

A systemic lessons learned and captured knowledge (SLLCK) model for project organizations.

Stephen Duffield^a, Dr Jon Whitty^b

^a Master of Project Management Research Student, University of Southern Queensland, Springfield Campus, Queensland, 4300 Australia

^b Senior Lecturer in Project Management, University of Southern Queensland, Springfield Campus, Queensland, 4300 Australia

Abstract

A significant challenge for government and business project organisations is to ensure that lessons are learned and that mistakes of the past are not repeated. Both the knowledge and project management literature suggests that the lessons learned process in practice rarely happens, and when it does it fails to deliver the intended results. This paper proposes a conceptual systemic project management lessons learned and captured knowledge model derived from the Swiss cheese model for safety and systemic failures, where captured knowledge from lesson learned is distributed and applied across a network of variables such as individual learning, culture, social, technology, process and infrastructure.

Keywords: Project Knowledge Management, Lessons Learned, Learning, Culture

Introduction

There is a government and business need to successfully manage programs and projects, to learn from success and failure, and to capture, disseminate and apply lessons learned [1-4]. The PMI's Project Management Body of Knowledge (PMBOK® Guide) [5] identifies the importance of collecting and documenting lessons learned and implementing process improvements. The PMBOK® Guide knowledge areas also reference the lessons learned process. However, in practice organisational learning from projects rarely happens and when it does it fails to deliver the intended results [6-13].

In this paper we present a research project that has developed and validated a systemic lessons learned and captured knowledge (SLLCK (pronounced Silk)) model, and identified some of the facilitators and barriers to capturing knowledge from lessons learned by projects. In the literature review we provide a broad examination of the key elements of knowledge, people and systems in the context of lessons learned. Next we introduce the SLLCK model and describe its development from the literature. We then present the method and findings of the validation study and a revised SLLCK model is proposed. Finally we discuss

the findings within the framework of the literature and speculate on practical applications and future research opportunities.

Literature review

The scope of the literature review is contained to what is known about the efficacy of current organisational lessons learned processes and the nature of organisational knowledge and how it is constituted from the accumulation of individual knowledge and distributed through a living network that comprises individual relationships and social, cultural, and organisational practices and processes.

On lessons learned

The dissemination and application of project management lessons learned is critical to organisational programs and projects achieving success [14]. Williams [11, p262] identifies that there is a need for "...wider research into how lessons can be disseminated throughout an organization and incorporated into organizational practice".

Overall there is a significant dissatisfaction with lessons learned processes as they are. Milton [9] has found that out of 74 organisations that attempted lessons learned, 60 per cent were dissatisfied. Williams [15] found that 62 per cent of 522 project practitioner responses had a process for learning lessons and of those only 11.7 per cent followed the process. Furthermore, O'Dell and Hubert [16] found that whilst the lessons learned process is popular, it fails to deliver the intended results as lessons are identified and are often not followed through and applied within the organisation.

Institutions such as NASA also have issues surrounding lessons learned. Following reviews in 2000 of NASA's Mars Program, Space Shuttle wiring problems and the implementation of NASA's 'Faster, Better, Cheaper (FBC) project, NASA implemented action plans to improve sharing of experiences and lessons learned [17, 4]. In 2002 the Government Accountability Office found that NASA lessons learned were not routinely identified, reviewed and accessed by project managers [1]. A recent 2012

NASA Office of Inspector General audit report highlights that NASA project managers are still not routinely using the lessons learned information system (LLIS) to contribute new information or to search for lessons learned identified by others [4].

A review of the BP Deepwater Horizon accident investigation revealed how lessons learned of previous “well control event incidents” and “lines of communication” were not acknowledged or addressed and was a contributing cause to the failure [18, 19]. NASA today uses the BP Deepwater Horizon incident as a lessons learned case study paying particular attention to communication deficiencies around government oversight, disregard of data, testing, changes to process, safety culture and lessons learned from previous incidents [20].

There are few signs that any lessons are being learnt in the public sector [21]. For example the Australian State Victorian Government Ombudsman examined 10 major ICT business transformation projects during 2011 and identified that despite the extensive guidance, reports and literature available, agencies are still making the same mistakes around planning, governance, project management and procurement.

On knowledge

To identify with organisational lessons learned one needs to understand what organisational knowledge is. Today, in the context of the organisation, knowledge exploration is attributed to Drucker [22] (knowledge as management resource and power), Wiig [23] (knowledge as a form of belief), Polanyi [24, 25] (distinction between tacit and explicit knowledge) and Davenport and Prusak [26, p5]:

Knowledge is a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information. ...In organizations, it often becomes embedded not only in documents or repositories but also in organizational routines, processes, practices, and norms.

Polanyi's [24] work formed the foundation for Knowledge Management (KM) theory authors Nonaka and Takeuchi [27, 28]. Tacit knowledge is subjective, environment-specific, personal, and is difficult to communicate. Explicit or codified knowledge is objective, easily communicated and transferred without in depth experience [27]. Polanyi [25, p4] stated “...we can know more than we can tell” and contends that humans create knowledge by involving themselves with objects through a process. Nonaka and Takeuchi [27] propose that tacit knowledge consists of cognitive and technical elements. The cognitive element is based on Johnson-Laird [29] “mental models” (schemata, paradigms, perspectives, beliefs and viewpoints) where humans

create working models of the world in their minds. The technical element is the existing know how and skills.

On networks

The term network is used to describe how the component parts of an emergent useful phenomenon are connected together. Two key examples of what are described as complex adaptive networks that are associated with knowledge distribution are human cultures and the human brain [30, 31]. That is to say that knowledge is not to be found stored in some way in one spot, but rather it is distributed across a network of interconnected component parts.

Projects and organisations are often described as complex adaptive systems which evolve through adaptive exploration and the transformation of information [31-34]. Gabora [31] and Whitty [35, 30] both describe the connection of biological structures and cultural ideas and practices and how they evolve through selection and transmission and the implications for human behaviour with complex adaptive systems such as organisation.

Kaeshavarz et al. [36] and Holland [37] further describe such social complex adaptive systems as comprising individuals and organisations, and as having a distributed network of control rather than a central point of control. Furthermore, Holland [38, p25] point out how complex adaptive system rely on “parallelism, competition and recombination” to adapt to new information within a system. Moreover, Bullmore and Sporns [39] describe the structural and functional makeup of complex networks such as the human brain to comprise nodes, clusters, hubs and module parameters. Human knowledge therefore, which extends beyond the human brain, is not only stored as interconnected cells within the brain [39, 30], but it is also stored across for example organisational cultural artefacts, rituals, and practices [40], that are also interconnected, or for want of another term – networked.

On people

Duhon and Elias [41] reports that failure of learning valuable lessons from projects can be connected to the learning, cultural and social people factors. Maqsood [42], and Duhon and Elias [41] both highlight the need to understand cognitive psychology when examining the effectiveness of tacit knowledge in the learning process. Maqsood [42] further reports that every person has a distinctive learning technique and that learning depends on an individual's capability to effectively acquire and use in a timely manner. Duhon and Elias [41, p1] describe learning as “...any increase in knowledge or skills that enables the learner to be more effective” in achieving their objectives.

From the collective point of view, project teams often know they are in trouble, however they take no or minimal effort to resolve errors as owning up to failure may cause shame [43]. Duhon and Elias [41] report that a protective post lessons learned attitude weakens the process and hides the real problems of the project. When a problem is recognised they are biased to learning the least-threatening lessons. Duhon and Elias [41] argue that all in an industry sector should be learning from the mistakes of others, and that we typically view others as substandard to us and don't believe we can learn from them. Therefore it is often hard to get relevant information on what went wrong.

The literature to date re-enforces that people factors influence the success of the lessons learned process and that a learning organisation culture is critical to successful dissemination of lessons learned [44-47]. The work of Senge [48], Nonaka and Takeuchi [27] both motivated companies to become learning organisations. Simon [49, p125] states that:

All learning takes place inside individual human heads; an organization learns in only two ways: (a) by the learning of its members, or (b) by ingesting new members who have knowledge the organization didn't previously have. ...What an individual learns in an organization is very much dependent on what is already known to (or believed by) other members of the organization and what kinds of information are present in the organizational environment. ...Individual learning in organizations is very much a social, not a solitary, phenomenon.

Duhon and Elias [41] argue that an organisation knows something if just one person knows it and that the organisation culture and structure enables that knowledge event to be used effectively. They reference actions such as; individual learning; knowledge storage (checklists and work processes); organisational changes that re-focuses knowledge; culture changes to open and act on problems; and relationship building that enables skills and knowledge to deal with organisational problems. They also state that people learn by processing information using the human central nervous system. An organisation does not have a central nervous system, so they need to create a structure to enable their personnel to learn as a group. Duhon and Elias [41] find that individual learning is a cognitive psychological process and for an organisation the learning process is social. Blackman and Henderson [50] briefly discuss how organisational learning is affected by social and intellectual credibility.

On Culture

Baring in mind what has been said about knowledge being distributed across a network, one can consider culture to be a form of network for like-minded individuals. Culture per se plays a significant part in

KM, organisational learning and in the effectiveness of learning mechanisms [47, 41, 51, 44]. Dvir and Shenhar [52, p20] state that "Great projects create a revolutionary project culture. The execution of great projects often requires a different project culture, which can spread to an entire organization." Williams [15, 11], Hislop [53] and Maqsood [42] all suggest that it is critical to understand the culture of an organisation before implementing or using lessons learned as surveys consistently reveal that the main obstacles to success are organisational people (social and culture) factors.

Reason [54, p195] defines a just culture as "...an atmosphere of trust in which people are encouraged, even rewarded, for providing essential safety-related information – but in which they are also clear about where the line must be drawn between acceptable and unacceptable behaviour." The other important elements of a safety related culture are to have a strong reporting, flexible and learning culture [54]. Reason [54] further states that the learning culture is the easiest to engineer however is the most difficult to make work. Pettersson and Nyce [55] state that "just culture" is where individuals in an organisation want to be open about failures and mistakes. Lucier [56] argues that if you can encourage team members to document their mistakes with no fear of further action, you will be able to establish a useful knowledge system. Stastny and Garin [57] and Duhon and Elias [41] both discuss the benefits and obstacles in implementing a just culture and there appears to be a lot of similarities with the project management lessons learned process.

The work of Reason [54] with just culture highlights a lot of similarities with project management lessons learned [41]. Reason's [54, 58] Swiss cheese model (Figure 1) argues that organisational accidents are caused by active failures and latent conditions. Reason [54] reports that the Swiss cheese model shows the implementation of "defences in depth", where one identifies that projects have errors (holes) in them, which are brought about by human factors, and there are layers of defences to prevent them from occurring.

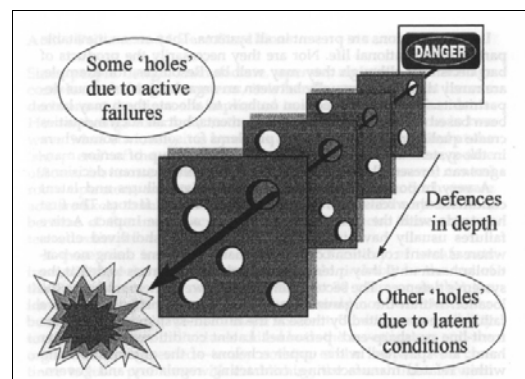


Figure 1 – The Swiss cheese model of defences
Source: Reason [54]

On lessons learned processes

The lessons learned process is specifically addressed in various project management guides, standards, methodologies and maturity models. Lindner and Wald [59] note a gap in project management practice as there is a need for more research in understanding the role KM plays in project management methodologies. Over the last 14 years the PMBOK® Guide has increased the references to the term lessons learned. In the PMBOK® Guide 4th edition there is a focus on process improvement as a result of lessons learned [5]. It is important to note that 'lessons learned' is not discussed anywhere except for a glossary description [5].

Reich and Wee [60, p24] recommend that the PMBOK® Guide should be "...transformed into a true knowledge guide - both imparting and recognizing the knowledge needed to complete projects successfully." The Project Management Institute's OPM3 Organizational Project Management Maturity Model [61] references lessons learned. However there is less guidance than that provided in the PMBOK® Guide [5]. The Office of Government Commerce PRINCE2 [62, p12] project methodology encourages project teams to "...learn from previous experience: lessons are sought, recorded and acted upon throughout the life of the project". PRINCE2 has a single process for recording lessons learned (lessons learned log) and reporting on them (lessons learned report). The Capability Maturity Model Integration (CMMI) [63] model provides for best practice organisational process improvement. Process improvement proposals and process lessons learned are key work products and sub-processes. Midha [64] discusses the benefits of CMMI and identifies the classic approach of collecting and translating key lessons into processes. Von Zedtwitz [43] developed a capability model for post-project reviews based on the standard five-stage capability model.

O'Dell and Hubert [16, p69] stated that the lessons learned approach typically focuses on a few key questions:

- What was supposed to happen?
- What actually happened?
- Why was there a difference or variation?
- Who else needs to know this information?

The major challenge is to then get employees to participate and reuse the captured knowledge [65, 16, 66]. Milton [66] describes the KM lessons learned process stages as learning before, during and after. The literature on lessons learned processes provides many variations on essentially three process steps 'identification, dissemination (transferring) and application'. Common literature capture techniques found are: reflection, lessons learned sessions; after action reviews; project debriefings; close out meetings; post project appraisals/reviews; case study exercises; community of practices; project milestone

reviews; post mortems, project histories; project health checks; and project audits [67-69, 10, 15]. Literature on knowledge disseminating and transfer often refers to codification, verification, storing, searching, retrieving, knowledge sharing and training [70, 71, 65, 16, 10, 15].

A number of methods are used to disseminate knowledge lessons learned. Two methods of interest are 1) process methods and 2) social based methods. Process based methodologies are those lessons learned where the knowledge is reflected in an organisations policies, processes and procedures [7, 64, 72, 10, 15]. Social based methodologies are those lessons learned that are not easy to break up and transfer knowledge from one person to another [73, 45]. Fernie et al. [45] argue that knowledge sharing is best performed through the communication of individuals. Two identified social-based processes are networking and mentoring [73, 74]. Knowledge application often requires a significant effort, commitment, understanding of people behaviour for both the organisation and individuals, as this is the area where the process typically breaks down and fails [41, 7, 15].

On technology and infrastructure

The literature provides numerous technology solutions of storing, recording and accessing lessons learned, the key is to identify what works for an organisation and constantly monitor, update and keep it current and relevant [15, 11]. Technology is a critical element to knowledge dissemination. Quite often technology is blamed for failure in knowledge dissemination [15]. As with all process flows, ensuring the right people are involved, the right systems and infrastructure (facilities, equipment and materials) is critical in laying the foundation down for lessons learned to be effective [75].

The SLLCK Model

The SLLCK model is grounded in the literature above. It is an attempt to network together by means of an adaptation of the Swiss cheese model, the various features of social and cultural learning with the processes, infrastructure and technology that support them. The model has, over a period of two years, undergone a number of iterations. Initial reviews of the literature pertaining to lessons learned focused on the dissemination of lessons learned and a preliminary model was developed (Figure 2). This version highlighted the people, process, learning and technology variables that influence the dissemination of lessons learned between the project team and the organisation. The model was derived and based on the reverse relationships of the Reason [54] Swiss cheese model where the variables all need to align to effectively disseminate lessons learned.

Following an extended detailed literature review it became clear that the model needed to focus on both the dissemination and application of lessons learned. The literature already shows that identification of lessons learned appears to be done quite well in most organisations, whereas the dissemination and application of lessons learned fails to deliver the intended results [6-13].

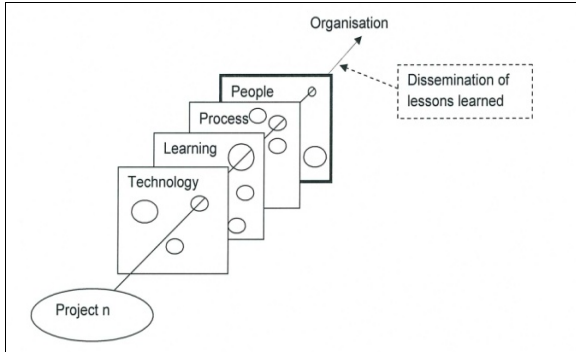


Figure 2 – Preliminary lessons learned model

The extended literature review highlighted the people element (learning, culture and social aspects), the system element (technology, process, and infrastructure) and the integration of the elements that form a knowledge network that captures and therefore influences the dissemination and application of lessons learned between the project team and the organisation. The output of the extended literature review was analysed using a grouping-categorisation matrix and associated mind maps. The deductive content analysis process assisted in the development of a revised SLLCK model (Figure 3).

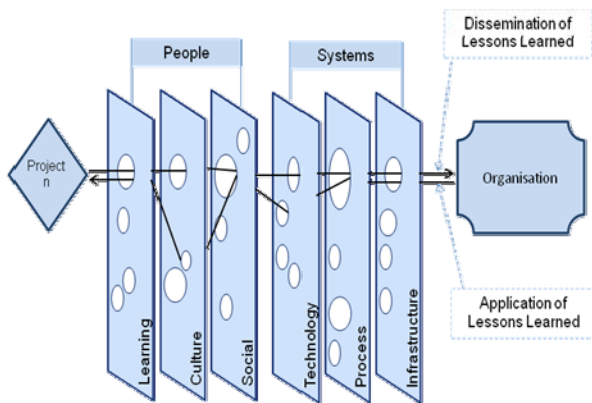


Figure 3 – A 'systemic lessons learned and captured knowledge model'

The model, as with its predecessor, is based on the reverse relationships of the Reason [54] Swiss cheese model where the variables of learning, culture, social, technology, process and infrastructure need to align and be effective to disseminate and apply lessons learned. The reverse relationship refers to the fact that the open holes in the variable layers represent the

various facilitators in each of those areas that enable the dissemination and application of the identified lessons.

Validation Study

Research Methodology

The research method adopted is a qualitative approach using an extended literature review and a range of tools (categorisation matrix, mind and concept maps) to carry out a deductive content analysis of the data [76]. The categorisation matrix, mind and concept maps exercise is based on the three sub-processes of data reduction, data display and conclusion drawing [77]. The purpose of the content analysis is to identify the most common lessons learned elements acknowledge by other researchers which will define the key variables that are synthesised to form a SLLCK model.

To further test the SLLCK model a qualitative exploratory focus group research methodology approach was used. The focus group provides the practical experience and performs as a diagnostic tool to validate the model [78]. It also enables multiple perspectives to be clarified to achieve a solid understanding and interpretation of the model [78]. The SLLCK model was presented to a pilot focus session followed by two focus groups. Ethical approval for this study was granted, anonymity assured, research notes were taken throughout, and audio recordings were destroyed following transcription. The pilot focus session provided a preliminary run through of the focus group exercise to refine the interview structure. The first focus group consisted of five participants, the second had eleven. The participants were project, engineering and knowledge management professionals from local South East Queensland Australia organisations.

The SLLCK model was presented to each of the focus groups and they were encouraged to make comments and provide feedback on their first impressions. The SLLCK model was then broken down into elements (learning, culture, and so on) on separate worksheets. The worksheets were in the form of large sheets of paper placed on desks and walls. The focus group participants were asked to identify positive openings (facilitators) and negative impediments (barriers) that impact the SLLCK model. The worksheets were then reviewed as a group. Following the focus group sessions the audio and worksheet data was analysed and grouped under each of the elements/variables of the model.

The Results

First impressions from the focus group participants were that the SLLCK model does “make sense and

gels with the reverse of the old adage that a catastrophe has several things lined up to fail". Participants also agreed with the view that technology is seen as an enabler and that culture, social aptitude and a priority to capture knowledge from learning experiences through project is important.

The data generated from the focus group sessions is shown in Table 1. During the focus group sessions the participants were able to validate the model as they felt it supported their experience whilst reconceptualising the topic of lessons learned. Drawing on their experiences, participants were able to identify the facilitators to lessons learned (the holes in the model) and the barriers. Whilst the participants raised much of what has already been identified in the literature, they also identified facilitators (See Table 1: identified with *bold) that have limited coverage in the lessons learned literature, such as;

- The level of knowledge/credibility of individuals
- A culture of helping people; culture of respect, where knowledge/experience is respected
- Where systems are respected and form part of the everyday job
- Where people are committed to credible processes.

Frequently the participants discussed how well the model represented the complexity of the real world, and how all the multiple variables need to align to enable a lesson to be learned and then captured (remembered) in various forms across the organisation. Participants also discussed how each of the variables has a number of subsets and that the model can represent knowledge storage and found some alignment with a complex organisational brain. One participant made the statement "Do people really understand lessons learned, as the concept is thrown around all the time, however often lessons are captured, the job is considered done and lessons are not reinforced."

Across the focus groups, participants agreed that it is the people element that is most likely to negatively influence lesson learned processes and create barriers to the dissemination and application of lessons learned in organisations. Focus group participants clearly stated that "people make it happen". One focus group spent more time discussing culture and process, while the other was more focused on the social aspect. Participants also highlighted how systems should provide a supporting role to the people. Using the SLLCK model as a construct for the discussion, one lesson learned scenario raised demonstrated how the variables of learning, culture, process and infrastructure were opened to capturing knowledge, whereas the variables of social and technology were closed and prevent the dissemination and application of the identified lessons.

The focus groups provided feedback as to how the model can help them. Participants stated that the model helps with the change management process. That the model reflects complexity, as it is "hard to get a lesson learned through, so it is not just about having a database, it is not just about one thing it is about a series of things...I like the way it kind of stacks it up and shows it working". One Project Manager stated that "we were getting lots of push from our KM team to get lessons learned going and get it implemented to meet deliverables, had we had the model we would have been able to present to the Directors to show them what needs to be invested in to do it properly, as it is not just about doing a process." Furthermore, that one problem for organisations is a lack of recognition of this complexity. All the focus groups agreed that the SLLCK model conceptualises the problem well in a way that enables the problems to be discussed, and that it provides a good alignment of what has to be in place to allow the lessons learned process to deliver the intended results.

Discussion

The data generated from the focus group sessions (See Table 1) appears to ground the SLLCK model in the lesson learned and project knowledge management literature [14, 73, 44, 41, 47, 42, 9, 16, 15, 11, 45]. Participants were able to identify their experiences with, and further build and refine the SLLCK model (See Figure 5). The results illustrate that organisational learning is a complex process and it is clear that organisations need to enable the facilitators and remove the barriers and encourage, through their practices and processes, positive cultural, social and learning environments.

Two particular discussion that arose from the focus groups are noteworthy; that of credibility and complexity. The discussions on credibility is notable in that it occurred during both the considerations of facilitators and barriers, and the subject has limited direct references in lessons learned and knowledge management literature apart from Blackman and Henderson [50] and Liebowitz and Megbolugbe [79]. The discussion on complexity is also notable as the focus groups emphasised how the SLLCK model can resemble and conceptualise the network 'brain' of an organisation. This supports the literature of knowledge distribution across complex networks [31, 35, 30].

The amount of discussion time spent during the focus group sessions on culture, social and process emphasises the importance these variables play in the SLLCK model and supports the findings in the literature of Anbari et al. [67], Bakker et al. [68], Duhon and Elias [41], Hislop [53] and Maqsood [42, 69], Schindler and Eppler [10] and Williams [15, 11].

Positive openings (facilitators) and negative impediments (barriers) within each lessons learned variable:	
People-Learning	
Facilitators	Barriers
Right skilled people Right people to hand Training (effective) Learning from experience (failures, challenges, difficulties and success) Staff with a high level of knowledge / qualifications Willingness/passion to share knowledge Understand that people learn differently (Training sessions; Technical notes; Technical forums) Education, training and staff development practices Reflection * Knowledge level (credibility)	Takes too much time; time pressures Memories fade Lessons wont apply to my project De-motivated Lets learn from our failure – witch hunt... People learn differently People do not learn and continue to make the same mistakes Difficult to teach practitioners in other parts of the organisation Different levels of knowledge and understanding Technical arrogance (credibility) Protecting ones sphere of knowledge Poor training practices
People-Culture	
Facilitators	Barriers
Tone at the top Routine practices Supportive practices / supporting culture * Help needed (help me to help you) Just Culture (Safety culture, learning culture, reporting culture) Group (work) support in development of learning's Understand that knowledge is power but even more so when it is shared * Individual knowledge sharing plans Networking encouraged and supported Action on positive feedback Positive leadership * Respect	Anonymous reports Blame Don't have time Rapid change of staff – redeployment Internal politics (credibility) To use lessons would reflect badly on my reputation Lack of incentives, buy-in Knowledge is power Shoot the messenger Communication gap / mis-understandings Delivery culture not learning culture Complex organisations; Operational silos No senior sponsorship Anxiety about changes Poor leadership practices Lack of adaptability or resilience WIIFM (What is in it for me) Fast moving workforce Social behaviours Old way the only way Personal goals different to organisational goals Low performance results focus culture Financial pressures
People-Social	
Facilitators	Barriers
Custom built teams Operate as a team Custom build the approach (Not one size fits all) Keep trying different approaches Do not personalise Interact with as many people as possible to capture information * (must have credibility) Teamwork approach Honesty and Integrity Provide time for unstructured interaction Generally want to improve Good enterprise social business Productive culture	Same old team Not invented here Unwillingness to share /less valuable Don't want to appear vulnerable and stupid by admitting mistakes Teams wont share mistakes and dirty laundry - reputation Resistance to change Not my problem Too stubborn Cynical Politics Don't understand what it is like to work in other parts of the organisation Poor communication - anti social behaviour - social interactions Personality traits Blame environment Competitive environment Perceived credibility and approachability Social polices Shame personally exposed Lack of trust Poor coordination
Systems-Technology	
Facilitators	Barriers
Intranets e-libraries Wikis Multiple channels of information in use Distribution of links to all targeted stakeholders Ease of access through different IT solutions * Systems respected and need to be part of your everyday job	Hard to find / locate lessons No way to classify lesson for easy retrieval Not trained in use of tools Poor (lack of) ICT systems and processes Done in inconsistent ways Too many initiatives Restrictive audience Poor Search facility SharePoint 2010 governance and funding issues Not everyone uses social media Lack of money / funding / expensive Too complex Set and forget systems Too many systems Systems are not part of your every day job Inappropriate focus on technology Not being able to find what you need when you need it Collection of data just for the sake of it Too structured
Systems-Process	
Facilitators	Barriers
Debriefing Reviews Brain Storming Case Studies / Tell a story / Keep it 2 pages - simple Dissemination (Training, Education) Mentoring Staff Transfer Functional management enforcement Alignment to Risk Management Senior management commitment * Credibility - endorsement of process in place - Imprimatur Simplification Capability in methodology Contextualised	Willingness to conduct the process Tick the box process / compliance Procedures not being followed, don't exist, are not updated Post-Implementation reviews not done Takes too much time Lack of time to mentor Lack of enforcement No metrics Lack of formalising the process and incorporating new work Lack of consistency in following the process WIIFM (What is in it for me) Lack of understanding and commitment Complacency Don't bother not my problem Language (taxonomy) Don't exist / fragmented Lack of flexibility in approach (no complex adaption) Read the process but don't understand the process Process/manuals are owned by another organisation Processes don't match with IT systems
Systems-Infrastructure	
Facilitators	Barriers
Physical space Training facilities Senior management commitment Good user interface/useability/search	Legal constraints Governance Poor facilitation Time poor Lack of financial/funding support Language (taxonomy) / poor search Don't have access to emerging technology Remote sites have limited infrastructure (Don't assume everyone has what you may have)

Table 1 – Positive openings (facilitators) and negative impediments (barriers) within each lessons learned variable

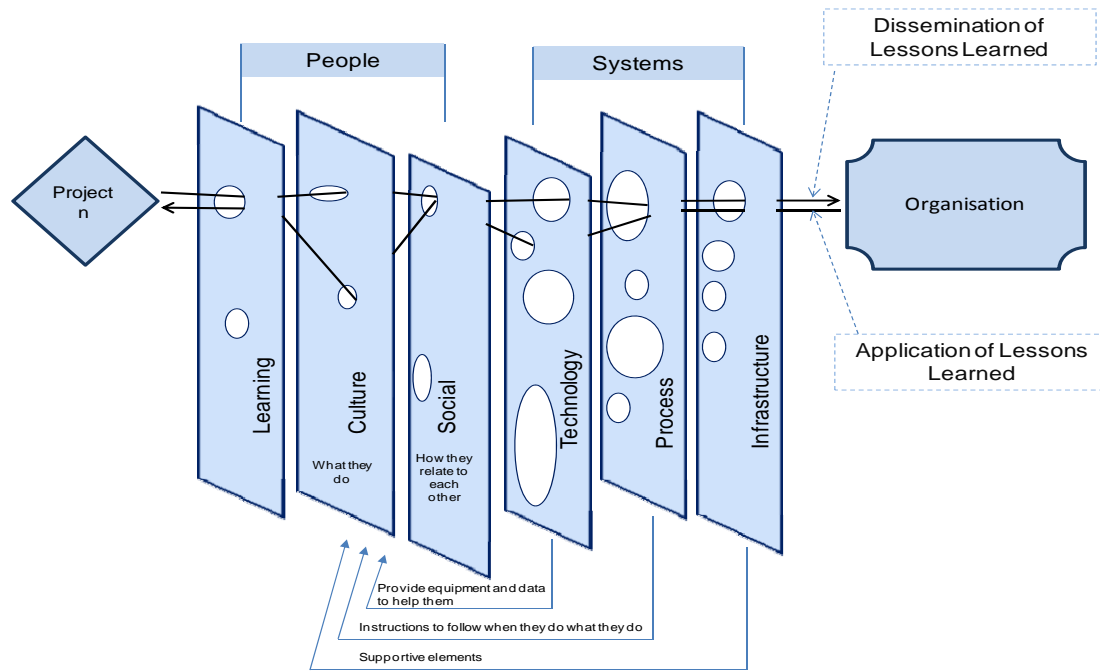


Figure 5 – A refined ‘systemic lessons learned and captured knowledge (SLLCK) model’

Many of the facilitators and barriers identified are not directly related to the project management and knowledge management operational processes; however they have significant consequences on how project knowledge is used within an organisation. One clear finding during the focus group sessions was the confirmation that lessons identification processes do exist and seems to work well and that the problem is with the dissemination and application of lessons learned. This causes individuals to believe the lessons learned process is working when in fact only the first part of the process (lessons identified - observed) is working. This separation of the lessons (identification) learned process is seldom discussed in the literature. The study has brought forth supporting evidence that a SLLCK model can influence the dissemination and application of project management lessons learned between the project team and the organisation.

Limitations and challenges

One of the challenges with content analysis is that the process is flexible in nature and there is no simple right way of doing it [76, 80]. The focus group approach does have some limitations and disadvantages. A unique sampling problem could arise as each of the two focus groups had similar backgrounds and experiences. The results could be dependent on the moderator and finally the groups are not intended to represent the larger population [78].

Future research

The information produced from the focus groups forms a good basis and structure for future research

using an appropriate mixture of qualitative case studies and quantitative survey instruments. More consideration should be given to the alignment, interaction and complexity issues of the people and systems elements within the lessons learned organisational environment. This approach is supported by a recent project management PM World Today editorial post on Lessons Learned but Knowledge Lost [81]. In response, Wideman [82, p1] a recognised project management global expert stated:

...in spite of all the technology that is available to us today, we have not yet found a presentation format that captures the essence of this wisdom in a way that is relevant to future usage, readily searchable and easy to store. ...we have a serious cultural problem. ...we are probably condemned to continue to throw away the valuable resources.

This open public discussion highlights the significance of project management, knowledge management and the lessons learned practice and the impact a grounded model has on providing solutions to the problem.

Finally the study supports the premise that the project management lessons learned processes today can largely be considered incomplete and misunderstood. Future research themes could focus on how best project management lessons learned is represented to the practitioner community and their organisations, in a way that can be captured in project management reference books, methodologies and bodies of knowledge.

Conclusion

This research study is focussed on exploring whether a SLLCK model can influence the dissemination and application of project management lessons learned between the project team and the organisation. The study suggests that by reconceptualising lessons learned, the SLLCK model can influence the dissemination and application of project management lessons learned. This study has established that the alignment of the people and system elements could positively influence the success of an organisation's lessons learned processes. The study found that the people element and culture factor may well be the most likely to negatively influence lessons learned in organisations. Furthermore, the study also established that several variables of the model and their elements need to align to ensure organisational lessons are learned by means of projects. Finally, the findings contribute to the project and knowledge management literature and provide an opportunity to improve project knowledge sharing, and ensure projects achieve success for organisations to maintain a competitive advantage.

References

- [1] Li, 2002, "GAO-02-195 NASA Better Mechanisms Needed for Sharing Lessons Learned," Office, U. S. G. A., Ed., ed. Washington, DC.
- [2] National Audit Office, 2009, "Helping Government Learn," ed. London: The Stationary Office.
- [3] New Zealand Government, 2010, "Major Projects Report: Overview & Assessment," Ministry of Defence, N. Z. D. F., and the Office of the Auditor-General., Ed., ed. Wellington: Ministry of Defence.
- [4] NASA, 2012, "Review of NASA's Lessons Learned Information System ", Washington, DC IG-12-012.
- [5] Project Management Institute, 2008, *A Guide to the Project Management Body of Knowledge (PMBOK® Guide)*, 4th ed. Newtown Square, Pa.: PMI Inc.
- [6] Atkinson, R., et al., 2006, "Fundamental uncertainties in projects and the scope of project management," International journal of project management, vol. 24, pp. 687-698.
- [7] Keegan, A. and Turner, J. R., March 1, 2001, "Quantity versus Quality in Project-Based Learning Practices," Management Learning, vol. 32, pp. 77-98.
- [8] Kerzner, H., 2009, *Project management : a systems approach to planning, scheduling, and controlling*, 10th ed. Hoboken, N.J.: John Wiley & Sons.
- [9] Milton, N., 2010, *The Lessons Learned Handbook: Practical approaches to learning from experience*. Oxford, UK: Chandos Publishing.
- [10] Schindler and Eppler., 2003, "Harvesting project knowledge: a review of project learning methods and success factors," International journal of project management, vol. 21, pp. 219-228.
- [11] Williams, T., 2008, "How do organisations learn lessons from projects—and do they?," IEEE Transactions in Engineering Management, vol. 55, pp. 248-266.
- [12] Wysocki, R. K., 2004, *Project management process improvement*. Boston: Artech House.
- [13] Wysocki, R. K. (2009, Accessed 2 May 2011). *Effective project management traditional, agile, extreme (5th ed.)*. Available: http://ezproxy.usq.edu.au/login?url=http://www.U SQ.eblib.com.au/EBLWeb/patron?target=patron&extendedid=P_427893_0&
- [14] Disterer, G., 2002, "Management of project knowledge and experiences," Journal of Knowledge Management, vol. 6, pp. 512-520.
- [15] Williams, T. (2007, Date Accessed: 17 July 2011). *Post-Project Reviews to Gain Effective Lessons Learned*. Available: <http://library.books24x7.com.ezproxy.usq.edu.au/oc.aspx?site=JE61N&bookid=24212>
- [16] O'Dell and Hubert, 2011, *The new edge in knowledge : how knowledge management is changing the way we do business*. New Jersey: John Wiley & Sons.
- [17] Keegan, B. and Griner, C., 2000, "Enhancing Mission Success – A Framework for the Future (A Report by the NASA Chief Engineer and the NASA Integrated Action Team)," BP, 8 September 2010, "Deepwater Horizon Accident Investigation Report," Cleveland, C. (2011, 25 March). *Macondo: The Gulf Oil Disaster*. Available: http://www.eoearth.org/article/Macondo:_The_Gulf_Oil_Disaster?topic=64403
- [18] NASA. (2011, 9 April). *The Deepwater Horizon Accident: Lessons for NASA*. Available: http://www.nasa.gov/pdf/592629main_BP_Case_Study_29AUG2011_FINAL.pdf
- [19] Brouwer, G., 2011, "Own motion investigation into ICT-enabled projects," Ombudsman, V., Ed., ed. Melbourne: Victorian Ombudsman, Victorian Government Printer.
- [20] Drucker, P. F., 1993, *Post-capitalist society*. Oxford: Butterworth Heinemann.
- [21] Wiig, K., 1997, "Knowledge management: an introduction and perspective," Journal of Knowledge Management, vol. 1, pp. 6-14.
- [22] Polanyi, M., 1958, *Personal knowledge; towards a post-critical philosophy*. Chicago,: University of Chicago Press.
- [23] Polanyi, M. and Sen, A., 2009, *The tacit dimension*. Chicago ; London: University of Chicago Press.
- [24] Davenport, T. and Prusak, L., 2000, *Working knowledge: How organizations manage what they know*: Harvard Business Press.
- [25] Nonaka, I. and Takeuchi, H., 1995, *The knowledge-creating company: How Japanese companies create the dynamics of innovation*. New York.
- [26] Nonaka, I., 2007, "The knowledge-creating company," Harvard business review, vol. 85, p. 162.
- [27] Johnson-Laird, P. N., 1983, *Mental models : towards a cognitive science of language,*

- inference, and consciousness*. Cambridge, Mass.: Harvard University Press.
- [30] Whitty, S. J., 2009, "New philosophy of project management: an investigation into the prevalence of modern project management by means of an evolutionary framework (presented at Univ. of Qld)."
- [31] Gabora, L., 1997, "The origin and evolution of culture and creativity," *Journal of Memetics: Evolutionary Models of Information Transmission*, vol. 1, pp. 1-28.
- [32] Harkema, S., 2003, "A complex adaptive perspective on learning within innovation projects," *Learning Organization*, The, vol. 10, pp. 340-346.
- [33] Williams, T. M., 1999, "The need for new paradigms for complex projects," *International journal of project management*, vol. 17, pp. 269-273.
- [34] Cooke-Davies, T., et al., 2007, "Mapping the Strange Landscape of Complexity Theory, and Its Relationship to Project Management," *Project Management Journal*, vol. 38, pp. 50-61.
- [35] Whitty, S. J., 2005, "A memetic paradigm of project management," *International journal of project management*, vol. 23, pp. 575-583.
- [36] Keshavarz, N., et al., 2010, "Social complex adaptive systems. A response to Haggis," *Social Science & Medicine*, vol. 70, pp. 1478-1479.
- [37] Holland, J. H., 1996, *Hidden order : how adaptation builds complexity*. Reading, Mass.: Addison-Wesley.
- [38] Holland, J. H., 1992, "Complex adaptive systems," *Daedalus*, vol. 121, pp. 17-30.
- [39] Bullmore, E. and Sporns, O., 2009, "Complex brain networks: graph theoretical analysis of structural and functional systems," *Nature Reviews Neuroscience*, vol. 10, pp. 186-198.
- [40] Walsh, J. P. and Ungson, G. R., 1991, "ORGANIZATIONAL MEMORY," *Academy of Management Review*, vol. 16, pp. 57-91.
- [41] Duhon, H. and Elias, J., 2008, "Why It Is Difficult To Learn Lessons: Insights from Decision Theory and Cognitive Science," *SPE Projects, Facilities & Construction*, vol. 3, pp. 1-7.
- [42] Maqsood, T., "The Role of Knowledge Management in Supporting Innovation and Learning in Construction," *School of Business Information Technology*, RMIT University, 2006.
- [43] Von Zedtwitz, M., 2002, "Organizational learning through post-project reviews in R&D," *R&D Management*, vol. 32, pp. 255-268.
- [44] Andriessen, J. H. E. and Fahlbruch, B., 2004, *How to manage experience sharing : from organisational surprises to organisational knowledge*, 1st ed. Amsterdam ; Boston: Elsevier.
- [45] Fernie, S., et al., 2003, "Knowledge sharing: context, confusion and controversy," *International journal of project management*, vol. 21, pp. 177-187.
- [46] Sense, A. J., 2007, "Learning within project practice: Cognitive styles exposed," *International journal of project management*, vol. 25, pp. 33-40.
- [47] Leistner, F., 2010, *Mastering organizational knowledge flow how to make knowledge sharing work*. Hoboken, N.J.: John Wiley & Sons.
- [48] Senge, P., 1990, *The Fifth Discipline, The Art & Practice of the Learning Organization*, Revised Edition, 2006 ed.: Doubleday New York.
- [49] Simon, H. A., 1991, "Bounded Rationality and Organizational Learning," *Organization science*, vol. 2, pp. 125-134.
- [50] Blackman and Henderson. (2001, viewed 2 January, 2012). *Does A Learning Organisation Facilitate Knowledge Acquisition And Transfer? . Electronic Journal of Radical Organisation Theory 7(1)*. Available: [http://www.mngt.waikato.ac.nz/ejrot/EJROT\(new design\)Vol7_1_front.asp](http://www.mngt.waikato.ac.nz/ejrot/EJROT(new design)Vol7_1_front.asp)
- [51] Eskerod, P. and Skriver, H. J., 2007, "Organizational culture restraining in-house knowledge transfer between project managers—A case study," *Project Management Journal*, vol. 38, pp. 110-122.
- [52] Dvir, D. and Shenhar, A. (2011) *What great projects have in common*. MIT Sloan Management Review. 18-21.
- [53] Hislop, D., 2005, *Knowledge management in organizations : a critical introduction*. Oxford ; New York: Oxford University Press.
- [54] Reason, J., 1997, *Managing the risks of organizational accidents*. Aldershot, Hants, England ; Brookfield, Vt., USA: Ashgate.
- [55] Pettersson, U. and Nyce, J., 2011, "Hierarchy and Tacit Knowledge in the Swedish Armed Forces: An Organisational Approach," in *Proceedings of the European Conference on Intellectual Capital*, 2011 2011, pp. p328-332.
- [56] Lucier, C., 2003, "When knowledge adds up to nothing - Why knowledge management fails and what you can do about it," *Development and Learning in Organizations*, vol. 17, pp. 32-35.
- [57] Stastny and Garin. 2004, "A Roadmap to a Just Culture: Enhancing the Safety Environment," *Gordon, et al., Eds., First ed: GAIN Working Group E*.
- [58] Reason, J., 2000, "Human error: models and management," *British Medical Journal*, vol. 320, p. 768.
- [59] Lindner, F. and Wald, A., October, 2011 2011, "Success factors of knowledge management in temporary organizations," *International journal of project management*, vol. 29, pp. 877-888.
- [60] Reich and Wee, 2006, "Searching for knowledge in the PMBOK guide," *Project Management Journal*, vol. 37, pp. 11-26.
- [61] Project Management Institute, 2008, *Organizational Project Management Maturity Model (OPM3®)*, 2nd ed. Newtown Square, Pa.: Project Management Institute Inc.
- [62] OGC, 2009, *Managing Successful Projects with PRINCE2*. London: TSO.
- [63] Chrissis, M. B., et al., 2003, *CMMI® : guidelines for process integration and product improvement*. Boston: Addison-Wesley.
- [64] Midha, A., 2005, "How to Incorporate "Lessons Learned" for Sustained Process Improvements," presented at the NDIA CMMI Technology conference, 2005.
- [65] O'Dell, et al., 1998, *If only we knew what we know : the transfer of internal knowledge and best practice*. New York: Free Press.

- [66] Milton, N., 2005, *Knowledge Management For Teams and Projects*. Oxford: Chandos Publishing.
- [67] Anbari, F. T., et al., 2008, "Post-project reviews as a key project management competence," *Technovation*, vol. 28, pp. 633-643.
- [68] Bakker, R. M., et al., 2010, "Managing the project learning paradox: A set-theoretic approach toward project knowledge transfer," *International journal of project management*.
- [69] Maqsood, T., et al., 2004, "Project histories and project learning—a knowledge management challenge," in 20th Annual ARCOM Conference, Heriot Watt University, 2004, pp. 561-70.
- [70] Boh, W. F., 2007, "Mechanisms for sharing knowledge in project-based organizations," *Information and Organization*, vol. 17, pp. 27-58.
- [71] Firestone, J. and McElroy, M., 2003, *Key Issues in New Knowledge Management*. Burlington, MA: Elsevier Science.
- [72] O'Dell and Grayson, "Identifying and Transferring Internal Best Practices," APQC, Ed., ed Houston: APQC, 1997.
- [73] Bresnen, et al., 2003, "Social practices and the management of knowledge in project environments," *International journal of project management*, vol. 21, pp. 157-166.
- [74] Huang, J. C. and Newell, S., 2003, "Knowledge integration processes and dynamics within the context of cross-functional projects," *International journal of project management*, vol. 21, pp. 167-176.
- [75] Thomas, W. H., 2012, *The basics of project evaluation and lessons learned*. Boca Raton, FL: CRC Press.
- [76] Elo, S. and Kyngäs, H., 2008, "The qualitative content analysis process," *Journal of advanced nursing*, vol. 62, pp. 107-115.
- [77] Miles, M. and Huberman, M., 1994, *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, CA: Sage Publications.
- [78] Zikmund, W. G., 2010, *Business research methods*, 8th ed. Mason, OH: South-Western Cengage Learning.
- [79] Liebowitz, J. and Megbolugbe, I., 2003, "A set of frameworks to aid the project manager in conceptualizing and implementing knowledge management initiatives," *International journal of project management*, vol. 21, pp. 189-198.
- [80] Leedy, P. D. and Ormrod, J. E., 2009, *Practical research : planning and design*, 9th ed. Upper Saddle River, N.J. ; Harlow: Pearson Education.
- [81] Pells, D. (2011, *Lessons Learned but Knowledge Lost! PM World Today 2011*(5 September 2011). Available: <http://www.pmforum.org/library/editorials/2011/PDFs/aug/Editorial-Pells.pdf>
- [82] Wideman, R. M. (2011, 5 September 2011). *On the August PMWT Editorial on Lessons Learned by Knowledge Lost. PM World Today*. Available: <http://www.pmworloday.net/letters/2011/sep/LE TTER-Wideman.html>