PROJECT HISTORIES AND PROJECT LEARNING - A KNOWLEDGE MANAGEMENT CHALLENGE

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With the advent of information and communication technologies (ICT), some construction organisations have endeavoured to develop and maintain project history systems. These are generally repositories that contain the data from previous projects. However, they are often poorly designed, implemented, managed and applied. We argue in this paper that a key reason for this situation is lack of senior management support and a need for the proper integration of project histories into a company's overall strategy and vision. However, recent interest in organisational learning and knowledge management appears to have a positive impact upon management practice in the construction industry. Management in major companies are now incorporating these emerging business philosophies into their overall strategy and vision. With the adoption of knowledge management strategies into construction companies, it will be possible to access project histories and conduct project learning in an efficient way. This paper provides an interpretative investigation of the issues concerning project histories for one leading construction company in Australia. A systems approach is used in this study as a tool to comprehend the underlying processes and to highlight the related issues.

Keywords: Project Histories, Repositories, Project Learning, Knowledge Management, Learning Organisations

INTRODUCTION

Information and communication technology (ICT) proliferation in the construction industry has encouraged more innovative organisations to develop systems commonly referred to as project histories. These repositories contain detail knowledge deemed important from previous projects. This data, used by personnel involved in project proposals and the tendering for new projects, is developed, refined and provides realistic estimating information. Project management methodologies such as Prince 2 emphasises that the key project completion procedure of project debriefing (or project audit) provides a means of capturing project histories (Bentley, 1997). There is, however, a gap between the perceived value of a project debriefing and its actual achievement. Knowledge and experiences gathered in different projects are not being systematically and successfully integrated into organisational knowledge bases (Schinder and Eppler, 2003).

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PROJECT HISTORIES DEVELOPMENT TECHNIQUES

Where project histories have been captured, the detail that forms part of the project histories is obtained through a variety of debriefing techniques. Schinder and Eppler (2003) have classified these techniques into two groups, process-based methods, and documentation-based methods. However, we could also add tacit knowledge transfer by teams and individuals through effective communities of practice (Jewell and Walker, 2004).

Table 1: Process-based Methods for History Collection
(Schindler and Eppler, 222, 2003)

| Parameter	Method			
	Project Review/Project Audit	Post control	Post-project Appraisal	After Action Review
Time of execution	After project completion or in the course of the project during individual project phases	Exclusively at project's end	Approximately two years after project completion	During work process
Carried out by	Review: moderators respectively auditor Audit: project-external people	Project manager	External post-project appraisal unit (a manager and four assistants), project homework group	Facilitator
Participants	Project team and third parties that are involved into the project	Project manager (inclusion of project team not neglected)	Project team and third parties that are involved into the project	Project team
Purpose	Status classification, early recognition of possible hazards, team-internal focus	Serves as delimitation/in addition to a more formal project end that focuses on the sole improvement of future project's goal conformity	Learning from mistakes, knowledge transfer to third parties	Learning from mistakes, knowledge transfer inside the team
Benefits	Improvement of team discipline, prevention of weak points and validation of strategies	Result is a formal document, which considers the ranges of aims of the project, quantitative goals, milestones, check points and budget goals and Contains an evaluation of the project result as well as a recommendation for future improvements	Best practice generation for large-scale projects, improvement of forecasts and proposals	Immediate reflection of the own doings to improve future actions
Interaction mode	Face to face meetings	Non-cooperative form of recording experiences, analysis of existing project status reports, milestones, checkpoints and budget targets are being compared in order to identify relevant backgrounds of differences between estimated and actual effort	Document analysis, face to-face-meetings	Cooperative team meeting
Codification	Partly in reports, usually no predefined circulation with knowledge transfer as a primary goal (excluding predefined distribution lists)	Partly in reports, usually no predefined circulation with knowledge transfer as a primary goal (excluding predefined distribution lists)	Booklets	Flip charts

The process-based methods illustrated in Table 1 gather lessons-learnt from the completed projects. These are the methods associated with approaches that include: Project Review/Project Audits, Post-Control, Post-Project Appraisal, and After Action Reviews. The documentation-based methods collect project experiences as soon as they occur. Techniques using this approach include: Micro Articles, Learning Histories, and RECALL. Table 2 illustrates the variation between these techniques.

Table 2: Document-based Methods for History Collection
(Schinder and Eppler, 225, 2003)

Parameter	Method		
	Micro Article	Learning Histories	RECALL
Scope	Between half and one page	Between 20 and 100 pages	Several screens
IT-support	Possible but not required, unless multimedia is used	Not required	Mandatory (database interface)
Participants	Not explicitly stated, focus one author	Individuals and teams depending on the process step	individual user
Supported by dedicated roles	Author, reviewer	Learning historian necessary for all process steps	Working group for reviewing
Frequency	On demand, regularly	Maximum once per project: after completion	On demand
Anonymity	No	Yes	No
Embedding/ distribution	Paper-based, databases/intranet	Cases with accompanying workshops	Databases/intranet.

ROLE OF PROJECT LEARNING AND HISTORIES IN ORGANISATION TRANSFORMATION TOWARDS A LEARNING ORGANISATION

The model shown in Figure 1 explains the transformation of the organisation over time by illustrating organisational learning. It shows three transformation stages that are indicative of the continuous transformation process.
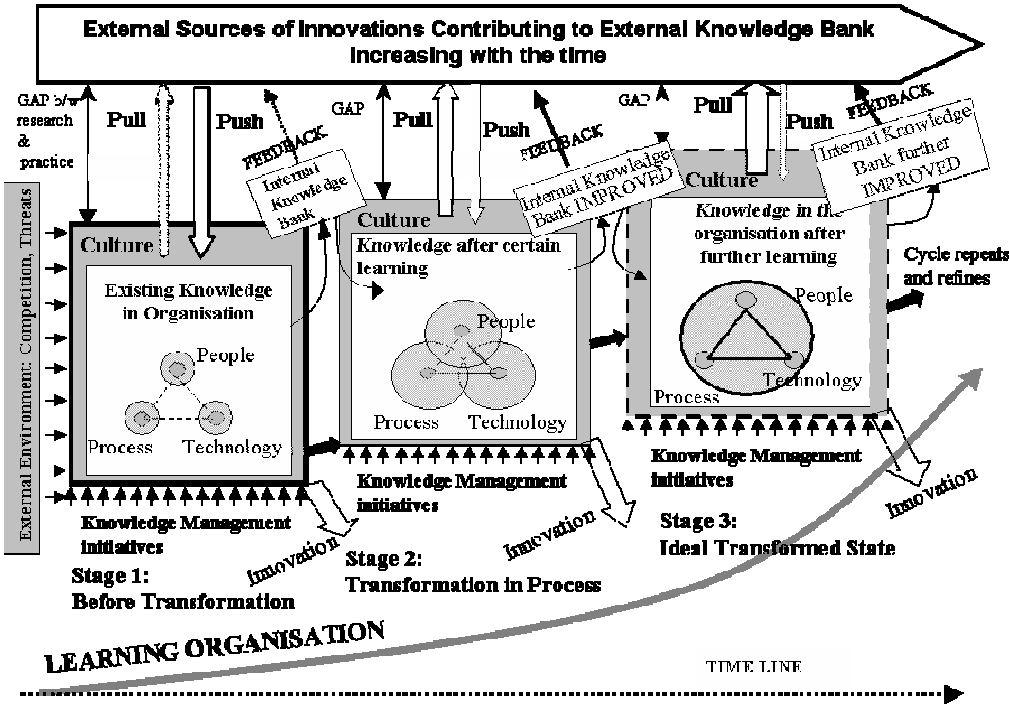
Figure 1: Integrated knowledge management, organisational learning and Innovation model (Maqsood and Finegan, 2003).

The model specifically shows a typical organisation and the sources of knowledge external to it are referred to as an External Knowledge Bank. This knowledge bank or

repository may consist of output from academic institutions and research centres that are dedicated to the production and discussion of technological knowledge. This can take the form of new innovative processes, products and technologies as well as training and educational development of people to utilize these processes. In addition this knowledge bank also consists of other external knowledge that flows as a result of social interaction of the organisation with other organisations in a supply chain. This external knowledge bank increases over time.

An interface is conceptualised in this model to exist between the organisation and external knowledge sources. This interface operates under the influence of two main forces - visualized as "pulling" and "pushing" forces. Push is exerted from the external knowledge sources towards organisation to adopt new knowledge, whereas pull refers to the drawing-in force exerted by the organisation to obtain the knowledge from the sources external to it. The distance between the external knowledge source and the organisations is an indication of gaps that exists between external knowledge and its adoption by the organisation. An example is the gap that exists between academic research and actual practice in industry.

The important aspect that this model depicts is the role that an internal knowledge bank plays in transforming the organisation. The model makes the assertion that a knowledge management initiative and implementation in the organisation would help develop an 'internal knowledge bank'. This in turn will promote an organisational transformation to progress up the learning curve. At the initial stage of the model, this internal knowledge bank is very weak and less detailed. However, the model assumes that it will improve over time. This internal knowledge bank can include project histories as an important asset.

SOFT SYSTEMS METHODOLOGY AS A SYSTEMS APPROACH

Systems thinking, holistic approaches, and in particular, soft systems approaches are strongly recommended when faced with poorly defined and complex problems in knowledge management (Cacioppe, 2000; Elliman and Orange, 2000; Yeoman *et al.,* 2000; Ballard, 2002; Gao *et al.,* 2002; Gustafsson, 2002; Rose, 2002; Venters *et al.,* 2002a, 2002b) Recommending the use of Soft Systems Methodology (SSM), Barry and Fourie McIntosh (2001) describe it as incorporating systems thinking and systems concepts into an approach that offers the opportunity for incremental improvement that is essential to address difficult problems. SSM provides a framework for involving all stakeholders in a continual learning cycle, and forms a theoretical foundation for thinking about, analysing and responding to complex problems.

What is SSM?
Soft systems thinking is an interpretive approach strongly influenced by Vickers' (1968: 59, 176) description of the importance of appreciative systems in dealing with human complexity. Checkland (1999), and Checkland and Scholes (1990) have attempted to transform these ideas from systems theory into a practical methodology that is called Soft Systems Methodology (SSM).

SSM concepts are based on practical application and experience in a wide variety of complex managerial systems. The methodology is designed to allow the human element of such systems, which is typically unstructured and poorly defined, to be incorporated into system design work. It may be used to analyse any problem or situation, but it is most appropriate where the problem "cannot be formulated as a search for an efficient means of achieving a defined end; a problem in which ends, goals, purposes are themselves problematic" (Checkland, 1999: 316). SSM, in its

idealised form, is described as a logical sequence of seven steps (Checkland, 1999, :162-183) illustrated in Figure 2. However the sequence of seven steps is not imposed upon the practitioner. A study can commence at any stage, with iteration and backtracking as essential components. Checkland (1999, 163) observes that

> "… in fact the most effective users of the methodology have been able to use it as a framework into which to place purposeful activity during a systems study, rather than as a cookery book recipe."
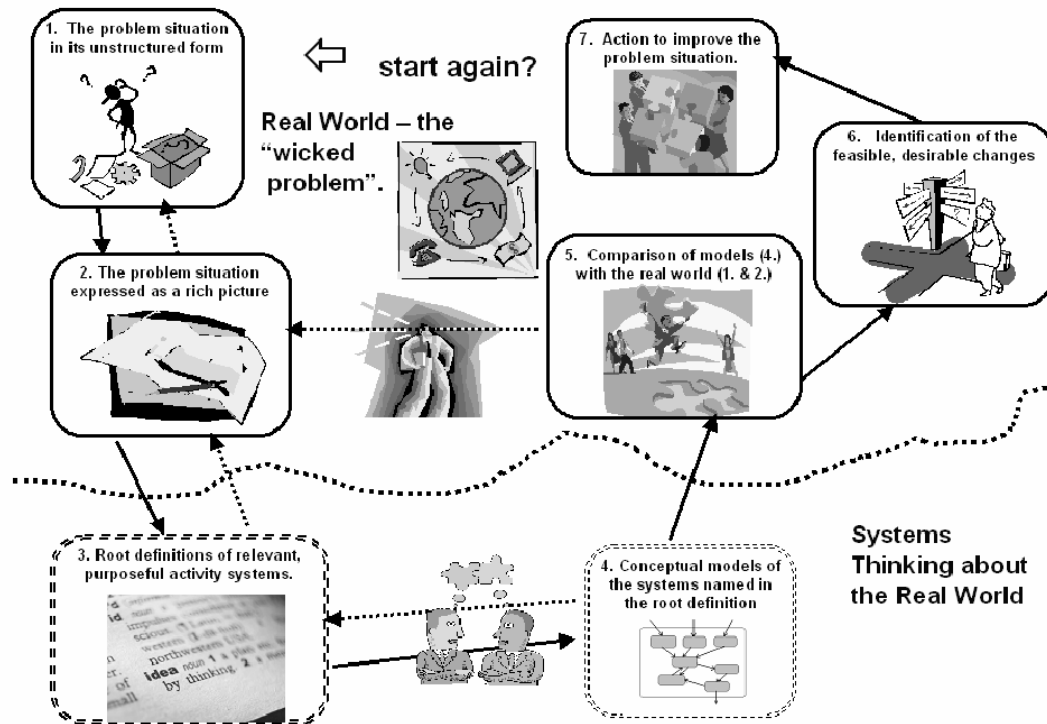

Figure 2: Summary of SSM as a seven-stage process (Finegan, 2003)

SSM encourages investigators to view organisations from a cultural perspective. Therefore the component parts that are human beings determine the essential characteristics of organisations. These "people components" can attribute meaning to their situation and define their own purpose for the organisation.
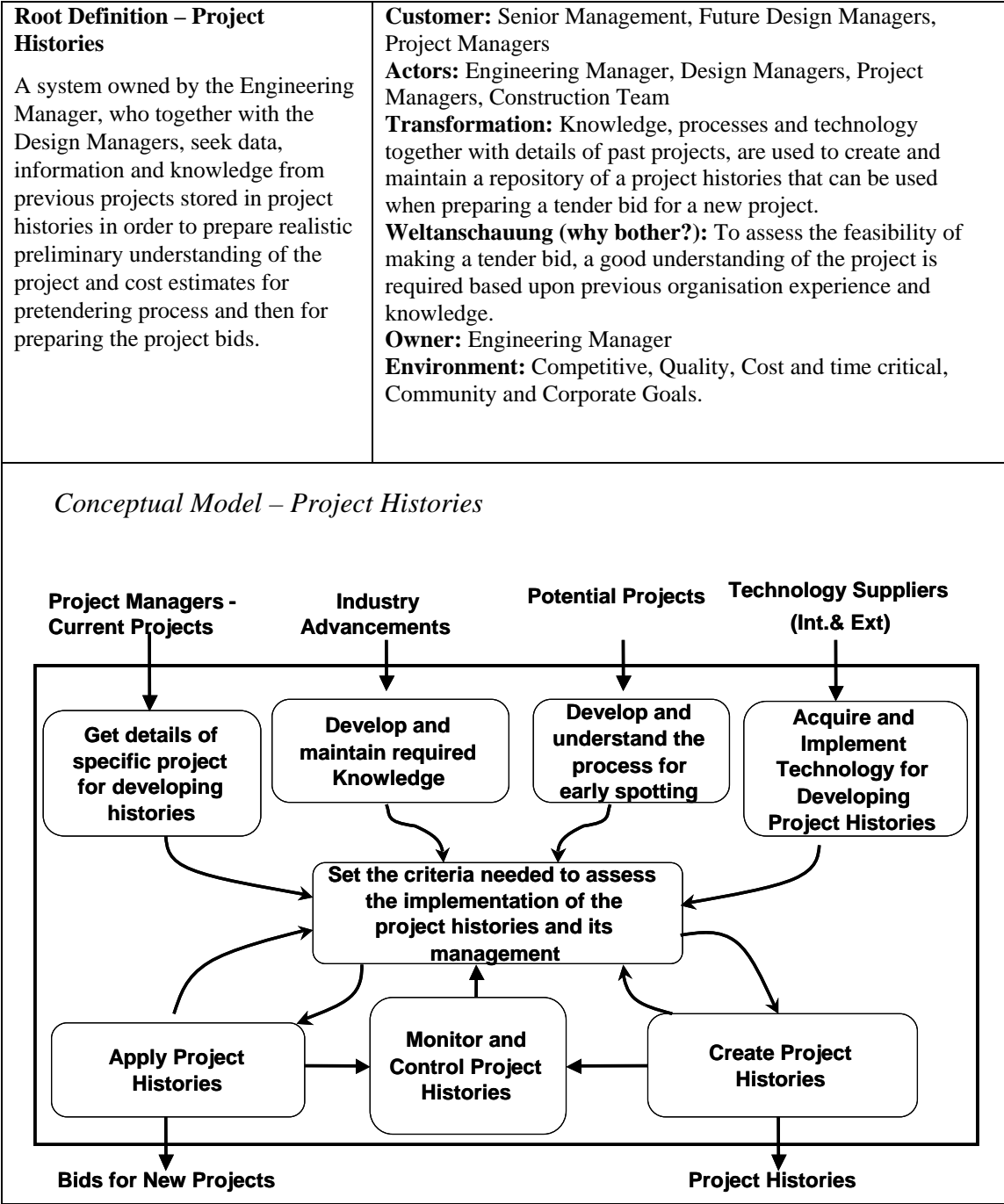
Developing Project histories case study using SSM

Research conducted by Walker *et al.* (2003) forms the basis of this case study in a major Australian construction engineering company with an annual turnover in excess of AUD-1billion. From a study of the process of "pre-tendering", it distinctly emerges that the pre-tendering team places a very high value on the use of project histories. Nevertheless, the effective use of project histories has been plagued with various issues that restrict the team's effective use of them. This led to the further investigation of the issues associated with the utilisation of the project histories. One of the initial participants - the Engineering Manager - who possessed an avid interest in the development and use of the project histories was interviewed by the research team in greater depth. The response is represented in the rich picture shown in Figure 3. This rich picture forms the basis for developing the Root Definition, CATWOE, and Conceptual Model more fully explained in Figure 4.
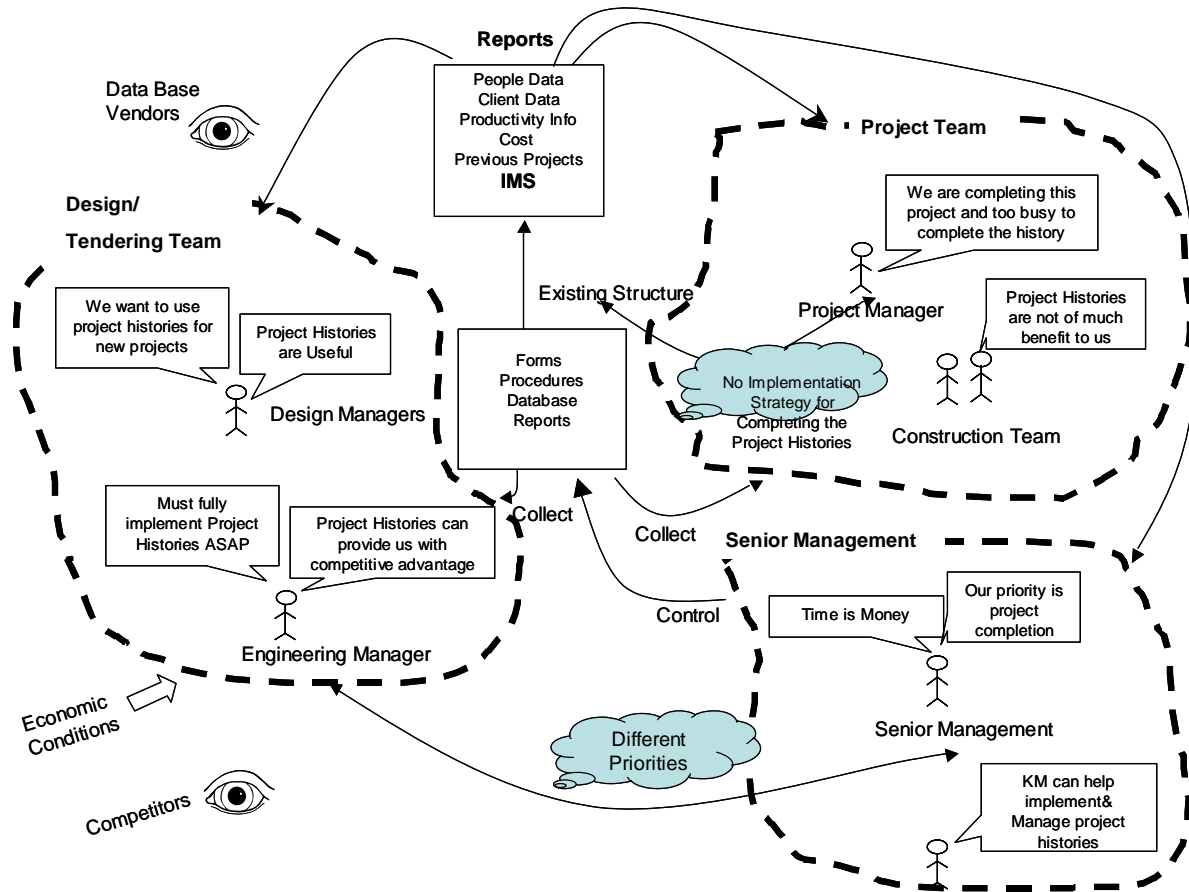
FIGURE 3: RICH PICTURE FOR PROJECT HISTORIES

In this organisation project histories are repositories/data bases that contain useful information and knowledge from previous projects. These should include information such as: productivity rates on previous projects; cost and timelines; and client details. These project histories are operated through a corporate ICT (Information and Communication Technology) system referred to as IMS (Information Management System). As one of the Australia's leading contractor company, this organisation has proliferated the use of ICT since the mid 1990's as part of its commitment to become a Best-in-Class organisation. IMS - as a communication tool - has become the general and most usual form of communication in the organisation and has been successfully diffused within the organisation to the foreman level. As such, IMS is effectively utilized while the project is in progress, but it is rarely used to successfully and efficiently to develop and maintain a project history.

Root Definition – Project Histories	Customer: Senior Management, Future Design Managers, Project Managers
A system owned by the Engineering Manager, who together with the Design Managers, seek data, information and knowledge from previous projects stored in project histories in order to prepare realistic preliminary understanding of the project and cost estimates for pretendering process and then for preparing the project bids.	**Actors:** Engineering Manager, Design Managers, Project Managers, Construction Team **Transformation:** Knowledge, processes and technology together with details of past projects, are used to create and maintain a repository of a project histories that can be used when preparing a tender bid for a new project. **Weltanschauung (why bother?):** To assess the feasibility of making a tender bid, a good understanding of the project is required based upon previous organisation experience and knowledge. **Owner:** Engineering Manager **Environment:** Competitive, Quality, Cost and time critical, Community and Corporate Goals.

Conceptual Model – Project Histories

Figure 4: The Root Definition, CATWOE and Conceptual Model of Project Histories

Developing a project history requires the management of the large volume of information to be generated while the project is being executed, and the identification and classification of information that may be of use on future projects. It is often recommended that this should be part of project debriefing; however, experience shows that this is often not sufficient to provide and record useful information for future use. The lack of interest of the project team in participating in project

debriefing further aggravates the problem. The end result is that there is very little knowledge that is carried forward from current projects that can be used in the future projects. In practice, most of the knowledge carried from one project to other remains uncoded as tacit, often unspoken, and certainly not documented knowledge. As illustrated by in the rich picture in Figure 3, the successful proliferation of project histories is limited. A key limiting factor is a lack of senior management support and championship. The thesis of this study is that project histories need to be aligned with strategic and business philosophy and the organisation's knowledge management initiatives. Further, effective involvement with production of learning histories and evolving a learning organisation should be linked to employees work planning, career path and rewards processes.

The benefits to be gained from project histories are significant and are very clear in the minds of the people who want to use them. However, project history users have little influence over project team members who are essential for the creation of project histories because they have very different priorities. The value of knowledge management is that it provides senior management with a rationale to support the creation and maintenance of repositories of project histories. These repositories will contain the lessons learnt and the unique problem handling techniques devised by the project team. Future projects can then avoid re-inventing the wheel, thus saving time and resources. Attaching the context of knowledge management to the scenario of project histories will give these endeavours a new vigour and a convincing rationale for both senior management and project team.

Knowledge elicited about Project Histories
Key players associated with the development and use of project histories are the Engineering Manager, Design Managers, Project Managers, and the construction team. During the process they interact with people external to the organisation such as competitors and vendors. This is illustrated in the rich picture (Figure 3) that shows the structure, processes and especially the beliefs and perceptions of the key players. Also shown are significant relationships, sources of knowledge, and significant concerns and perceived conflicts within the situation.

This rich picture is followed in Figure 4 by the development of the root definition that provides the central transformation of the "ideal" project history system. In this case-study the transformation is defined as: "Knowledge, processes and technology together with details of past projects, are used to create and maintain a repository of a project histories that can be used when preparing a tender bid for a new project". This transformation is the basis for the development of the conceptual model for project histories (Figure 4). This is expressed as a model of human activity where there are eight high-level key activities necessary to achieve the transformation. Of particular interest as candidates for further study are the three knowledge acquisition activities (or subsystems), the planning subsystem, and the management subsystem:

- Get details of specific projects for developing histories,

- Develop and maintain required knowledge,

- Develop and understand the processes,

- Set the criteria needed to assess the implementation of project histories and its management, and

- Monitor and control project histories.

The next stage of the research is to interview the participants again with structured questions that will emerge from key activities described by this conceptual model. This detailed information will then form the basis of the comparison between the realities of the real world of developing and using project histories, and the "ideal" expressed by the conceptual model. This comparison – or gap analysis – provides the framework to focus on the issues and opportunities, examine assumptions, and better understand the dysfunctional behaviours/actions that need to be remedied. This stage will also provide a reality check for the analysis to date, and is the point where SSM initiates a process to rethink and re-analyse the underlying assumptions in order to identify the desirable and feasible options for change and improvement in the process of creating and using project histories. In this case study the complete utilisation of SSM would formalise the knowledge of project histories in explicit form, highlight problematic areas and provide recommendations to improve the process.

CONCLUSIONS

In this paper we discussed the role of project histories in facilitating a transformation of the organisation into a learning organisation through knowledge management. We presented a case study of a leading Australian construction contractor to illustrate how we conducted an investigation using a SSM framework. SSM provides a system approach with deeper insights into the issues regarding the application of project histories in the organisation that generates project learning. We recommend this approach for dealing with confusing situations that incorporate human, organisational and technical aspects. In particular, using SSM encourages group learning and is ideal as a group decision-making approach. It is strengthened by the active involvement of different participants and stakeholders, and encourages joint ownership of the problem solving process. SSM is particularly useful where there is organisational complexity and the challenge of effective knowledge management and decision-making. The conceptual model derived by applying SSM indicated various sets of activities that would help to apply project histories in the organisation.

The paper argues that knowledge management implementation in the case study organisation would give project histories an importance of strategic concern. Knowledge management places very high emphasis on the creation and management of project histories and views it as a medium through which "tacit" turned "explicit" knowledge of the individuals can be disseminated and shared through out the organisation. Under this knowledge management process, the structure of the project histories can vary. However, this was beyond the scope of this study. The next stage of the broader research project (a PhD project) is to further investigate the shape and structure of project histories in order to synchronise these with the aims and objective of knowledge management philosophy.

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