# TRANSNATIONAL ADAPTATION MODEL FOR FACILITATING TECHNOLOGY AND EXPERTISE MOBILISATION IN GULF AEC ORGANISATIONS

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## ABSTRACT

The fragmented nature of the Architecture, Engineering, and Construction (AEC) industry is well recognised, the main issues of which relate to failures in communication, process, productivity and interoperability. These failures have contributed to an increased proliferation of adversarial relationships between the different parties involved in projects, the result of which have deleteriously affected projects. Challenges include a range of issues, from the veracity of design information throughout the project lifecycle, through to supply chain communication. These are global issues. For example, in the Gulf States, the nature and complexity of AEC projects has changed significantly due to increased globalisation and the emergence of enmeshed transnational practices. This has created an overwhelming reliance on the mobilisation and transfer of technology/expertise of professional expatriates, which has influenced the approach taken to traditional design and construction business models, including staff roles and procedures. New knowledge and ways of working are needed to support future projects in the Gulf States. There is also a requirement to capture and codify domain-specific expertise. This paper discusses the need to enhance Qatar's AEC industry by fostering a smooth transition from its current position, into a more sustainable [replicable] state. The philosophical underpinnings of this paper take into account disparate socio-cultural, environmental and economic impacts of change, in terms of business models, technology, innovation, labour market needs, local laws/bylaws, and legislation. A theoretical growth model is presented for discussion. This builds on the experience of the UK (in particular) in terms of facilitating the mobility and penetration of technology/expertise/change in the AEC sectors. This paper presents a series of recommendations needed to develop a Pervasive Transnational Adaptation model for Qatar and the Gulf States, covering such issues as: ICT adoption, agile project management, technology-transfer, innovation, offsite construction, Public Private Partnerships, capacity building, and international strategic alliances.

*Keywords: Productivity and Workforce Issues, AEC, Transnational Adaptation, Expertise Mobilisation, Technology Mobilisation, Innovation, Gulf States, Qatar.*

## 1. INTRODUCTION

The Qatari economy has increased majorly over past 10 years. Gross Domestic Product (GDP) has more than tripled. A major reason for this is the oil and gas industry. These natural resources have aided Qatar in becoming the world leader in GDP per capita according to the International Monetary fund (IMF). In pursuance of this, the Qatari construction sector is expected to expand on average, by 12% a year (up to 2021). The successful 2022 FIFA World Cup bid has had acted as a catalyst and has led to the Qatari government to develop a long-term framework for delivering outcomes, namely the 'Qatar National Vision'. By 2030 Qatar aims to become an advanced society, capable of being sustainable in terms of development. The vision also aims to provide a high standard of living for current, and future, generations. It is anticipated that achievement of the Qatar National Vision will evolve Qatar from being a predominantly hydrocarbon-driven economy into a "knowledge economy", via the four pillars of Human Development, Social Development, Economic Development and Environmental Development (Qatar National Broadband Network, 2013). In accordance to this progressive development and globalisation trend within this region, technology/expertise mobilisation and transfer of tacit and explicit knowledge from developed countries has been widely acknowledged as one of the key factors for leveraging success. However, the social, technological, cultural, and economic implications of this trend has led to fundamental changes in the conventional design and construction business models, including staff roles and procedures, within the Qatari Architecture, Engineering, and Construction (AEC) industry. This has been even amplified due to fragmented nature of the AEC industry which is well recognised both in academia and in practice, the consequences of which have led to several documented problems relating ostensibly to failures in communication and information processing (Egan, 1998, Latham, 1994). These failures have contributed to an increased proliferation of adversarial relationships between

the different parties involved projects, and have affected the veracity of design information within the project lifecycle. As such, this paper argues that the AEC industry in the Gulf region needs a paradigm shift from the conventional approaches to be able to address the challenges of the new type of practice. It is also suggested that due to these high impact transitions, high value skills and processes need to be firmly embedded in the Gulf States.

## 2. CROSS CULTURAL TRAINING AND STRATEGIC ALLIANCES

In order to increase international productivity, many global organisations provide Cross Cultural Training (CCT) to their expatriates. This simple action can significantly contribute to the success of international construction projects and is critical in construction, due to the increase in strategic alliances in the industry. This increase in strategic alliances increases the significance of cultural differences due to the interaction of workers from different cultures. Companies have to consider the cultural concepts in their daily business to operate successfully in the global marketplace (Kivrak *et al.*, 2009). There is a high rate of expatriate failure in Qatar, and a major reason for this is the inability to adapt cross-cultural skills in their new environment (Hurn, 2007). Consequently, many companies operating in the Gulf Region have been exploring new methods to aid expatriates in acclimatising to their new environment. CCT has been identified as a main method of achieving this. It is important to acknowledge the importance and impact of culture and innovation on business performance. Corporate culture is often ingrained and very difficult to influence and change, as it is frequently affected by employees' deep-rooted values and beliefs, the nature and causes of which can often have far reaching consequences (Geletkanycz, 1997). This is a particular challenge in the Gulf region, especially where companies are trying to enter new markets, or 'settle in' to new business environments. Numerous issues tend to surface, from general acclimatisation, through to understanding on such factors as government strategies/policies, ethics, traditional approaches, technology, procurement, financial matters etc. Understanding these issues from the outset can therefore have a significant impact on how companies perceive this new operating environment; specifically, whether they can adapt, or decide to leave. From an AEC perspective, it is therefore important to appreciate the dynamic business environment and move forward into a new learning culture, as construction organisations need to learn (and change) simultaneously (Love *et al.*, 2000). Whilst that culture is accepted, one must recognise the impact of several conflicting concepts, including the 'tensions' between traditional and innovative business thinking. The real challenge here is to maximise such drivers as the creation of added-value (Johannessen, 2013), improved productivity (Al-Ansari *et al.*, 2013), increased growth (Paul Jones *et al.*, 2013), sustainability, developing economies of scale (Reed *et al.*, 2012), organisational learning, and understanding the relationship between organisational culture, people and performance. This is particularly important, as the preservation of traditions and culture often tend to take precedence; which can be counterproductive if not appropriately managed (Sadegh Sharifirad and Ataei, 2012).

## 3. THE IMPLEMENTATION OF ICT AND SKILLED LABOUR

Failures due to the fragmented nature of AEC industry have contributed to an increased proliferation of adversarial relationships between the different parties involved in a project, and adverse information loss within the project lifecycle. Stewart *et al.* (2003) advocated employment of cutting-edge technologies in organisational management and decision-making process. During past two decades, ICT has revolutionised AEC production and design communication and decision-making systems and has led to dramatic changes within the AEC sector, in terms of labour and costs. However, project teams are still facing real and signification problems and challenges regarding heterogeneous systems faced by project teams using disintegrated project interfaces (Goulding *et al.*, 2014). In essence, the problem here is that the industry is experiencing confusion as to how to manage an integrated project information system in order to support decision-making process. In spite of the success of some promising attempts in employing Building Information Modelling (Sawhney *et al.*, 2014), process integration in Gulf projects is still limited, especially at the decision making stage. Thereby, current AEC firms in the region are facing a series of challenges with respect to the management, integration, and alignment of dynamic data to market forces, core business processes and legislative compliance requirements. Consequently, there is a need to address these challenges by an innovative decision support tool capable of managing complex data sets and aligning to differing Small and Medium Enterprise (SME) business models and levels of organisational maturity. These can be further justified in lights of issues of People, Process, and Product. From the People perspective, failure concerns the inability to understand the importance of obligations, the necessity to employ competent and qualified staff in the area of archives and records management, and the inability to understand the importance of training. These issues were raised in a temporal study by Parker and Castleman (2007), especially noting the importance enabling SMEs to employ ICT to help them make informed decisions. From the Process perspective, failure concerns the inability to establish policies, procedures, and guidance for the management of project documentation goals and practices, the provision of appropriate resources to manage data, and the inability to implement statutory and/or legal requirements. Finally, from the Product perspective, failures include the inability to deploy appropriate technologies and systems needed to support project information, records management and archiving.

### 4. GROWTH AND PRODUCTIVITY MODELS

Numerous attempts have been made to model and measure productivity in the construction industry, most of which have focused on multifactor productivity indicators and the measurement of total factor productivity (TFP). However, these studies have been hampered by the lack of availability of appropriate data on the composition of output and inputs at the meso-level. For example, Xue *et al.* (2008) used data envelopment analysis based indices to measure construction industry productivity in China; and Li and Liu (2010) used a Malmquist index method as a decomposition technique to estimate the TFP of the Australian construction industry (to analyse the factors which affecting technological change in the industry). However, the problems of data provision are not just issues for the construction industry (Ruddock and Ruddock, 2011). The OECD and the Groningen Growth and Development Centre maintain multifactor productivity series for OECD economies at the macro-level. However, to permit international comparisons, the main challenge seems to be the lack of available statistics on the composition of labour and capital at the industry level for a sufficient number of countries. As a result, international industry productivity comparisons are rudimentary, including methods of inputs, outputs and TFP measurement, mostly based on national accounts data, the OECD Structural Analysis (STAN) database and its predecessor the International Sectoral Database (ISDB). These databases provide industry level series on output, aggregate hours worked and aggregate capital stock for a limited group F countries and years, while ignoring changes in the composition of factor inputs. Growth and Productivity Accounts, such as EUKLEMS, provide a rich source of information for the analysis of productivity and growth in the construction industry. On this theme, determining 'value' can present its own set of challenges, where for example Ruddock (2006) reported that efficiency gains from ICT in the construction industry could only be understood with better measurement approaches. Similarly, Jorgenson *et al.* (2008) asserted that the growth accounts allow the absolute and relative importance of labour, capital and intermediate inputs to growth to be measured and the derivation of multifactor productivity measures to indicate the efficiency with which inputs are being used in the production process. The growth accounting framework utilises production possibility frontiers where industry gross output is a function of inputs indexed over time.
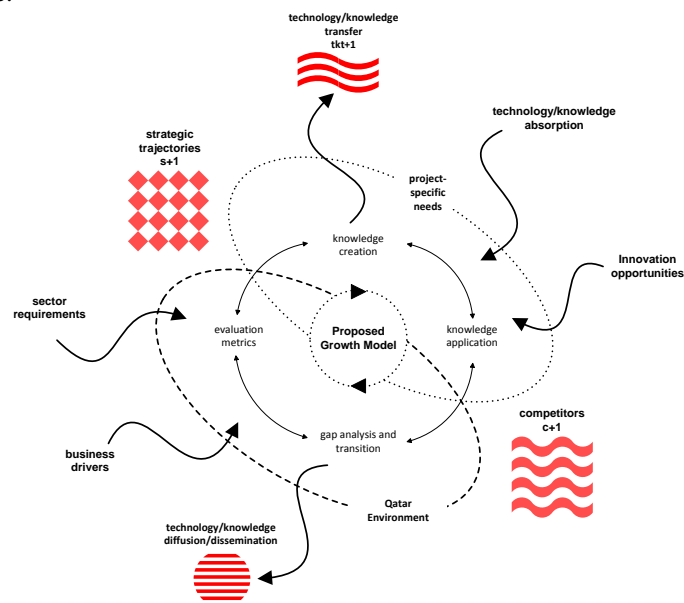


*Fig. 1. Theoretical Framework of the Proposed Growth Model*

The transdisciplinary global AEC projects are becoming progressively complex, engaging new business processes and technological solutions to meet ever-increasing demands. This often requires employing high-level skill sets to deliver the solutions needed. This is also evident in the Gulf States. These issues [and contextual requirements] are presented in Figure 1. From this, it can be seen that there are several interrelated issues to contend with, from causal drivers and external constraints, through to the need to capture, codify and store interdisciplinary and transdisciplinary processes, skills and decision-making criteria for subsequent re-use. This includes a number of fundamental dynamics, including policies, technology, productivity, skills, infrastructure, culture, competition, strategic trajectories etc. These are critical issues facing global construction companies operating in the Gulf States.

### 5. CONCLUSION

New knowledge and way of working is critical for the future of the Gulf States. Acknowledging this, there is a need to capture and codify domain-specific expertise in an all-encompassing model for future growth. This paper

presented a theoretical framework for this growth model, the rubrics of which highlight a series of internal and external forces, constraints and opportunities. These issues need to be evaluated and prioritised as part of any transitional arrangements. A pervasive transitional model of this nature would provide Qatar's AEC industry to objectively evaluate its present position, then highlight its strategic priorities through a cogent roadmap in order to signpost a series of transition arrangements - from its current position, into a more sustainable (mature) state that is capable of being replicated. However, this model would also need to be pervasive, so that it fully embraced all disparate socio-cultural, environmental, technological and economic impact variables; as these are firmly intermeshed, in respect of changes to business models, technology, labour market needs, local laws/bylaws, legislation etc. Notwithstanding this, there are tangible opportunities and benefits to be garnered, not least through improved synergies with knowledge transfer, skills, and innovation opportunities.

## REFERENCES

Al-Ansari, Y., Pervan, S. & Xu, J. 2013. "Innovation and business performance of SMEs: the case of Dubai." *Education, Business and Society: Contemporary Middle Eastern Issues, 6*(3/4), 162-180.

Egan, J. 1998. "*The Egan Report - Rethinking Construction, Report of the Construction Industry Taskforce to the Deputy Prime Minister",* London, HSMO.

Geletkanycz, M. A. 1997. "The salience of 'culture's consequences': The effects of cultural values on top executive commitment to the status quo." *Strategic Management Journal, 18*(8), 615-634.

Goulding, J. S., Pour Rahimian, F. & Wang, X. 2014. "Virtual reality-based cloud BIM platform for integrated AEC projects." *Journal of Information Technology in Construction (ITCON), 19*(Special Issue BIM Cloud-Based Technology in the AEC Sector: Present Status and Future Trends), 308-325.

Hurn, B. J. 2007. "Pre-departure training for international business managers." *Industrial and Commercial Training, 39*(1), 9-17.

Johannessen, J.-A. 2013. "Innovation: a systemic perspective–developing a systemic innovation theory." *Kybernetes, 42*(8), 1195-1217.

Jorgenson, D. W., Ho, M. S., Samuels, J. D. & Stiroh, K. J. 2008. "Industry origins of the american productivity resurgence." *Interdisciplinary Information Sciences, 14*(1), 43.

Kivrak, S., Ross, A., Arslan, G., Tuncan, M. & Dainty, A. "Impacts of cultural differences on project success in construction." Proceedings of 25th Annual ARCOM Conference, Association of Researchers in Construction Management, Nottingham, 2009. 7-9.

Latham, M. 1994. "*Constructing the Team, Joint Review of the Procurement and Contractual Arrangements in the UK Construction Industry, Final Report",* London, HSMO.

Li, Y. & Liu, C. 2010. "Malmquist indices of total factor productivity changes in the Australian construction industry." *Construction management and economics, 28*(9), 933-945.

Love, P. E., Li, H., Irani, Z. & Holt, G. D. 2000. "Re-thinking TQM: toward a framework for facilitating learning and change in construction organizations." *The TQM Magazine, 12*(2), 107-117.

Parker, C. & Castleman, T. 2007. "New directions for research on SME-eBusiness: insights from an analysis of journal articles from 2003-2006." *Journal of Information Systems and Small Business, 1*(1), 21-40.

Paul Jones, P. G. P., Dr Martin Beckinsale, Dr, Thompson, P., Williams, R. & Thomas, B. 2013. "Are UK SMEs with active web sites more likely to achieve both innovation and growth?" *Journal of Small Business and Enterprise Development, 20*(4), 934-965.

Reed, R., Storrud-Barnes, S. & Jessup, L. 2012. "How open innovation affects the drivers of competitive advantage: Trading the benefits of IP creation and ownership for free invention." *Management Decision, 50*(1), 58-73.

Ruddock, L. 2006. "ICT in the construction sector: Computing the economic benefits." *International Journal of Strategic Property Management, 10*(1), 39-50.

Ruddock, L. & Ruddock, S. 2011. "Evaluation of trends in the UK construction industry using growth and productivity accounts." *Construction Management and Economics, 29*(12), 1229-1239.

Sadegh Sharifirad, M. & Ataei, V. 2012. "Organizational culture and innovation culture: exploring the relationships between constructs." *Leadership & Organization Development Journal, 33*(5), 494-517.

Sawhney, A., Mukherjee, K. K., Rahimian, F. P. & Goulding, J. S. 2014. "Scenario Thinking Approach for Leveraging ICT to Support SMEs in the Indian Construction Industry." *Procedia Engineering, 85*(0), 446-453.

Stewart, R. A., Miller, C., Mohamed, S. & Packham, G. "Sustainable development of construction small and medium enterprises (SMEs): IT impediments focus." *In:* AMOR, R., ed. W78 International Conference on Information Technology in Construction - Construction IT Bridging the Distance, 23-25 April 2003 Auckland, New Zealand. 361-368.

Xue, X., Shen, Q., Wang, Y. & Lu, J. 2008. "Measuring the productivity of the construction industry in China by using DEA-based Malmquist productivity indices." *Journal of Construction engineering and Management, 134*(1), 64-71.