**THE IMPACT OF ORGANISATIONAL CULTURE ON MEGAPROJECT LEARNING**

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**ABSTRACT**

Megaprojects have long durations and generate a great deal of tacit knowledge. As many important decisions are made in early design phases and involve numerous professionals it is crucial for the organisations to manage knowledge transfer effectively to support the management of uncertainties, complexities and project risks. The focus in this research is knowledge management in an infrastructure project client organisation, engaging with a great number of supply and stakeholder organisations which can contribute their expertise and competence. The potential is greater efficiency in execution and effectiveness in outcome regarding the delivery of benefits in use. In practice, however, lessons learnt are reviewed ad-hoc without real understanding or not reviewed at all. And even if lessons are captured, documented and validated, fragmented and unique nature of megaprojects restricts the assimilation of the lessons learnt by the organisations involved. Knowledge practitioners agree that the great challenge in developing an effective knowledge management system lies in the organisational and cultural aspects. This research introduces the impact of a client’s organisational culture on knowledge transfer in a multibillion-euro national infrastructure megaproject. The concluding remarks seek to establish a relationship between organisational culture and learning environment that facilitate capitalising on expert knowledge.

Keywords: knowledge management, megaproject, large infrastructure projects, organisational culture, organisational learning, stakeholder collaboration.

**INTRODUCTION**

Among other characteristics, megaprojects distinguish themselves from other projects by involvement of a large number of private actors having standards, processes and procedures predetermined by the client organisation, which is often a government or public sector organisation.

For the megaproject to improve collaboration among all stakeholders often with conflicting interests in order to deliver right quality, on the right time and at the right price the risks of repeated mistakes due to wrong decision making should be minimised. Appropriate cultural environment can enable megaproject learning leading to continuous improvement of the ability of the project to meet business goals.

Because of making such a significant contribution to the regional and global economy, developing relevant competence by capitalising on both historic and new “know-how” acquired in past, recently completed and current projects, during the planning stages and for early problem solving is crucial for better performance whether measured as efficiency in execution or effective benefits delivery. Therefore, explicit attention is needed to cultural processes in client organisations for the effective and efficient coordination and cooperation among all the stakeholders involved in megaprojects.

Today, leading companies realise that their competitiveness depends on how fast knowledge and innovations flow through the organisation. Knowledge has become a strategic resource of the organisation, as the basis of competitive advantage. Dissemination and incorporation of lessons learnt into organisational processes can help organisations improve their current and future project delivery (Duffield and Whitty, 2016). Organisations therefore need to understand success and how to replicate it (Flybjerg, 2014). Equally, it is crucial to analyse failures to avoid repeating the mistakes.

Project-based learning, which is mainly “ad hoc”, requires commitment and continuous investment of time and resources yet is also often neglected (Davies and Brady, 2000; Williams, 2008). There are no guidelines on structured ways of analysing projects and retaining lessons learnt for future projects and few for building the practical organisational capabilities and competencies.

Organisational culture plays an important role in motivating and facilitating learning from projects (Principe and Tell, 2001). At the same time, organisational culture is labelled as the one of the most important barriers to knowledge management (KM) and “perhaps the most difficult constraint that knowledge managers must deal with” (Davenport, et al., 1997).

“Organisations learn only through individuals who learn” (Senge, 1990, p. 139). Organisations that implement large-scale infrastructure projects need to build capability by understanding their cultural environment and perspectives of employees regarding enablers and inhibitors to knowledge transfer (Davies and Brady, 2000).

The objective of this research is to understand the cultural barriers to learning in the client organisation, from projects with its complex multi-organisational composition that coordinates implementation. The empirical focus is a multibillion-euro (c. €5bn) infrastructure programme or megaproject comprising a series of sub-projects. Analysis is derived from a series of interviews conducted across the client organisation with using a cognitive mapping technique. It helped reveal the key inhibitors to creating a knowledge sharing culture and the areas that can be positively influenced by cultural changes.

**LITERATURE REVIEW**

Lessons learnt from projects have received much attention among researchers and practitioners (Hartmann and Doree, 2014). Today, knowledge is considered as one of the most important assets in the economy invoking the idea that knowledge is “perhaps even the only-source of competitive advantage’’ (Drucker, 1998). At the same time, the construction industry is often criticised for slow learning or not learning at all (Hertogh et al., 2008; Flybjerg et al., 2002). The question remains as to how the organisation can overcome some of the main obstacles to knowledge sharing in individual, cultural and technological domains to enhance knowledge sharing culture in the organisation and among the key stakeholders. This is particularly critical where knowledge is “sticky” and the tacit form is predominant due to the non-repetitive nature and context of much project work (Kelly et al., 2013; Szulanski, 2000).

Establishing a KM system will not automatically generate a learning environment or lead to greater understanding. Large-scale infrastructure programmes and projects are essentially a human enterprise and that cannot be understood solely in terms of technical relations among components. The organisations need to focus KM initiatives on people, and not on the collection of data, because knowledge resides in the people (Churchman, 1972; Davison and Blackman, 2005; Rubenstein-Montano et al. 2001).

It is important to find the most appropriate for the company way to reinforce the necessary behaviours around knowledge use. That will eventually lead to a long-term cultural change. New practices will change behaviours that over time will change norms (De Long, 1997). These changes will affect values on the long run which in its turn will significantly contribute to changes in organisational culture. Organisational culture plays a big role in decision making regarding knowledge creation, capture, share, access and application.

A review of different frameworks on KM (Heisig, 2002; Nonaka and Takeuchi, 1995; Wiig, 2000) was undertaken to identify the most suitable approach given the challenges revealed in the organisation under scrutiny. The Knowledge Flow Framework by American Productivity and Quality Centre (APQC) has been found to be the most suitable for structuring the ideas and recommendations by the interviewees as it reflects the most important soft and hard factors that contribute to capturing and sharing knowledge.



Figure 1 **Knowledge Flow Process Framework**

*Source: APQC, 2014*

The Knowledge Flow Process diagram (Figure 1) is a seven-step cycle describing how knowledge is created, identified, collected, reviewed, shared, accessed, and used within organisations (APQC, 2014). People, process, content and technology, the soft and hard key knowledge management elements emphasised by the framework, reflect the most important factors contributing to capturing and sharing knowledge. All four elements are need to be balanced to ensure that the full benefits of knowledge sharing are exploited. However, the role of people in knowledge management is one of the most important and complex elements to work with. Behaviour of people is often influenced by their beliefs, different values and attitudes. Organisational culture, existing roles and routines are among the factors that affect decisions regarding management in large projects.

**METHODOLOGY AND METHODS**

In order to objectively examine the cultural barriers to learning within project-based organisations, we used qualitative approach. A case study approach is adopted with an action research element. The study is supported and funded by Innovate UK via a 2-year Knowledge Transfer Partnership programme.

This programme started by mapping the mental models of the team responsible for coordination of multibillion-euro megaproject to learn about their perspectives regarding enablers and inhibitors to knowledge sharing and to understand the cultural environment, in which people identify, create and share knowledge.

A case study approach has been defined as an empirical inquiry that investigates a phenomenon within its real-life context, when the multiple sources of evidence are used and when the boundaries between phenomenon and context cannot be clearly seen (Yin, 1984). Following case study research guidelines, the most important sources of the information were the interviews (Yin, 1984).

Stakeholder collaboration in complex settings among other cognitive limitations is affected by multiple perspectives and bounded rationality. Thus, it is very important to have the tools that allow full representation of all the perspectives and views. Soft interpretive organisational research (OR) approaches and techniques recognise the importance of human perceptions, interpretations and worldviews while dealing with subjectivity and uncertainty (Rosenhead and Mingers, 2001).

For this research, Cognitive Mapping (CM), one of the problem-structuring tools of soft OR and System Dynamics Causal Loops Diagrams (CLD) were applied. CM is a visual mapping technique that supports elicitation of mental models and generation of creative ideas using the language participants used to present their viewpoint and make their argumentation (Ackermann and Eden, 2010). The formal basis for cognitive maps derives from Kelly’s (1995) personal construct theory which proposes an understanding of how people ‘‘make sense of’’ their world by seeking to manage and control it (Eden, 2004). CM is designed to support decision makers in dealing with the complexity inherent in organisational problem findings. Cognitive maps however, do not demonstrate demonstrate feedback processes

and time delays. CLDs were used to see dynamic behavior of the system.

Data was solicited from 12 members of megaproject management team of the client organisation. Prior engagement was a feature of the action research, although the level varied. This provided valuable context together with organisational artefacts such as documentation. The semi-structured one-to-one interviews were conducted over 1-2 hour periods. The interview scripts were then translated into the language of CM. The next step was to validate the content of individual cognitive maps by sharing them with interviewees during follow-up interviews. The individual maps then were merged into a collective map that was analysed using Decision Explorer software[[2]](#footnote-2).

**FINDINGS AND DISCUSSION**

The cultural issues were derived from analysis of the collective cognitive map - see Figure 2. A comprehensive look at the map revealed some of the main obstacles to building a learning environment in the client organisation. They are categorised into three main domains:

1. Organisational/cultural, i.e. *lack of clear and structured procedures for capturing and sharing lessons learnt*,
2. Individual, i.e. *lack of motivation to share knowledge,*
3. Technical, i.e. *knowledge repositories are neither structured nor centralised*.

These domains also represent barriers that are interrelated and any one of them, unless recognised and removed, can hold the organisation back from enhancing knowledge sharing culture.

The analysis of the map helped identify the key strategic options framed to achieve the goals “improve organisational performance” and “build a strong megaproject management team” (nodes 10 and 91, Figure 2). Domain and centrality analyses of the map revealed the key strategic actions necessary to achieve the goals - see Table 1.

In large and long-term complex projects it is very common to solve similar problems from scratch over and over again because of not sharing already developed and tested solutions. Based on interviewees’ perceptions the concepts “share knowledge” and “share best practice” are among the key issues mentioned by the management team.

The node “change the organisational culture” has the second highest scores. Culture, as an organisational mental model plays crucial role in effectiveness of KM and sharing. Based on the map, it directly affects organisational performance, top-down communication and employees’ comfort and security at work.

****Figure 5**NEPT Cognitive Map** (size of the model: 462 concepts and 539 causal links)

|  |  |
| --- | --- |
| **The key strategic directions in descending order** | **The reference** **on the map**  |
|  | share knowledge  | 65 |
|  | change the organisational culture  | 1 |
|  | make the client organisation a better place to work  | 23 |
|  | create a learning environment  | 3 |
|  | retain knowledge in the organisation  | 4 |
|  | share best practice  | 40 |
|  | continue organising conferences  | 128 |
|  | create more comfort and security at work | 58 |
|  | improve top-down communication | 24 |
|  | create and maintain an effective knowledge repository  | 123 |

Table 1 **Domain and centrality analysis of the map**

Loop analysis of the cognitive map helps reveal causal feedback processes as perceived by the interviewees The loops were modified in order to build SD CLD with the help of Vensim[[3]](#footnote-3) software (Figure 3). It demonstrates that the changes in organisational culture directly affect other strategic directions listed in the Table 1. From the perspectives of the respondents positive changes in the organisational culture can improve top-down communication, reduce blame and improve core behaviours.



Figure 3 **Causal Loop Diagram***[[4]](#footnote-4)*

Better top-down communication may help reduce top-down blame, which may positively affect core behaviours and facilitate more transparency in the organisation, which will eventually contribute to improvement of organisational culture.

The loops demonstrate also that there is a concern regarding employees’ comfort and security at work which affects staff motivation, loyalty and may eventually lead to staff turnover. Staff motivation also promotes creativity and innovation in the organisation. High turnover rate affects knowledge retention, which in its turn influences knowledge sharing. Retained organisational knowledge contributes to organisational stability which makes it a better place to work.

Deeper analysis of the map showed that the main challenges to knowledge transfer among the key stakeholders are in the cultural domain. Among many other barriers the interviewees mentioned: a) “silo” mentality, b) “blame” culture, c) lack of the environment of mutual trust and understanding among the stakeholders, d) outsourcing knowledge with outsourced projects; e) lack of proper planning, and f) lack of common language within the supply chain.

While each of these issues is not unfamiliar to those researching projects and project organisations, including certain concurrence, the combination as a cultural force and the clarity of actor recognition as emanating from the parent organisations is worthy of attention. Indeed the client organisation proved powerful in setting the tone, norms and conduct in the supply chain (Smyth and Duryan, 2016).

It is extremely difficult to change or transform organisational culture, however, organisations need a paradigm shift from “knowledge is power” to “sharing knowledge is more powerful” (Dalkir, 2005). In order to organise effective collaboration with all the stakeholders of a megaproject it is necessary to elicit their thinking about the problem situation and their ideas about possible solutions. The management should be aware of what is going on at the front line and should address at least some of the issues communicated to them. They need the “time out to hear what people at the bottom think” because staff needs to be “valued and listened to”. The organisations need to build trust in their culture before expecting employees to share their knowledge and expertise without worrying about their competitive advantage.

The KM system implementation requires consideration and planning, especially at the programme front-end and for each sub-project within this megaproject. A KM strategy must be linked to specific business, programme and project objectives and must address work processes that create organisational knowledge. Compliance with company’s business objectives will allow embedding KM activities in daily work processes which in turn will encourage active involvement of employees across the company.

In order to motivate employees communicate and share knowledge and expertise with their colleagues and across supply chain instead of working in “silos", the client organisation should maximize access to knowledge internally and across the megaproject via “improved communication among project managers and engineers” and discipline-based communities of practice led by experts. Best-in-class organisations create communities of practice, use blogs, yellow pages, upload success stories, how-to-videos on a corporate ‘WiKi’ and create knowledge maps (APQC, 2014). Communities of practice are one of the most powerful and efficient ways to facilitate innovation and knowledge sharing among likeminded individuals and to welcome new members into the organisation (Dalkir, 2005). This is echoed in the project literature (Bresnen et al., 2003). Communities of practice can be mobilized quickly and become dynamic using WiKis and social media in contrast the current low levels of engagement found with more traditional IT platforms and knowledge software packages.

It is generally accepted that in order to facilitate knowledge sharing an organisation needs to sustain a blame-free culture where calculated risk of failures is acceptable and expected, creative solutions are always encouraged and rewarded, and people are given time and resources to try new things.

The interviewees mentioned that the lessons learnt are captured in an ad-hoc way at the close-out project meetings. There should be a dedicated team in the client organisation that will follow a structured agenda and will hold review sessions at the end of each milestone of a megaproject. The team should study what worked well, what didn’t and why, what should be changed. The key lessons learnt after each project should be documented and critical lessons learnt should be disseminated through established communities of practice of all organisations involved.

The knowledge sharing should become a part of a daily routine and be regarded as a natural norm on a job. Employees should be able to contribute content and knowledge through the same applications they use for other duties.

The respondents emphasized the importance of sound planning and keeping it dynamic. It is crucial to involve the design groups at early stages of planning before it is too late to influence the targets. Their early involvement will help them understand where they can add value. Thus lessons learnt have strategic input and are not confined to tactical responses during execution, suggesting a layered and structured approach to the forms of lessons and knowledge for sharing and application, which has been insufficiently addressed to date, yet beyond the scope of the reporting here.

The complexity of the megaprojects is increased by the fact that there are many different stakeholders, including owners, managers, sponsors, and local communities, and they all have different perspectives. The lack of common language with organisations involved in megaproject can cause big problems for knowledge transfer. It is crucial to establish a knowledge taxonomy and knowledge dictionary for knowledge content. The client organisation must set up a knowledge repository, comprising project and supplier information, lessons learnt and pre-bid material.

**CONCLUSION**

Due to their complexity, high level of resource uncertainty and political pressure, organisational learning in megaprojects is essential. One of the key factors for success can be learning from already established and proven practices, instead of trying to reinvent the wheel.

It is important to transfer knowledge within and between projects to be aware about good practices to avoid unnecessary mistakes and minimize the risk of time and cost overruns. In early design organisations of megaprojects socially oriented practices and routines should be developed in addition to formal processes and documentation.

Culture creates norms regarding what is ‘right’ and ‘wrong’ in the organisation and influences how people communicate and share knowledge. The importance of a knowledge sharing culture as an enabler for the creation and transfer of knowledge should not be underestimated.

The objectives of this research were to study how learning from projects is transferred around the organisation that manages a €5bn euro infrastructure programme and to identify the role culture plays in transferring lessons learnt among multiple projects. The findings highlight the importance of understanding cultural barriers to sharing and reusing lessons learnt in megaprojects.

CM technique stimulated new thoughts and ideas around the key issues and helped merging diverse viewpoints into a single representation. The maps has helped reaching a consensus and managing disagreements during the focus group discussions. Their analysis revealed the key areas of concern and possible solutions as perceived by the respondents.

The megaproject management client team emphasised the importance of having dedicated staff to administer and manage knowledge creation, revision, storage and dissemination. The fragmented and unique nature of the megaproject managed by the organisation under the scrutiny makes it difficult to form a culture of continuous knowledge flowing system. At the end of each project, employees are often moved on to the next project before the analysis of lessons. This limits the flow of information, creates barriers to learning and often leads to wastage and poor performance. For the organisation under scrutiny to capitalise on the “know-how” acquired in previous and current projects the company needs to look at managing knowledge more holistically and purposefully combining techniques from executive management, human resource management, KM, content management, and the technical disciplines themselves. The organisation does not have to reinvent the wheel every time it starts a project if it incorporates lessons learnt into organisational standards and processes and disseminates them among all stakeholders involved.

Therefore, the findings show organisational barriers that are essentially cultural. The cultural issues and specific norms need to be addressed in order to build the capabilities at organisational and project levels cited as necessary by others (e.g. Davies and Brady, 2000; Principe and Tell, 2001; Brady and Davies, 2004). Communities of practice around knowledge are found to facilitate learning in line with Bresnen and his colleagues (2003). The detailed analysis of cultural practices provides an additional insight derived from cognitive mapping to learning on megaprojects. This analysis is the critical first step in developing an intervention to align the culture of a client organisation in support of effective knowledge transfer among all the actors to support overall business goal of a megaproject.

**REFERENCES**

Ackermann, F., Eden, C. (2010), *Strategic Options Development and Analysis.* In: M. Reynolds, & S. Holwell (Eds.), Systems Approaches to Managing Change: A Practical Guide (pp. 135-190), London, UK: Springer.

APQC Best Practices Report (2013). Transferring and Applying Critical Knowledge. *Retrieved from:* <https://www.apqc.org/knowledge-base/documents/transferring-and-applying-critical-knowledge-best-practices-report>

APQC Report, (2014). *Exploring APQC's Knowledge Flow Process.* *Retrieved from:* <https://www.apqc.org/knowledge-base/collections/exploring-apqcs-knowledge-flow-process-collection>

Brady, T. and Davies, A. (2004). Building project capabilities: from exploratory to exploitative learning. *Organisation Studies*, 25 (9), 1601-1621.

Bresnen, M., Edelman, L., Newell, S., Scarbrough, H., & Swan, J. (2003). Social practices and the management of knowledge in project environments. *International journal of project management*, 21 (3), 157-166.

Churchman, C. W. (1972). *The Design of Inquiring System: Basic Concepts of Systems and*

*Organisation.* New York: Basic Books.

Dalkir, K. (2005). *Knowledge Management in Theory and Practice.* Elsevier Butter worth–Heinemann, Oxford, UK.

Davies, A. and Brady, T. (2000). Organisational capabilities and learning in complex product systems: Towards repeatable solutions. Research Policy, 29, 931–953.

Davenport, T. H., De Long, D. W., Beers, M. C. (1997). *Building Successful Knowledge Management Projects.* Center for Business Innovation. Ernst & Young LLP.

Davison, G., & Blackman, D. (2005). The Role of Mental Models in the Development of Knowledge. *International Journal of Organisational Behaviour,* 10 (6), 757-769.

De Long, D (1997). Building the knowledge-based organisation. How culture drives knowledge behaviors. Working Paper. Ernst & Young’s Centre for Business Innovation, Boston.

Drucker, P. (1998). *Managing in a Time of Great Change.* Penguin Putnam, NY.

Duffield, S. and Whitty, S. (2016). How to apply the Systemic Lessons Learned Knowledge Model to wire an organisation for the capability of storytelling. *International Journal of Project Management,* 34, 429-443.

Eden, C. (2004). Analysing cognitive maps to help structure issues or problems. European Journal of Operational Research, 159, 673–686.

Flyvbjerg, B., Skamris Holm, M. and Buhl, S. (2002). Underestimating costs in public works

projects – Error or lie? *Journal of the American Planning Association*, 68(3), 279-295.

Flyberg, B. (2014). What You Should Know About Megaprojects and Why: An Overview. *Project Management Journal,* 45 (2) 6-19.

Hartmann, A., Dorée, A. (2014). Learning between projects: More than sending messages in bottles. *International Journal of Project Management*, 33, 341–351.

Heisig, P. (2002). *European Guide to Good Practice in Knowledge Management: Frameworks on Knowledge Management.* Head of Competence Center Knowledge Management, Berlin, Germany.

Hertogh, M., Baker, S., Staal-Ong, P.L. and Westerveld, E. (2008). *Managing Large Infrastructure Projects: Research on Best Practices and Lessons Learnt in Large Infrastructure Projects in Europe*. Baarn: AT Osborne BV.

Kelly, G. A. (1955/1991). *The psychology of personal constructs*. New York: Norton (Reprinted by Routledge, London, 1991).

Lane, D. (1994). With a little help from our friends: how system dynamics and soft OR can learn from each other*. System Dynamics Review*, 10(2-3), 102-134.

Nonaka, I. & Takeuchi, H. (1995). *The knowledge-creating company.* New York: Oxford University Press;

Prencipe, A. and Tell, F. (2001). Inter-project learning: processes and outcomes of knowledge codification in project-based firms. *Research Policy*, 30(9), 1373-1394.

Rosenhead, J., & Mingers, J. (Eds). (2001). *Rational Analysis for a Problematic World Revisited.* 2nd ed. Chicherster, UK: Wiley.

Rubenstein-Montano, B., Liebowitz, J., Buchwalter, J., McCaw, D., Newman, B., and Rebeck, K. (2001). A Systems Thinking Framework for Knowledge Management. *Decision Support Systems,* 31(1), 5-16.

Senge, P. (1990). *The fifth discipline: The art and practice of the learning organisation*. New York: Bantam Doubleday, Dell Publishing Group, Inc.

Smyth, H. J. and Duryan, M. (2016). *Knowledge Application in the Supply Network of Infrastructure Programme Management*, Cobra 2016, 19th-22nd September, Toronto.

Szulanski, G. (2000). The process of knowledge transfer: a diachronic analysis of stickiness. *Organizational Behavior and Human Decision Processes*, 82, 9-27.

Wiig, K. M. (2000). Knowledge Management; An emerging discipline rooted in a long history. In C. Despres and D. Chauvel (eds.), *Knowledge Horizons: The Present and Promise of Knowledge Management. Boston: Butterworth-Heinemann,* pp. 3-26.

Williams, T. (2008). How do organisations learn lessons from projects—and do they? *IEEE Trans. Engineering Management*. 55, 248–266.

Williams, T., Ackermann, F., Eden, C. and Howick, S. (2001). *In, Project Management Institute Annual Symposium, Nashville, Tenessee.*

Yin, R. K. (1984). *Case study research: Design and methods.* Beverly Hills, CA: SAGE Publications, Inc.

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2. http://www.banxia.com, Banxia Software Ltd., Registered in England [↑](#footnote-ref-2)
3. http://vensim.com/ [↑](#footnote-ref-3)
4. Arrows denote the direction of causality between a cause and its effect, and the signs “**+**” and “**-**” at the arrowhead represent “same” and “opposite” directions of causality. The “**=**” sign denotes time delays. [↑](#footnote-ref-4)