and survey in an environmental and marine archaeological investigation was being undertaken at Tel Akko, in northern Israel. Here, photographs were being taken from a small balloon/kite which carried a small camera. The problem was that the camera had to be lightweight camera, because the maximum payload of the balloon was very limited. Consequently the camera was too small and the resolution was inadequate. Also as the wind got stronger, not only did the camera become susceptible to camera shake, but the balloon could get caught up in trees and vegetation; additionally if a balloon was left tied to a post it could come undone and fly way with the resulting loss of a camera!

In another project - the Maryport Roman Vicus excavations - an Unmanned Aerial Vehicle (UAV), or 'drone', was employed. This was a small multi-rotor helicopter, which proved to be a much better platform for aerial photography. The UAV was much more stable in the wind and had more flexibility with respect to altitude, which resulted in good photographs.

If the site had been recorded using a total station approach 15mm accuracy would be the best they could have achieved realistically, whereas a detailed view of the whole model showed sufficient detail for individual stones to be digitised. With this level of detail a stone or artefact could be identified using a process which involved an initial point cloud, leading to a modelled image in order to develop a textured model.

Quartermaine discussed several example projects and showed images, including a modelled image of a Wearside Pottery Kiln. He showed the same modelled texture draped onto survey data generated using a total station, which clearly demonstrated the accuracy of the modelling technique.

The accuracy that could be achieved tended to be proportional to the size of the site. Quartermaine cited an example where 0.22% accuracy had been achieved. He discussed examples of 3D modules: using survey control points and contouring. This provided flexibility and could produce a 'fly around' as well as the model.

He showed images of an old school building in Burnley where elevations, plans and the structure had been recorded. Another example was Quarry Bank Mill, near Manchester airport, which was recorded by a combination of laser scanning and photogrammetry using a mast and photography from upper windows.

Comprehensive mapping of excavations is an important part of the work carried out by the likes of Oxford Archaeology; they use 3D modelling and GIS layers. UAVs represent recent technology, along with batteries, digital cameras and the prerequisite software.

According to Quartermaine, photogrammetry still had potential benefits. All it required was a selection of un-doctored digital images from multiple view points. Setting up the programme can take a couple of hours, though, and then the programme can take up to six hours to run- this is typically left to run over night.

This approach can provide an economical way of recording a complicated site in 3D. It can also provide the means for mapping any archaeological site – providing potentially the cheapest way of recording landscapes, excavations and structures.

The session continued with a presentation on Practical Applications of GIS for Heritage, delivered by Dr Andrew Lowerre is Archaeologist (Spatial Analysis) with English Heritage, whose research interests have focussed on history and archaeology of Anglo-Saxon and medieval settlement and fortification, and in the use of GIS.

Lowerre defined geographic information system (GIS) as spatial information. Its focus was on capturing and storing information and checking, interacting and manipulating the data. There were blurred boundaries between GIS and geo-browsers, e.g., Google Earth.

There were different approaches with spatial data: vector GIS and raster GIS. According to Ordinance Survey, with vector data the features are recorded one by one, with shape being defined by the numerical values of the pairs of x & y coordinates, whereas in raster data the entire area of the map is subdivided into a grid of tiny cells. Raster data employs more pixels which provide more detail, but new equipment might record using both vector and raster data.

A single spatial record will have attachments with geo-referenced layers and attributes i.e., spatial representation or features. The data can be drawn from a range of systems including non-tabulated data (e.g., digital photographs and text documents). Layers of data are also known as ‘themes’. Some layers are linked to database management systems (DBMS).

In considering whether GIS should be used and to what level and extent, Lowerre suggested that there were a number of questions that practitioners needed to address: to which questions were they trying to find answers; what tasks were entailed in the project; whether there was already data out there; and whether new data was required.

There were other considerations too: the need to share information was also important, for example. This might involve querying the data and looking at the multiple relationships between the attributes and spatial features. The data might be used in visualisation in the form of maps, 3D models and walk or fly through applications.

The data might be needed for further analysis in order to develop a greater understanding of buildings and landscapes; what is there, what it is and why it is there?

Lowerre cited the GIS project at Audley End historic landscape, as an example. In previous work the focus had been on the house, whereas now the presentation was on the house within its wider setting.

The survey approaches taken provided a wide variety of information which included: background and heritage data; digital terrain modelling; historic mapping; aerial photography and LIDAR (light detection and ranging) interpretation; and data from earthworks surveys, paleoenvironmental studies and geo-physical surveys. The data was useful in terms of heritage protection issues, e.g., in identifying locations with evidence of shallow archaeological remains and deciding where overflow car parking should be sited. The data will be invaluable in informing decisions regarding future directions: possible excavation targets; new analysis over time; and digitised package/estate books.

Lowerre ended his presentations by summarising the case for and the case against the use of GIS. On the positive side GIS: adds further information/data as available; targeted excavation enables digitising and date stamping of features in historic mapping; produces a range of different data; and it is a powerful tool for visualising relationships between people, places and things in space. There are some drawbacks to GIS however: the software is expensive and learning how to use it is time consuming. There are also difficulties with respect to GIS and 3D, although this situation is improving slowly.

The fourth speaker in the Surveying and Recording session was Peter Insole, a Senior Archaeological Officer in the City Design Group at Bristol City Council. His talk was entitled – Know Your Place: Managing Bristol's Historic Environment Record.

'Know Your Place' (sometimes abbreviated to KYP) is a tool that is used to understand and manage the historic environment, by establishing partnerships – which is crucial in times of austerity.

Insole began by discussing the role of the Historic Environment Record (HER) and introducing the way in which Know Your Place helped the process. The key themes the council's officers had to address were: managing the process, maintaining the data and publishing the data. Other issues that were import to the HER and KYP were: providing a link to place-making; ensure community involvement; and enabling collaboration with and between officers.

Insole explained that the HER's role was central in planning in terms of quality place-making and material considerations. He then set this within the wider stakeholder context, because it is clear that without support from all stakeholders it will be very difficult to ensure that the HER's role is indeed central.

On the one hand he identified the Local Authority, in terms of councillors and officers and in terms of the council's functions as: landowner, regulator and service provider. He identified the business community too: landowners, developers, potential investors and consultants/advisors. Neighbourhood planning groups were defined as being area focused and their advisors, facilitators / and consultants were identified as stakeholders.

Two other shareholder groups were identified and, since the HER was cited as having a central role in the model, not surprisingly they comprised English Heritage and Local Heritage and Amenity Groups. English Heritage's roles comprised:

advisor & influencer; regulator; and funder; whereas Insole identified Local Heritage and Amenity Groups as campaigners and commentators and for being involved in CAP.

The Know Your Place initiative enabled and promoted participation through a dedicated website. OS based maps were featured and vector and raster data was employed. A Silverlight web-browser plug-in had been incorporated in the form of a spy glass. Historical maps and modern maps were overlaid and browsers could switch back and forth. The website also included material from the city archive, e.g., historical paintings & illustrations

KYP includes a community layer for added richness. A contribution tool provides step-by-step instructions which allow people to upload material which is then featured in the database. This has resulted in people uploading material from their personal archives and making personal nominations for local listing.

The Website also featured the so called Heritage Eye, which was a smartphone app for Heritage at Risk. Heritage Eye enables people to survey the condition of listed buildings in Bristol. Completed surveys and photographs are submitted to the Bristol HER to assist with maintenance of the Heritage at Risk register.

A pilot beta version was tested by civic society members before Heritage Eye was released. The facility to complete a simple survey or even just submit a photograph has proved to be quite popular and far less daunting than completing the full EH survey would have been. The submitted surveys are validated by a conservation officer before being fed into the data base.

The website also included Design Bristol. This feature allows people to add their photographs and videos of good and bad design in Bristol and comment on the city's 'collection'.

The KYP initiative as a whole has promoted wider participation and allowed a standardised consistent approach. The feedback that city officers have received suggests it has been enjoyable and engaging for participants. It works quickly and it saves on limited resources. It establishes effective collaboration channels and partnerships and establishes links with officers.

The Surveying and Recording session ended with a video, introduced by Drew Hemment, the day conference chair. The promotional video was for NOMA, one of the day conference's sponsors.

NOMA is short for North Manchester and is being developed by the Co-operative Movement. Digital technology is playing a large part in planning and the aim is to work towards 'collectivity'.

The Co-op's new Headquarters, 1 Angel Square (the venue for the day conference), was a new sustainable building. In the NOMA initiative the Co-op is working with magneticNorth (or mN) who bill themselves as: "an interactive design company telling stories through digital experiences filled with charm, curiosity and playfulness for people filled with the same - i.e., like minded clients.

The day conference's second session on Interpretation began after coffee. The first presentation was An Introduction to Digital Heritage Interpretation, by Lou Cordwell and Ray Mosley from magneticNorth. Using digital interpretation means that it is possible to play with a building without making physical alterations, as a means of finding how to tell its story. On their projects, magneticNorth work with the communities as a way of building neighbourhoods.

With NOMA magneticNorth have used live information on the side of buildings and public transport and a 'pop up taxi rank' - with live data on people queuing and the number taxis available.

The term digital interpretation was defined: the speakers told the delegates that interpretation was about 'telling stories' or about 'people experiencing something'; but delegates were also told no one under twenty even talks about 'digital', they just see it as normal.

There was a quote from Arthur C Clarke, the English physicist and science fiction writer: “Any sufficiently advanced technology is indistinguishable from magic.” The point was that with interpretation, whether we are referring to heritage interpretation or to interpretation in the arts world, the starting point has to be information and not just technology. For interpretation to be successful there needs to be collaboration between organisations.

Gallery One, at the Cleveland Museum of Art, is a new “innovative gallery (that) blends art, technology, and interpretation to inspire (visitors) to explore the museum’s permanent collection. Gallery One offers something for everyone – from those who are having their first art museum experience to frequent visitors.” It features the largest multi-touch micro-tile screen in the United States, which displays images of over 3,500 objects from the museum’s collection. This forty foot ‘collection wall’ is front-of-house and visitors are able to ‘like’ objects and ‘push’ them to an (ipad) ‘art lens’ so they can shape their own bespoke guided tour.

Another example that was cited was the collaboration between British theatre company Punchdrunk and the MIT media lab where theatre and gaming was merged into ‘an immersive teleperformance’, or online platform that partnered live audiences with online participants. They created a ‘mash-up’ of physical and web technologies to create a mixed-reality experience.

In Newark Park, ‘Reflecting the Past’ was a digital interpretation using mirrors, sensors and images to tell stories. Closer to home, at Grange Court, the timber framed former market hall in Leominster, nexus tablets were used and locals had produced a BBC style history mini documentary.

These examples reinforced the point that it was important to always start with information, not just technology.

The human aspect was important too: collaboration was fundamental to a successful project and employing the right experts was vital. As long as the starting point was right today’s technology can be used to make most things possible: it is not necessarily expensive and the potential for digital interpretation is immense!

After the introduction to digital heritage interpretation there were two presentations based around case studies. The first of these was delivered by Gareth Langley, a co-founder of Stardostar, a digital interpretation agency, which Langley describes as “creating delightful interactive content, tools and toys that improve people’s lives.” His presentation was called Digital Interpretation: Recent Projects.

Langley began by echoing sentiments expressed in the previous presentation, when he stated that he hated the word digital. Langley stressed the human centred design emphasis that his agency advocated. He said that this meant addressing important questions like: what is the point? how will people use it? and how will they feel using it?

An underlying theme in the presentation was the psychological basis to the human centred approach. As humans we had evolved to learn by doing. Additionally we had evolved to listen to and tell stories, which normally had a cause and effect

element and a narrative. Consequently, Stardostar believed that interactive storytelling was the best way for people to learn.

One recent project Langley discussed was the Cotswold Area of Outstanding Natural Beauty. This living landscapes project featured a kiosk, which had been created to teach 8-10 year olds about the 6000 years of landscape change due to human intervention and how our relationship to the landscape has changed over time. There are also plans to show: a year in the life of the Cotswolds and the four seasons. To appeal to the children the project used cartoon characters of 'time travelling quantum sheep'. The kiosks also had to be portable but not 'steal-able'.

The Cotswolds AONB project basically had two audiences: one audience comprised people who were already Cotswolds visitors and the other comprised people who had never heard of the Cotswolds. The project team had to focus on the objectives of the users, in order to get their client's message across.

Another project was Hearmanchester.com, which focused on interpreting the landscape of the Rochdale Canal. Real world signage was used to give people a sense of place.

Hearmanchester.com included ten audio portraits of the city, which were intended to show how Manchester was in turn: inspired, green, en-route, underground, unsung, radical, poetic, human, proud, and industrial. One audio portrait was Deansgate, which was shown as a travel intersection and the country's first passenger railway station. The audio portraits enabled people to listen to the story of the place or building and the MP3 audio tracks are supplemented by pdf maps. They were intended to convey 'the idea of history' and of 'moving forward'.

Langley then went on to discuss the use of 'Binaural Audio' and 'Augmented Audioscapes'. The HLF funded binaural audio programme employed psycho acoustics and 3D stereo to enhances the real world around the person. Binaural audio recording can measure with a microphone using left and right channels to mimic sounds playing through head phones. The brain interprets where the noise is coming from. Langley believed that audio could create the most powerful augmented reality.

Augmented audioscapes are also known as locative audio. The idea is to take the above and, by using a GPS enabled device, sensors detect a person's location and trigger music, sound effects and voices to tell a linear story or a story that responds to people's choices in turning left or right.

The idea is not to replace the real world, just to add 'bits' to it. Langley said that real locations with binaural audio were great, but real locations with binaural audio and enhancing other senses, such as temperature or smell was even better.

The next presentation also featured digital heritage interpretation case studies. It was delivered by Louise Hampson, the Development Officer for the Centre for the Study of Christianity and Culture at the University of York. The presentation was called: Is there an app for that? - New technologies and their place in church interpretation.

The Christianity & Culture Centre is entirely grant-funded and works on a not-for-profit basis. It was established in 1999 in response to a growing awareness that students needed to develop an understanding of Christian heritage and how it underpinned British and Western civilisation. Helping students to develop background knowledge enabled them to understand Christian references in art, literature, architecture, music and history.

In order to tell the story of the Church in England the Centre has produced various publications and resources. Four interactive resources and also an academic book series have been developed to help people understand this heritage and the history and present life of church buildings.

The Centre's latest DVD-ROM, "English Cathedrals and Monasteries through the Centuries", is the second of a two-part project on the Story of the Church, which had been due out in October 2013. The first edition of "The English Parish Church through the Centuries" had been published in 2010 and was well received by both archbishops and leading academics.

Cathedrals (and some key churches) face a dichotomy: they have a high number of visitors who are interested in heritage, but the purpose of the place is worship: the Centre advocated an approach based on the idea that heritage visitors may become interested by the religious element.

The Centre believes that all interpretation, regardless of media should be: engaging, accessible, sustainable and cost-effective. It also promotes the maxim that: it is important to remember technology is the servant of the scheme not the master!

Hampson explained the starting point in church interpretation was determining what was required of the scheme. She gave some example questions, like: what do you want to achieve by your scheme? and who is going to use it, or who do you want to be able to use it?

It was also important to consider the particular practical circumstances of the building in question, for example: whether there was an entry charge; whether there was a power supply near the point where you wanted to locate items/appliances; and what staffing arrangements are in place. The staff may all be volunteers, so knowing what their interests were was important. Another practical consideration concerned: whether money was available and whether income was expected or needed from the scheme.

Hampson discussed the advantages and disadvantages of phone apps for church and cathedral interpretation. On the positive side: no hardware was required; they were easy to update; there were no printing costs or storage issues; video and 3D modelling could be incorporated; they were attractive to teenagers and young adults; they could be downloaded ahead of the visit; and they can include the facility for making a donation. On the other hand though: not everyone has a smart phone (yet); apps encourage the use of mobile phones, which was something some churches are uncomfortable with; solid stone walls mean that there could be signal and network coverage issues, if the app had not been downloaded in advance; the

existence of the app was not necessarily immediately obvious to the casual visitor without prominent signage; and creating and maintaining multi-platform access for Apple and Android is complex and potentially costly.

With DVDs visual tools could be used like: 3D modelling; and fly-through/fly-round applications. These visual tools, along with antiquated drawings and historic maps, made it easier for visitors to develop an understanding of things like how the building had changed over time.

Some examples of the work of the Centre were given, namely: Holy Trinity in Goodramgate where touchscreen technology had been introduced with CD-ROMs for sale; and touchscreen technology had also been employed at Holy Trinity in Micklegate.

Delegates were told that phone apps were available to download free for both Apple and Android devices, for a number of churches and cathedrals. Holy Trinity in Stratford-upon-Avon is known as 'Shakespeare's Church' and many visitors just want to see the Bard's grave. This was an early app, but it includes an attractive trail. The York City Centre Churches app portrays the buildings as 'living churches'. There is an app for Coventry and Winchester cathedrals, in which there is an interpretation of the three cathedrals at Coventry: the 20th century Basil Spence cathedral, the medieval cathedral and the Saxon cathedral.

Hampton concluded by explaining that in church interpretation the centre's work blurred the distinction between people who use churches 'properly' and visitors. The interpretation schemes are designed with the idea in mind that visitors may be interested in exploring churches in new and different ways.

The morning finished with a questions and answer session. The point was made that we should be looking at new ways of working and engaging the public, rather than simply doing the same things in slightly different ways. For example, cathedral guides were often 'one size/one story', i.e., they contained what the visitor should know! The approaches that had been discussed during the morning identified that it was possible to offer interpretation that provided more options: so visitors could follow their own interest.

New approaches meant that the focus was moving away from seeing visitors as 'empty vessels' towards activities like 'walls with post-it stickers'. Interpretation was becoming less top-down, i.e., telling the visitors whether a place was important or not. Now tools were being developed to encourage public engagement. Such approaches recognise that we are often dealing with places where people live – it is their heritage and their decision whether a place was important.

Some rhetorical questions were raised, however. Elaborating on the subject of interactivity and content of interpretation there was the question of whether 'locals' should take the decisions about heritage, since there were always tensions between specialists and local communities? An associated question was: whether visitors really valued vox-pops of other visitors or whether they actually preferred to hear from experts. It was important to achieve the right balance between experts and enabling dialogue through technology.

The presentations on surveying had shown how the transfer of technology had empowered people and how the visibility of technology was driving things on: people were able to do more by using the technology that was now available.

Although we have moved from creating websites, 10 years ago, to creating apps, 5 years ago, the question was raised : are these advances all about citizen science or are they about citizen heritage?

There were questions about the degradation and/or security of digital answers/ solutions. The questions revolved around the life-span of digital data and its implications for archives. Technology always has its limitations, but although it was important to be aware of this, it was also important not to let technology stifle creativity.

However, in church interpretation technology enables practitioners to move from a one scale to another, for example, from a one specific parish church to parish churches in the town. The question and answer session ended with the point that: technology gives access to the experts!

After lunch there was a choice of two walking tours. One tour focussed on the £165m Manchester Town Hall Complex Transformation programme. The tour consisted of a visit to two buildings in the complex: the Town Hall Extension and the Central Library. These buildings are both Grade II* listed and they were both designed by E Vincent Harris. The Town Hall Extension is adjacent to the Town Hall and immediately to its south; whereas the Central Library is adjacent to the Town Hall Extensions and immediately the south of that building.

The tour was led by Alan Garbutt who heads the Town Hall Complex Transformation Construction Programme, which is responsible for delivering all property related aspects of the programme. Garbutt was joined by Graham Cavanagh from Ryder Architects.

According to the City Council the Central Library, which is due to re-open in Spring 2014, will be “a brighter and more exciting place with more space available to customers and visitors than ever before. It will be joined at lower ground floor level to the brand new extended Central Library that is being developed in the Town Hall Extension. The aim is to create a world-class library complex, of international significance, that the people of Manchester will love to visit and can rightly be proud of.

“Its new archive centre will bring together a detailed and fascinating picture of our region’s past, housing materials from a range of partners. Access, storage, interpretation and display will all be hugely improved, providing a fitting showcase for Manchester’s treasures.

“There will also be extensive book and multi-media collections, learning spaces for groups and individual quiet study, performance spaces and cafes.”

The Central Library is a circular building constructed between 1930 and 1934 in a neo-classical style. Garbutt explained that the main book cases had been part of a ‘stack system’, which supported the upper floors. Delegates were informed that it had been determined that this stacking system was a later addition that had been retro fitted and as such EH had agreed that the book cases could be removed.

The building had been surveyed using digital technology and a BIM model produced. (Delegates heard more about BIM modelling later in the afternoon in a presentation by Stephen Anderson (see below).)

A new internal structure was designed using BIM and constructed off-site. It was then brought into the Central Library and manoeuvred into position. The survey data and BIM design had been so accurate that the new structure fitted perfectly. To improve access to upper floors a contemporary steel and glass lift had been installed, which complemented the new structure.

The next part of the tour was a visit to the ground floor of the Town Hall Extension. This building was constructed between 1934 and 1938. It had been designed in what the listing description describes as an eclectic style with a Gothic accent. It was intended to complement the Gothic Revival Town Hall on one side and the Central Library on the other.

The completed refurbishment work in the Town Hall Extension had been executed sensitively, so that the original design of the interior could still be read and the décor appreciated - particularly in the concave corridor on the south elevation.

The library was currently being housed on the ground floor of the building. The layout the delegates saw was temporary, since some of the books and materials would be returned to the Central Library once the refurbishment was complete, but some materials would stay in the building as part of the Central Library extension proposals (described above).

The tour provided delegates with a good insight into the benefits of digital technology in surveying and refurbishing historic buildings and an example of the sensitive introduction of new uses in a listed building.

The other tour looked at the use of technology in Archaeology. The tour was led by Chris Wild of Oxford Archaeology North.

Owing to inclement weather the session began with an illustrated presentation entitled: “Hell on Earth”: Co-operative Headquarters Excavations. The presentation

showed the extent of the 2009-2012 excavations and featured photographs of some of the finds in terms of artefacts and remains of buildings.

The area known as “Angel Meadows” had been developed in the Georgian/Regency period as terraces with weaving rooms on the top floor. Photographs showed they were of high quality with door surrounds framed by pediments and columns.

William Green’s map from 1787–94 showed the locations of Arkwright’s Mill and Mr Simpson’s Cotton Works. The erection of Arkwright’s Mill nearby led to a substantial influx of poor workers. The gracious houses were extended more and more at the rear and subdivided into smaller units until whole families lived in airless, unventilated hovels. Friedrich Engels, the German social scientist and political theorist, described the conditions in his writings and dubbed them as: “hell on earth.” The German edition of Engel’s work was published in 1845 and the English edition in 1890.

By using historic maps and GIS, archaeological excavations were able to tie in present discovery with past surveys and prove that the horrendous conditions had evolved out of previously prosperous ones. The presentation had also shown sections of Adshead’s 1851 map of the township of Manchester and the OS map from 1878.

The delegates were then taken on a tour around Angel Meadows, in the vicinity of the Co-op’s Headquarters, where the excavation site had been. The tour gave context to the talk and showed how survey techniques had been transformed since 1999. Rapid and accurate surveying of artefacts and levels was now possible with the minimum of datum points, through the use of digital aerial photographs at first taken from long poles, to the use of unmanned small quadcopters in recent years. Laser scanners could provide 3D views to give a better understanding of building layout and construction.

In future, mobile phone apps will be able to use GIS to position visitors and enable them to explore the archaeological record on screen as an overlay to present conditions in the location.

The afternoon continued with the presentation of the IHBC NW 2013 Conservation Award, which was made by Paul Hartley the Chair of the IHBC NW Branch. The award went to the City of Chester Walls Portico Project. The EU funded project’s aim had been to create the best urban heritage trail in the UK. Innovative interventions and improvements/enhancements had been made to the city walls without compromising their archaeology.

The final part of the afternoon was devoted to the theme of: Future Opportunities. The first of these two presentations was delivered by Stephen Anderson, an Associate with Buttress Fuller Alsop Williams Architects, who worked within their cultural heritage team. The presentation was called: The Physical Impact of Digital Technology.

Anderson explained that there were two strands to the impact of digital technologies: technologies being used to help to manage change and technologies driving change. Using digital technologies to manage change was about enhancing our understanding of the built environment. There was a wide range of available tools, so the key was to select the right tools and use them correctly.

The first case study presented was Norton Priory, on the outskirts of Runcorn: a grade I listed building and a scheduled ancient monument.

This was stage 2 of a current HLF funded project. It involved conservation repairs to the medieval undercroft. There had been longstanding issues with the undercroft floor and resulting movement: some parts of the floor had settled, whereas other parts had risen. It had proved difficult to understand the cause of problems, which meant additional data was required.

The structure dated from the 12th century and had been retained as part of a post-reformation house. The undercroft floor had been tiled in Victorian times.

The structure had suffered from subsidence and an archaeological report had been commissioned. The report from this earlier investigation provided important

evidence. Indications of water movement under the tiled floor had been identified. It was suspected that the silt layer had become waterlogged. An earlier measured survey had highlighted areas of the floor that had risen.

The intention of the work was to: develop an understanding of the problem, record the existing structure and allow for long term monitoring. The adopted methodology involved sinking test holes in order to monitor water levels. Digital monitoring could have been used, but this would have been expensive so the team opted for manual measurement. A weather station was also established and temperature and humidity level data was logged.

A detailed survey was carried out to measure floor levels – using laser scanning. The data was cross referenced with data from the previous measured survey, but the changes in floor level were not found to be radical.

It was decided to record the undercroft floor and ceiling using rectified photography, accurate to ± 10 mm. Anderson explained that this sort of recording can be used to inform a decision whether to reinstate a floor and it can be used to specify works for a contractor. It provides just enough information, but not too much.

Rectified photography only provides 2D images. Consequently, since the undercroft roof was vaulted, although these images could identify elements and masons marks, the use of 2D images were less useful.

The team turned to Building Information Modelling (BIM) to address this shortcoming. Anderson described BIM as: more developed CAD. BIM could be used for building visualisation and for virtual prototypes. It provided a range of analytical opportunities for example: thermal modelling, structural and fluid dynamics.

Another aspect of the work at Norton Priory concerned the statue of St. Christopher. This significant object was very large and heavy. It had been recorded previously using photogrammetry, but this was not a 3D model.

The statue of St. Christopher was laser scanned, jointly with National Museums Liverpool, to produce a shared BIM model. This made it possible to use BIM to model a museum building and analyse various potential locations for the statue within the building and identify sight lines problems - using the 3D model of St. Christopher.

The second case study was the restoration of the early 19th century glasshouse in the Upper Garden, at Quarry Bank Mill, near Manchester Airport. Here the existing structure had been surveyed using laser scanning techniques. The team were able to use the original data to obtain the information they required. In this way there was no need for invasive investigations in the early stages of the project.

The Museum of Science and Industry (MOSI) in Manchester was another case study, which Anderson dubbed: ‘A cautionary tale against over reliance on digital data’.

A measured survey was undertaken at the museum to obtain focused information. Human error occurred in the survey, because the context of the survey had not been taken into consideration. Relying on this data resulted in a discrepancy in the floor levels, which led to physical impacts.

Anderson then addressed the issue of digital technology driving change. Digital technology opens up new possibilities such as: large volumes of data, reduced costs for new technologies and miniaturisation. New technologies permit display, dissemination and interpretation of information. Enhanced control of building environments is now possible.

All of this has the potential for significant physical impacts. The nature of these impacts could be wide ranging and sometimes they have unanticipated consequences - as demonstrated in another case study, which also happened to be at MOSI.

The focus of this scenario was the installation of various technologies to provide cutting edge digital interpretation. The proposals included the installation of a media wall and a large chandelier with screens suspended from it. Visitors were to be photographed and their images would appear on the screens.

The media wall was installed, but when it was actually operational the heat it generated overheated the space. The engineers had to go back to the drawing board and undertaken further calculations: to redesign the ventilation scheme to alleviate this problem. Extraction fans were built into the top of the media wall to take the heat away at source. Air vents at the bottom of the wall ensured user comfort.

The chandelier comprised 96 LED light tubes, there were a lot of screens suspended from chandelier - each linked to a PC - and lots of wires. The weight of the chandelier meant it had to be supported by a steel beam. The installation had significant space and plant requirement too as the need for a computer hardware room was identified. The cabling led to extra building work, because it had to be chased into the wall.

Builders' Work for digital technology should be low impact, but it tends to have a greater than anticipated impact. As in this case, the unanticipated implications of digital technologies can lead to physical interventions to the fabric of historic buildings taking place.

The final case study was a boiler replacement scheme at Waterloo Place, University of Manchester. In this project a decision was taken during the inception phase to include an historic building architect in the design team. This was due to the perception that the project would prove to be challenging. The perception proved to be accurate, but early inclusion of an historic building architect facilitated careful design which was sensitive to the significance of the heritage asset and detailed coordination of builders' work at an early stage. The right data meant the contractor was given the right instructions and there were no ambiguities in the information they received. As a result, potential physical impacts were carefully managed and the project was a success.

Anderson ended his presentation by drawing some conclusions. Digital technologies provide a range of tools, which are appropriate to different tasks. If they are used properly they can help to limit physical impact on the historic environment through good design.

Digital technology is also driving change, but the desire to use technology within historic buildings can have physical impacts. It is important that managing impacts starts at project inception. The case studies demonstrated the importance of providing detailed information to prevent unanticipated impacts.

The final presentation of the day was entitled: Unlocking Funding through Digital Technology. It was delivered by Karen Ziesler, Development Manager at the HLF in the North West.

HLF recognises that digital technology is useful: it has seen examples of good projects in which it has been used well. Digital technology is not key to HLF funding or a prerequisite. The HLF take a broad view of heritage, which includes themes like cultures and memories and histories of places, for example. The minimum funding for successful HLF bids was £3000.

HLF's current digital policy dates from July 2012. Previously HLF had only funded digital technology as part of a wider programme. Under this policy digital technology is seen as a platform and can be the main focus of a project. A successful bid would need to meet HLF's aims and criteria, adopt the principles of high quality engagement in the digital environment, observe good practice for digital technology and meets HLF's specific requirements for digital outputs.

In May a new strategy is being launched in with the aim to make: a lasting difference for heritage and people. This single strategic aim is underpinned by outcomes for heritage, people and communities. The outcomes focus on improving the management, condition, interpretation and recording of heritage; they focus on developing people's skills and learning, changing their attitudes and behaviour, creating enjoyable experiences and encouraging volunteering; they focus on reducing environmental impacts, engaging a wider range of people with heritage, making the local community a better place to live, work or visit, boost the local economy and make organisation(s) more resilient.

The strategy also incorporates specific outcomes for digital technology in heritage projects: digitising existing heritage assets (e.g. archives, records, films, sound recordings and photographs); creating a digital record of heritage; and new and creative ways to interpret heritage.

A good example of this is the Flicker website. Flicker is a new installation by renowned British artist Catherine Bertola at historic Gawthorpe Hall in Padiham, Lancashire. It was commissioned by Mid Pennine Arts and Lancashire County Council's Museum Service as part of Contemporary Heritage: A new way of seeing. This is an ambitious programme of 'site-responsive artist commissions at stunning historic sites across Pennine Lancashire.' With respect to Flicker at Gawthorpe Hall, Catherin Bertola was quoted as saying: "I am interested in how the space can be seen from different perspectives, through the eyes of different people who have

occupied the space over the course of its history." The interpretation at Gawthorpe Hall includes flickering historical images to present portraits of the past. Images were collected via community events, which were linked to memories. The images have been digitised and a record kept on the website.

Another project was St Helens Pals, which involved creating an online database and crowdsourcing volunteers: i.e., obtaining (information or input into a particular task or project) by enlisting the services of a number of people, either paid or unpaid, typically via the internet.

Ziesler explained that in order to achieve the outcomes digital engagement had to be audience driven, i.e., the target audience for a project had to be identified. The use of technology could then be determined based on needs and interests, so that benefits could be demonstrated. Projects needed to provide opportunities for active participation to enable people to deepen their understanding and awareness of heritage.

Identifying a target audience involves finding out about people's access and interest in digital technology and how they use it. It revolves around the answers to questions like: is digital appropriate for the target audience, and if it is which technology are they likely to use? Another point is finding out who might bee excluded by adopting digital technology.

The next question a project team needed to address was how they would engage people. The answers to this were linked to people's motivations. For a project to actually engage people it needed to offer: challenges and rewards and the opportunity to make a difference and contribute to something wider. Digital experiences needed to connect with activities in the real world and enablle real interaction and sharing.

A couple of examples were cited. One example was the Museum of London 'Street Museum' which used i-phone/android apps providing layered information, so people could create their own trails, linked to galleries. Another example was 'Bolton Worktown'. This project included photos by location, which were linked to archive material and it enabled people to add comments.

Ziesler provided a list of the benefits people could enjoy through digital engagement. They could share their learning, work collaboratively and connect with experts. Since there was a range of activities there could be different levels of engagement and people could be guided by their own preferences. The contributions people made were used and acknowledged and their material became part of a wider record. In short, technology supported engagement with heritage.

There were issues that need to be considered if people were engaged digitally. Digital requires an open way of working and an open approach to data. We need to use digital environments that our target audiences already inhabit, but ensure the content is targeted. A marketing strategy was still needed, because engagement would not just happen.

There were also expectations for digital outputs in any kind of project, i.e., where possible: open source technology should be employed; projects should contribute to heritage digital collections; and there should be no private gain through digital material.

HLF has a series of open programmes: rolling programmes with no fixed deadlines. Sharing Heritage includes funding for projects of between £3,000 and £10,000. Another programme is Our Heritage, with funding available between £10,000 and £100,000. HLF also provides Heritage Grants of £100,000 and above.

Additionally, HLF had targeted programmes running between 2013 and 2018, which included: Townscape Heritage Initiative - £500,000 to £2m; Heritage Enterprise - £100,000 to £5m; Grants for Places of Worship - £10,000 to £250,000; and Young Roots - £10,000 to £50,000.

HLF provides support for applicants in the form of a webpage on policy change. Advice is provided for people who are thinking about using digital technology in heritage projects and there is information about 22 case studies.

The day conference ended with a Discussion and Summary. Drew Hemment began by summarising some of the main points that had been raised about apps. We need to check whether they are 'time limited' and decide whether they would fall out of fashion. Fashions changed and apps and software change too. It was clear that 'content is king', but a key issue with digital archives was whether we would be able to play today's apps on new technology/appliances. So whilst there are obvious benefits with digit technologies the question of future proofing remained.

There was a brief discussion about the Bristol experience: Know Your Place. It was reported that this initiative was "going regional" with similar schemes being launched in South Gloucester and Wiltshire.

By way of closing remarks Hemet said it was interesting to see how questions of this nature were now being asked in the heritage sector. It was all a sign of deep social shifts taking place, he said, but he warned that often working with digital images was seen as being less expensive by government funding bodies!

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