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INDUSTRY CULTURE: CHALLENGES TO THE SUCCESSFUL IMPLEMENTATION OF INNOVATIVE CHANGE

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ABSTRACT

Research indicates, one of the last available 'mechanisms' left for organisations to improve their competitive position within an industry, is by considering its people (culture) along with its technology (Schein E. H. 1997). In other words, if one wants to make Architectural, Engineering, and Contractor (AEC) industry organisations, groups and project teams more efficient and effective, then one must better understand the role that culture plays within them. Furthermore, culture inevitably is difficult to change and manage, as it essentially represents the accumulative beliefs, attitudes and values that individuals within an organisation, group or team possess, which must ultimately be changed if the overall culture is to be changed. Leaders of a change process need to realise that most changes within an organisation will usually cause and expect some change in its existing culture and sub-cultures – i.e. change in certain values, attitudes, assumptions, and behaviours, etc. Therefore, having a better understanding of the effects change has on the sub-cultures of an organisation, group or team, will in turn help leaders of a change process better understand the resistance towards the change itself, and provide a more realistic approach on how to manage it.

Future development in determining new and improved ways for AEC industry participants to do business through information and communication technology (ICT) tools and systems is dependent on the innovation of the user, not only the technology itself – i.e. the successful implementation of ICT requires careful consideration to the 'human touch'. The success of technological developments, in terms of uptake and usage, can be improved if the conditions of innovation diffusion within project organisations, parent organisations, and the broader AEC industry are better understood and brought into play. This includes the matching of technological innovation with the perceived needs and preparedness for change on the part of the industry.

Supporting its aims and objectives, and as a major deliverable of the recently completed two year industry and government supported CRC for Construction Innovation (CRC CI) 2001-008-C Research Project, this paper provides:

- A summary of one of its recently completed literature investigation into the unique and 'deeply embedded' cultures of today's AEC and other industry sectors - in an attempt to better understand the inherent resistance to change; and
- 24 'Guiding Principles' on how today's AEC industry can achieve and benefit from both a cultural and technological driven change.

This paper is not intended as a comprehensive statement of the AEC industry's need or ability to change its existing culture. Rather, it provides an overview based on a comprehensive literature review of 'general' industry organisation experiences, characteristics and cultural attributes towards implementing a cultural and technological driven change. It is also part of an ongoing PhD investigation – identifying and analysing AEC industry organisation and project team member values, attitudes and beliefs, etc. towards change - to help develop an AEC industry specific 'Culture Change Framework' which addresses the key cultural issues that challenge the adoption of innovative ICT solutions within project teams.

Key words: Technology; Culture; Change; AEC Industry.

INTRODUCTION

Over the past decade, the word 'culture' has dominated the thinking of many managers and become an integral part of their everyday language. That is to say, today's global competitive business environment has made the culture of an organisation a critical aspect of its success (Sadri G. and Lees B. 2001). Every organisation has its own unique culture, sub-culture, character, nature, and identity. It has its own history of success and failures, which reinforces or challenges the organisation's 'way of doing things'. Older and more successful organisations, for example, are said to have stronger cultures, natures, and identity (Meudell K. and Gadd K. 1994; Schneider W.E. 2000). Yet, despite the growing awareness of various cultural issues, little attention is paid to the practical, day-to-day process involved in creating, managing and changing culture (Williams A., Dobson P. et al. 1993).

Research indicates, one of the last available 'mechanisms' left for organisations to improve their competitive position within an industry, is by considering its people (culture) along with its technology (Schein E. H. 1997). In other words, if one wants to make construction industry organisations, groups and project teams more efficient and effective, then one must better understand the role that culture plays within them. By employing a dedicated, highly skilled, flexible, co-ordinated, committed and productive workforce, coupled with a leaner, flatter and more responsive organisation, will ensure a more effective and successful implementation of innovative ICTs (Morley M. and Heraty N. 1995). Current 'secretive' organisational cultures, for example, who see information as a source of power, influence, and importance, and made available only on a 'need-to-know' basis, are to 'transform' themselves into more 'open cultures' where, whilst a degree of control is maintained, there is an atmosphere of mutual trust and respect within and between organisations (Baines A. 1998). Unfortunately, this transformation of personalities (culture) and traditional processes is not easy (Michel H.L. 1998), characteristically hindered by the industry's unique and determined way of 'doing things' the way it always has, and by its deeply embedded and resistive nature to change.

RESEARCH BACKGROUND

Four decades of international construction industry reports reinforce poor communication, information transmission; coordination; and teamwork issues are the cause of countless performance problems in the construction industry. Failure to achieve significant improvements in what are well-identified issues can be linked to the hitherto limited capacity to conceptualise and manage the very complex dynamics in project processes throughout the project's life cycle.

Debatably, today's industries, businesses and personal worlds are dominated by a wide range of technologies and e-activities, including: computers, email, Internet, Web sites, etc., finding it more and more difficult to function without them. Yet, the success of any profession is described as going beyond simply exchanging electronic information. Successful implementation of innovative information and communication technology (ICT) requires careful consideration to meet industry needs - where future research and developments (R&D) in determining new and improved ways of doing business through innovative ICTs, is dependent on the innovation of the industry (and end user), not only the technology itself – i.e.: matching technological innovation with the perceived needs and preparedness for change on the part of the industry. Consequently, there is an urgent need to address those key issues that will most significantly influence the construction industry and

the way in which it contributes to our society and the economy as a whole in the future.

In an attempt to demonstrate leadership in implementing a cultural and technological driven change within the Architectural, Engineering, and Contractor (AEC) industry, the main objectives for the two year industry and government supported CRC for Construction Innovation (CRC CI) 2001-008-C Research Project included:

- Identifying, examining and better understanding the 'deeply embedded' culture of today's AEC industry, its organisations, teams and participants - by focusing on human and cultural factors, limitations, barriers, and drivers as they arise from this investigation.
- Developing a set of research and industry recommended Culture Change Guiding Principles that will foster the expansion of an ICT adaptive culture - thereby stimulating stakeholder efficiencies and encouraging the wider adoption of innovative ICTs in the building and civil construction sectors.

CULTURE

Being "one of the last mechanisms" for organisations to enhance themselves within an industry (Schein E. H. 1997), the study of an organisation, group or team's culture is important:

- Culture focuses on communication at all levels of a hierarchy, where individuals identify who they are in relation to one another and their environment, and where shared understandings form identifiable subgroups / sub-cultures.
- By focusing on culture, one inevitably focuses on the daily routine and 'sense-making' that is the process of building identities and shared reality among members.
- A cultural approach focuses on largely ignored issues such as assumptions and brings underlying values and motives to the surface.
- The understanding of culture offers a better insight to the managers and leaders – not in order for them to better shape the culture, but to better understand and participate in the 'sense-making' activities of members.
- Undertaking a cultural approach will help identify novel approaches and understandings of future organisations, groups and teams.
- Finally, culture is pervasive, not simply a variable that affects the organisation, group or team, but indistinguishable from it (Pepper G. L. 1995).

Culture is also identified as one of the most difficult and complex approaches to understand. This is mainly due to culture being defined in so many different and sometimes conflicting ways (Pepper G. L. 1995):

- "*Begins to form wherever a group has enough common experience" which in turn becomes the "property of that group*" (Schein E. H. 1999) p13.
- "*Is influenced by traditions, myths, history and heritage...it is the sum of how we do things around here*" (Hensey M. 2001) p49.
- "*Pervades the decision-making and problem-solving process of the organisation, influencing the goals, means and manner of action…a source of motivation and de-motivation, of satisfaction and dissatisfaction, thereby underlining much of the human activity in an organisation*" (Williams A., Dobson P. et al. 1993) p15
- "*Is a pattern of shared basic assumptions that has been learnt whilst solving problems, that has worked well enough to be considered valid and, therefore, to*

be taught to new members as the correct way to perceive, think, and feel in relation to those problems" (Schein E. H. 1997) p12

When it comes to people, culture is identified as "*a set of mores, values, attitudes, beliefs, and meanings that are shared by the members of a group or organisation*" (Williams A., Dobson P. et al. 1993; Duarte D. L. and Snyder N. T. 2001), and is often the primary way in which one 'group' (organisation, team, etc) differentiates itself from others. Further described as influencing and influenced by various issues, ranging from major strategic decisions down to the layout of the offices or the way members of an organisation, group or team address one another.

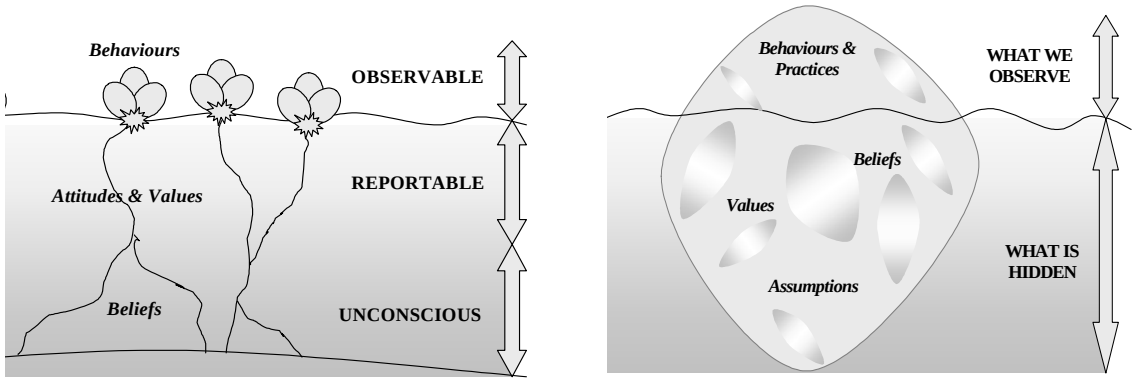
CHARACTERISTICS

The characteristic patterns of a group's behaviour and the elements of its culture can be portrayed via two diagrams (Figure 1):

- **Lilly pond:** where over time, behaviours and elements become 'invisible' and 'second nature' - serving as 'shortcuts' for guiding actions and making decisions.
- **Iceberg:** similarly exposing a partially 'hidden' culture created by repeated interactions between members of a group, which in turn, guides their behaviours.

In short, the two diagrams illustrate the behaviour, attitudes, and values, etc. of people, which in turn are dependent upon both their 'conscious' and 'unconscious' sets of beliefs, and seen as a 'key element' of organisational culture.

Figure 1: The 'Lilly Pond' and 'Iceberg' of Culture and Behaviour

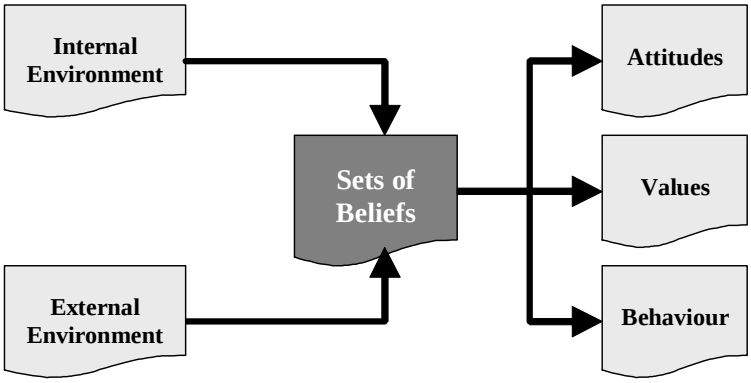


(Williams A., Dobson P. et al. 1993) and (Duarte D. L. and Snyder N. T. 2001)

The 'relationship' between these beliefs, attitudes, behaviours and values of people is summarised in

Figure 2. Here culture is portrayed as '*defined needs related to behaviour',* and consequently related to that of organisational behaviour. Further illustrating that the attitudes, values and behaviours of members of an organisation or team are dependent on the level of internal and external 'influences' on the '*sets of beliefs'* they possess, which in turn underlie individual attitudes, values and behaviours relating to a specific person, action (change) or object.

Figure 2: Relationship between Belief, Attitude, Values and Behaviour



(Williams A., Dobson P. et al. 1993)

CULTURE 'BRANDING'

Industry organisations should also take care not to simply 'brand' a group or team as having either a 'strong' or 'weak' culture, and rather ask themselves, for example: "is it a strong culture…"

- Because its central beliefs and attitudes are strongly held?; or
- Because they are common to all groups (homogeneous)?; or
- Because it promotes overall effectiveness?

The 'non-branding' of culture is also supported in (Bate P. 1996), describing a 'strong' culture as having employees with increased authority and responsibility, who can be relied on to set their own standards and discipline, and where this 'freedom' is conditional upon the ability to 'deliver'. In addition, (Williams A., Dobson P. et al. 1993) defines the strength of an organisation's culture as the extent to which members have 'internalised' the beliefs, attitudes and values that exist within the organisation – i.e.: whereby individuals undergo a 'reasoning process' to mutually accept, agree with, own and value the beliefs, attitudes and values of other members. Further stating strong cultures are characterised by *"dedication, spontaneity and cooperation in the service of common values*" that can operate in direct conflict with the goals of senior management and other sub-cultures. That a strong culture is unlikely to be 'imposed', but rather 'fashioned' through the availability of valid information, openness, trust and free choice. Therefore the internalised beliefs, attitudes and behaviours of a 'strong' culture is less likely to change, where as in the case of a 'weak' culture, changes in policies, rewards, tasks and structures are likely to "*modify organisational behaviour and cause a cultural shift*".

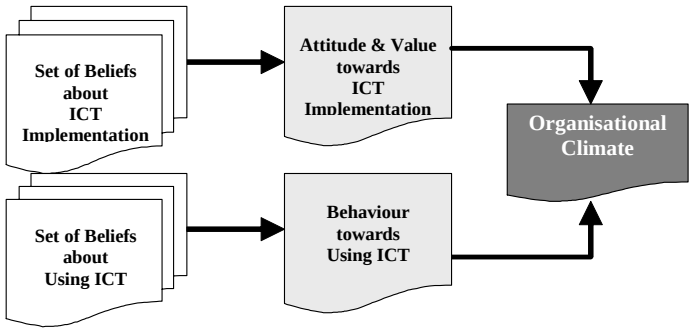
CHANGE

"When we know what culture is, we know what needs to be changed for culture to change.
Only once we appreciate its nature can we understand how it might be changed.
When we know its role, we can comprehend its importance"
(Williams A., Dobson P. et al. 1993) p11.

IMPLEMENTING CHANGE

When implementing change – e.g. a new ICT system or process - the 'climate' of an organisation, team or group is also influenced by the relationship between how members would like or aught to behave and what the work environment dictates that they do, in relation to that implementation (Figure 3). Of course, employees or team members can be forced to comply to '*the new way of doing thing around here'*, but usually at a price. On the other hand, if employee and employer (or change agent) attitudes, values and behaviour are in harmony, then a stronger and more effective culture is likely to result, where members are committed to the overall change, goals and methods of the organisation, group or team (Williams A., Dobson P. et al. 1993).

Figure 3: Change vs. Organisational Climate



Adapted from (Williams A., Dobson P. et al. 1993)

NEED FOR CHANGE

"*If you do not see a truck racing towards you, you are unlikely to jump out of the way…*
…likewise, if you do not realise that you are standing on a treasure of gold…
…you are unlikely to bend down and pick it up"
(Black J. S. and Gregersen H. B. 2002) p20

The above extract reinforces the importance for organisations, groups and teams to realise the 'need' for change, before the act of change can take place. Unfortunately, to be convinced of the need for change is easier said than done, because people tend not to see even the most obvious threats and opportunities because they are 'blinded' by the '*way we have always done things around here*'. Many organisations decide to change their existing culture based on the need to implement a strategically driven change, due to a certain 'crises' or 'opportunity' being identified – i.e.: many organisations are driven to change due to business demands, not necessarily by the need to change culture. Yet, this change strategy requires a change in organisational objectives, work methods, habits, systems, structures, training, and the way people '*think or do things around here*' (i.e. culture). The successful realisation of the need for a change in culture can therefore promote a strategic change, but if not properly implemented and managed, both existing and 'enforced' culture groups may constrain a new business strategy (Williams A., Dobson P. et al. 1993; Bate P. 1996; Schein E. H. 1999).

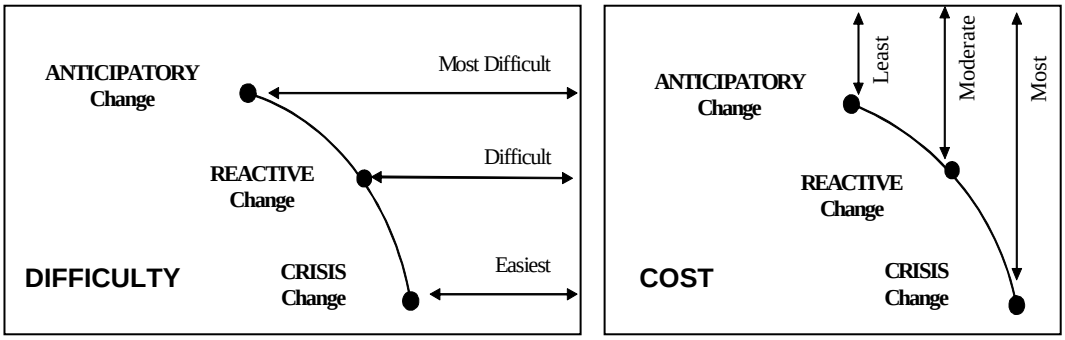
If people fail to see the need for change (whether threat or opportunity drives it), they will not change"
(Black J. S. and Gregersen H. B. 2002) p20.

TIME VS. COST

Research also shows the timing and cost effectiveness of implementing the following three types of change process or method could determine the success or failure of a change (Figure 4):

- **Anticipatory:** *When organisations look ahead and predict change in advance* – i.e.: anticipating the need for change. This is the most difficult of the three approaches to start and finish due to difficulty in sensing future threats and opportunities or what unpredictable course they may take. Unknown return on investments is also a major reason why organisations avoid this process. However, if executed correctly, this change tactic can present the greatest potential benefits and lowest cost to a firm, and when change involves steep and ongoing learning, then the sooner a firm starts changing, the greater will be the firm's advantage over the 'slower-to-change' competitors.
- **Reactive:** *When organisations react to the obvious signs and signals that change is needed* – i.e.: by observing customers, competitors, shareholders, employees, etc. This seems to be the most common approach. It is slightly easier to get underway than the 'Anticipatory' change and less costly than the 'Crisis' change (below), due to a more certain change opportunity being identified before the organisation's 'survival' is a critical factor in decision-making. Organisations with a reasonable 'agility' to change at short notice can benefit greatly by responding to change as a 'quick second mover' rather than a 'slow first mover'.
- **Crisis:** *When signs and signals to change have multiplied and intensified to the point where the organisation no longer can deny them* – i.e.: where the need or opportunity for change has been ignored for too long, and where competitors have already begun to change. The longer an organisation ignores this need or opportunity for change, the less chance of survival and competitive edge. Although this type of change is the easiest, it usually costs money, shareholder value, customer value, and jobs.

Figure 4: Difficulty vs. Cost of Change



Adapted from (Black J. S. and Gregersen H. B. 2002)

CHANGE METHODS

Changing the culture of an organisation and its members takes time. That is because it is a slow process for people in existing or newly established 'social systems' to develop a new set of common held beliefs, attitudes and values (Williams A., Dobson P. et al. 1993). Today's industry organisations are using a wide variety of mechanisms in an attempt to change their culture. The identification of the aforementioned 'crisis' and 'opportunity' factors, for example, are echoed in (Whyte J.

2002), stating there are two major methods to create the need for change – i.e.: motivating people to change:

- When they are confronted with real or perceived **threats** (e.g. job security, increasing competition, etc), which in turn motivate short-term behaviours.
- Through real or perceived **opportunities** (e.g. improved profitability, greater productivity, increased employee development, etc), which in turn motivate long-term behaviour within an organisation.

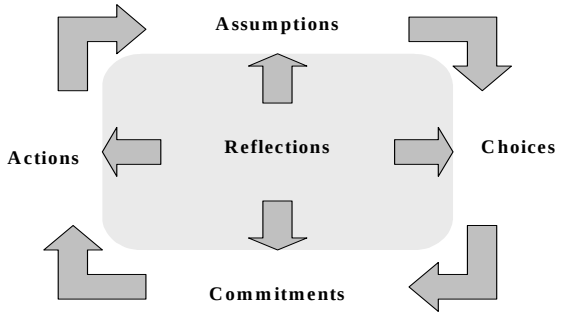
Importantly, the real or perceived threats and opportunities will vary from organisation to organisation, where certain key threats and opportunities are better or worse for one but not the other. Further investigations identified a number of alternate key approaches of changing the culture of an organisation (see Guiding Principles).

CHANGE PROCESSES

Investigations identified a number of analytical frameworks used to describe the process of culture change, including:

- **Change Process Model:** enabling organisations to facilitate substantial change and improved implementation via five critical activities, which in turn help ensure long-term effects:
  - Identifying Assumptions: Assumptions can be considered as the '*taken for granted'* beliefs that individuals have about reality, which guide their actions and are to be isolated and fully understood before an organisation will advance and accept any change.
  - Analysing Choices: This includes examining how decisions are made, who participates in the decision-making process, what criteria are used, and what consequences follow the choices made.
  - Making Commitments: Requires choosing between two or more desirable outcomes. Leaders and their employees must then determine which of the positive outcomes they desire most and which they are willing to allocate financial and human recourses over a lengthy period.
  - Selecting Appropriate Action: Where organisations take definite actions to help satisfy their assumptions, choices and commitments.
  - Engaging Critical Reflection: Where organisations attempt to understand why they made certain decisions, but perhaps more importantly, how to improve upon that action (Figure 5).

Figure 5: Change Process Model



(Gilley J. W. and Maycunich A. 2000)

- **Force Field Model**: Based on early 1950's research into changing behaviours of individuals and social systems, (Williams A., Dobson P. et al. 1993) elaborated on

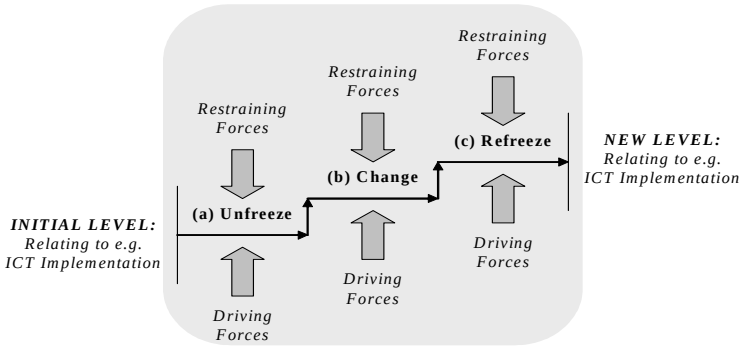
a model portraying two sets of forces (driving and restraining) to help bring about change. Firstly, one is encouraged to identify the various forces impending on the change 'target' (e.g.: implementing an innovative ICT solution or process); secondly, one is encouraged to consider the relative strengths of these forces, and finally it helps one explore alternate strategies to 'modify' these forces (Table 1).

Table 1: Forces of Change

DRIVING FORCES (eg)	RESTRAINING FORCES (eg)
Change at the top	Career-based organisation
Powerful external influence	Low turnover
Powerful leader	Stable environment
Crisis or opportunity	Lack of clear authority
Acceptance of need to change	Blindness to the need to change

- **Three-Stage Model**: Again based on early 1950's research and elaborated on by (Williams A., Dobson P. et al. 1993) and (Schein E. H. 1997), is yet another useful and 'revolutionary' mechanism in bringing about change in culture. Achieved by firstly, 'unfreezing' existing forces, secondly, introduce change (geared to re-establishing the 'equilibrium of forces') and finally, to 'refreeze' the new situation (Figure 6).

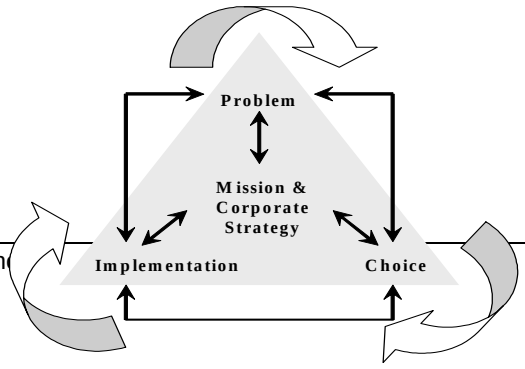
Figure 6: Three-Stage Model



Adapted from (Williams A., Dobson P. et al. 1993) and (Schein E. H. 1997)

- **Decision Making Model**: Described as a common and rational tool used to encapsulate the various stages management teams go through in solving organisational problems or in developing new opportunities in a change process (Figure 7) (Williams A., Dobson P. et al. 1993).

Figure 7: Decision Making Model



(Williams A., Dobson P. et al. 1993)

Due to their very simplicity, the above change models / processes can be applied to a wide range of applications, whether at a group, team, individual or organisational level, and highlight the importance of a number of considerations in managing change.

GUIDING PRINCIPLES

Supporting the research aims and objectives, and as a major deliverable for the Construction Innovation 2001-008-C Research Project, the research team identified - via an extensive literature investigation – 24 'general' 'Culture Change Guiding Principles'. These principles are meant to introduce stakeholders and change leaders to the underlying need to transform the AEC industry's deeply embedded culture and resistive nature to technologically driven change, as well as provide a 'preliminary guide' on how to adopt a more technology and culture driven change 'philosophy' (Table 2).

Table 2: Culture Change Guiding Principles

24 GENERAL CULTURE CHANGE GUIDING PRINCIPLES		
#	OUTLINE	RECOMMENDATION
CC1	**Harmonise Attitudes, Values and Behaviour**	If member attitudes, values and behaviour are in harmony, then a stronger and effective culture is likely to result, where members are committed to the overall change, goals and methods of the organisation, group or team *(Williams A., Dobson P. et al. 1993)*.
CC2	**Understand the 'Role' of Culture**	To make industry organisations, groups and project teams more efficient and effective, one must better understand the role that culture plays within them *(Williams A., Dobson P. et al. 1993) (Schein E. H. 1997).*
CC3	**'Culture' is Never 'Singular' Always 'Plural'**	Attempts to change the 'whole' culture of an organisation must be abandoned, because every culture is made up of a whole range of mentalities and sub-cultures, all of them different, and at different stages of development *(Bate P. 1996).*
CC4	**Identify the Need for Change**	It is import for organisations, groups and teams to realise and create a 'need' for change, before the act of change can take place *(Black J. S. and Gregersen H. B. 2002).*
CC5	**Motivate People**	People are 'motivated' to change when they are confronted with

		real or perceived 'threats' and/or 'opportunities' *(Whyte J. 2002).*
CC6	**Suitable Change Strategy**	To ensure successful change in culture, a suitable change strategy needs to be identified and properly implemented and managed, which in turn can promote a new business strategy *(Williams A., Dobson P. et al. 1993; Bate P. 1996; Schein E. H. 1999).*
CC7	**People and Places**	People in key positions may need to be changed, moved or rotated to ensure successful change in culture within an organisation *(Williams A., Dobson P. et al. 1993)*.
CC8	**People's Beliefs, Attitudes and Values**	To ensure successful change in culture, individual beliefs, attitudes and values may need to be altered by applying one or more suitable change methods *(Williams A., Dobson P. et al. 1993)*.
CC9	**Structures, Systems and Technology**	An organisation's existing communication network may entail restructuring, and require the implementation of an improved reward, appraisal, monitoring, budgeting and/or control systems to ensure successful change in culture *(Williams A., Dobson P. et al. 1993)*.
CC10	**Corporate Image**	Promote an improved corporate image to help develop positive attitudes between both customers and staff, which in turn will enhance overall commitment towards the organisation *(Williams A., Dobson P. et al. 1993)*.
CC11	**Invest in People**	To ensure successful change in culture, organisations need to improve their attitude and performance towards respecting and recruiting their people in order to retain their best talent *(Rethinking Construction 2000) (Linowes J.G. 1999).*
CC12	**Create a Feeling of 'Shared Ownership'**	Employee participation is essential to ensure increased commitment and 'feeling of ownership' towards the implementation of a culture change process *(Baines A. 1998)*.
CC13	**Suitable Culture Change Process**	To ensure successful change in culture within an organisation, a suitable change process needs to be identified, properly implemented and managed *(Lewis P. and Thornhill A. 1994).*
CC14	**Timing of Change**	Timing and cost effectiveness of implementing a change process or method in an organisation determines the success or failure of change *(Black J. S. and Gregersen H. B. 2002).*
CC15	**'Align' technology with people**	Understanding the 'interconnections' between technology and people (culture) is essential during the implementation of a technologically driven culture change process. This can be achieved by: (a) designing the technology to fit the organisation's current structure and culture, or by (b) reshaping the organisational structure (processes) and its culture (people) to fit the demands of the new technology *(Cabrera A., Cabrera E.F. et al. 2001).*
CC16	**Promoting an 'Electronic' Culture**	Organisations need to investigate and implement a suitable 'transition strategy' to help ensure a technological driven culture change – i.e.: assisting an organisation in its transition from existing / traditional business operations and processes, to industry required (electronic) operations and processes *(Grenier R. and Metes G. 1995)*.

CC17	**ICT Champion**	An organisation pursuing technological driven advancement or change requires strong support from an ICT champion (preferably senior management within the organisation) to undertake and lead the difficult task of managing its impact upon organisation structures and cultures *(Tantoush T. and Clegg S. 2001).*
CC18	**'Three Cornerstones' of Successfully Implementing Innovative ICT**	Industry organisations are to consider three success factors when implementing ICT: (a) Vision: A durable vision of the change process is required to ensure progress - shared with top management, construction managers, developers and ICT staff. (b) Commitment: Obtain overall commitment from top management, construction and ICT managers (re allocation of financial and human resources). (c) Possibilities: apply a 'migration strategy' that enables ICT staff to balance the ICT strategy with the companies business needs, thereby underwriting the success of the change process *(Myllymaki R. 1997).*
CC19	**ICT Implementation Strategies**	Construction industry executives and management need to consider various ICT implementation strategies, and select the one that best serves the needs of the application and its users *(Paulson B.C. 1995).*
CC20	**Overcome Fear**	The construction industry is to lesson and ultimately remove the fear of 'exploitation' of technology-led innovation *(CRISP 2000).*
CC21	**'Camouflaging' Change**	It is important for implementers of an innovative ICT tool or system, not to 'camouflage' the true nature of a change prior to its implementation – i.e.: not to portray the change as less dramatic and positively beneficial to the employees and the company *(Hughes T., Williams T. et al. 2000) (Kaarst-Brown M.L. and Robey D. 1999).*
CC22	**Promote ICT Adoption Benefits**	The construction industry will increase and strengthen the rate of technological adoption by promoting its benefits, developing and running short courses, establishing industry-wide awards for ICT best practice, and taking relevant action *(Fujitsu Centre 1998).*
CC23	**Continued Training and Education - A Must**	Construction industry organisations need to become learning organisations - attuned to absorbing and using knowledge and providing for lifelong learning *(Foresight 2000) (Kajewski S.L., Weippert A. et al. 2002)*.
CC24	**Enhanced Tertiary Training and Education**	Tertiary education (both undergraduate and postgraduate) is to further develop and support the understanding of how to evaluate and implement technological and cultural change and innovation within construction industry organisations *(CRISP 2000) (Kilby T. 2001)*.

FUTURE RESEARCH

This report provides an overall snapshot of 'general' industry organisation experiences, characteristics and attributes towards implementing a cultural and

technological driven change. It is also part of an in-depth PhD investigation into AEC industry specific organisation and project team member values, attitudes and beliefs, etc. towards a technology driven culture change. This on-going PhD research investigation will further identify and analyse various AEC industry team culture (a) driving and restraining forces; (b) threats and opportunities; whilst (c) considering various proven and innovative change methods / processes (similar to those highlighted in this paper) in order to develop, test, trial and evaluate an effective, easy to use, but more important, AEC industry specific 'Culture Change Framework' that team leaders can strategically implement to help address key cultural issues that challenge the adoption of innovative ICT solutions within project teams. This in turn will help ensure the successful adoption of technologically driven change, and significantly influence and enhance a project team's ability to meet its objectives.

CONCLUSION

Based on the literature provided, initial investigations concur, AEC industry organisations and teams will change only as far and as fast as its collective individuals are willing to change. This is because people are and always will be 'instinctively programmed' to resist any form of change. To change any organisation or team strategically and successfully, one must first attempt to change individual beliefs, attitudes and values (i.e.: culture) before the organisation or team as a whole can benefit (Black J. S. and Gregersen H. B. 2002). Yet, culture is identified as not a sure or stand-alone remedy to achieve, for example, improved organisational performance - described as being '*complex'*, '*multi-levelled*' and '*deeply rooted'* – and a concept that must be observed and analysed at its every level before it can be fully understood or successfully changed and managed (Williams A., Dobson P. et al. 1993; Schein E. H. 1999). Therefore, when examining or attempting to change an existing culture, industry organisations are to keep in mind that 'culture' is never 'singular' and always 'plural'; that every culture is made up of a whole range of mentalities and sub-cultures; all of them different and at different stages of development (Bate P. 1996).

The development of an adaptive and innovative culture is characterised in this paper as one of several critical and mutually reinforcing variables and activities which organisations must implement and manage effectively. In order to achieve this, industry organisations need to define their objectives; decide on how best to achieve them; develop effective tools to evaluate the progress; and finally, learn how to do this against a background of constant change (Williams A., Dobson P. et al. 1993). Further suggesting AEC industry organisations not only manage change, but also develop their collective capabilities in order to turn continuous change into competitive advantage. This, according to (Grenier R. and Metes G. 1995), can be accomplished by letting go of current 'managing change beliefs', and by building an innovative and adaptive culture that can work within a continual change environment. Many organisations decide to change their existing culture based on the need to implement a strategic driven change, due to a certain 'crises' or 'opportunity' being identified – i.e.: many organisations are driven to change due to business demands, not necessarily by the need to change culture. Yet, this change strategy requires a change in organisational objectives, work methods, habits, systems, structures, training, and the way people '*think or do things around here*' (i.e. culture). The successful change in culture can therefore promote a strategic change. However, if not properly implemented and managed, both existing and 'enforced' culture groups may constrain the new change strategy (Williams A., Dobson P. et al. 1993; Bate P. 1996; Schein E. H. 1999).

This paper recognises an increase in the relevance and importance of culture and the need for it to be changed, in turn reinforcing the need for continued efforts in identifying ways for the AEC industry to cope with, and eventually overcome, its resistance to change. The 24 general 'Culture Change Guiding Principles' identified during this investigation is the first of many stages in developing a set of AEC Industry Specific Best Practice Guidelines that will assist industry stakeholders in transforming their deeply embedded and resistive nature to technologically driven change, into a more 'technology adoptive', flexible, and continuously evolving culture.

Finally, by encouraging the use of innovative ICT solutions; identifying practical and effective ways in which people can improve their performance; and by determining improved and strategically driven ways of aligning technology and people (culture) - will undoubtedly help increase the overall knowledge, awareness and skills, of all industry stakeholders in bringing about a much needed change.

"If you are serious about managing culture…
…the biggest danger you face is that you not fully appreciate its depth and power."
(Schein E. H. 1999) p185

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