

# **Barriers to enhancing project performance through experiential learning.**

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degree of Master of Business Administration**

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## **Abstract**

Experiential learning has been empirically confirmed to enhance performance of project organisations. This research investigates the literature and included field surveys to get insights into the barriers (and by default any enablers) relating to project related knowledge transfer in project orientated organisations. It seeks to explore the reality and perceptions related to experiential learning within an international group of organisations to confirm expected obstacles to learning.

The research follows a quantitative approach in the form of a field survey and includes qualitative insights gained from a secondary data review. It seeks to test the validity of propositions articulating suspected barriers to learning as it is experienced or perceived to exist within the selected sample of organisations.

This study is unique as, although it build on previous research, it introduces a new dimension in that experiential learning aspects as experienced by international organisations are measured simultaneously with conditions within related local organisations. The results confirmed a similar outcome between the two groups in terms of the research propositions and must be used by project orientated organisations to create management awareness in terms of the reality of specific barriers so as to guide implementation of suitable corrective measures.

Keywords: Knowledge transfer, Experiential learning, Project orientated

## Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.



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## 1. INTRODUCTION TO RESEARCH PROBLEM

### 1.1 Background

#### 1.1.1 Role and implications of project management to organisations

Trends towards globalisation, the accelerating development of information technology and the internet revolution are all changing the global market environment. By forcing business organisations to respond to local demands and to local low-cost competition around the world, these trends are increasing competition in the market environment and the way businesses operate (Lampel, Scarbrough, & Macmillan, 2008). The need to innovate and learn under these conditions is often given as the reason for organisations to deploy projects in the organising and execution of work (Lampel *et al.* 2008).

This trend towards a project orientation (or becoming project orientated companies) is happening throughout almost every industry and is doing so in an accelerating fashion (Shenhar & Dvir, 2007). The authors' further state that, as project management (PM) is taking an ever increasing share, it presents an opportunity for businesses to enhance their competitive position by exploring the potential gains that exists in projects. These benefits includes reduced project risk, reduced costs due to avoiding repetition of past mistakes and enhanced project competence to increase future project success (Kotnour, 1999).

Anbari *et al.* (2008) observes that projects offer organisations opportunity to learn and strengthen their PM processes. While projects are being executed a lot of new knowledge is generated when people come up with innovative ideas during problem solving session. Such valuable information and experiences must be deliberately captured and processes, procedures and routines must be made available to support the continuous learning at all levels of the organisation (experiential learning). Experiential learning, for the purpose of this research considered a sub-section or same as organisational learning, is expected to happen through various knowledge transfer mechanisms and reference to organisational learning or knowledge transfer includes the notion of experiential learning. Similarly, the notion of project performance and project success will be used interchangeably.

### **1.1.2 Improving organisational performance using PM**

In a study of more than 600 projects over a period of 15 years, Shenhar & Dvir (2007) found that 85 percent of projects, which include well-managed projects, failed to meet time and budget goals. The root cause of these failures, they found, can be ascribed to a general lack of communicating the extent of project uncertainty and complexity within project teams or failing to adapt management style to a specific situation. Despite a project's uniqueness, the experiences gained in one project can be applied in future projects, providing valuable lessons. By sharing that knowledge a lot of costly reinvention or duplication is avoided (Carrillo, 2005).

Following a well-established set of PM guidelines does not always work. A new framework is needed that acknowledges the continuously changing environment and replaces the traditional predictable, fixed PM model (Shenhar & Dvir, 2007). One adaptive approach is the introduction of continuous learning from project experiences and to then effectively communicate or transfer those lessons learned between project team members and across different projects. Experience shows that it is people who deliver successful projects, not methods and tools, and it is people's ability to engage intelligently with the complexity of projects, that is central to the successful management of projects (Winter, M., Smith, C., Morris, P & Cicmil, S. , 2006).

## **1.2 Research Problem**

Holding lessons-learned review meetings and updating lessons-learned documentation is clearly critical to improving the probability of balancing the triple constraint of time, cost and quality and to prevent repeating mistakes (Seningen, 2005), or preventing a repeat of previous successes. However, learning from previous projects is by no means novelty as well-established methodologies are contained in PM guidelines such as PMBOK® or PRINCE2. One may then reasonably expect that businesses that are predominantly projects orientated will have the mechanisms in place to effectively learn record and share their learning, but evidence exist that projects still consistently fail due to failure of learning effectively in projects or from different projects (Newell, Edelman, Scarbrough, Swan, & Bresnen, 2003). The question therefore arises what is preventing the effective knowledge transfer in and between projects?

### 1.3 Motivation for the Research

Although many organisations have formal processes in place to deal with lessons learned from historical projects, very few can claim that it functions effectively (Marlin, 2008). Discussing and capturing project lessons learned and storing it on a data base is clearly not sufficient, as the knowledge does not get transferred efficiently (Goffin, Koners, Baxter, & Van der Hoven, 2010). Also, even though the benefits from post-project reviews are generally accepted, such reviews are often not conducted in a consistent manner, if at all (Anbari, Carayannis, & Voetsch, 2008). The evidence of these persistent inefficiencies and poor return on learning from a project on the one hand and the potential business gains that can be generated if the learning is maximised and used, warrants further research into what causes this tendency of poor learning and what prevents effective use thereof.

*“Sharing knowledge in a systematic format, documenting lessons-learned and ensuring frequent communication will maximise project success factors”* (Seningen, 2005). The author highlights the important aspect of sharing and communicating project learning in relation to project success. Research confirmed a belief and acceptance that post-project reviews and cross-project learning are beneficial to future project success (Anbari *et al.* 2008). Failure to transfer the knowledge gained from lessons learned, leads to impaired project performance. Nevertheless, a recent empirical study confirms that transfer of learning does not readily happen (Swan, Scarbrough, & Newell, 2010). The

proposed research can make a significant contribution by generating or confirming a list of barriers that constrain effective learning in projects and transfer of that learning to the wider organisation for use in future projects. Previous research showed that the body of knowledge of projects obtained from other projects is positively associated with project performance (Landaeta, 2008). Thus, by eliminating the barriers to intra-project and cross-project learning, organisations can enhance their project successes.

#### **1.4 Research Objective**

It is important to understand how the business context influences the ability to generate and transfer project learning and therefore the mechanisms that either enhance or constrain that ability to effectively learn and transfer knowledge (Swan, Scarbrough, & Newell, 2010). This research investigated the literature and included field surveys to get insights into the barriers (and by default any enablers) relating to project related knowledge transfer in project orientated organisations. The research focused on:

- i. Exploring the effectiveness of institutionalised lessons learned processes and routines within targeted (project orientated) organisations. (How well does it function?).
- ii. The extent to which learning supporting and facilitating infrastructure are being used in target organisations to enhance their project learning. (What learning facilities are available?).

- iii. Identifying which factors affect the sharing of project knowledge intra-project, as well as, across other projects in the organisation and between organisations. (What inhibits free communication and sharing?).

The outcomes aimed to provide clarity and insight into compiling a set of recommendations for project orientated organisations. Recommendations on how to circumvent the barriers identified, so as to leverage future project successes from previous project experiences.

### **1.5 Relevance of study in South Africa**

South African companies are also competing in the global arena and in order for them to remain competitive, they will also have to tap into the knowledge available on inter-project and cross-project learning. Limited research exists on the topic of project learning and transfer of knowledge in a South African context. This research attempted to add to that body of knowledge as the study sample contains a wholly owned Group of international companies which includes South African companies.

## 2 LITERATURE REVIEW

### 2.1 Introduction

The literature review presented an argument for the research within the current academic literature and aimed to highlight pertinent issues relevant to the research problem. The mental model shown under Figure 1.0 was used to approach the literature review.

Figure 1.0 Graphical representation of approach to literature review

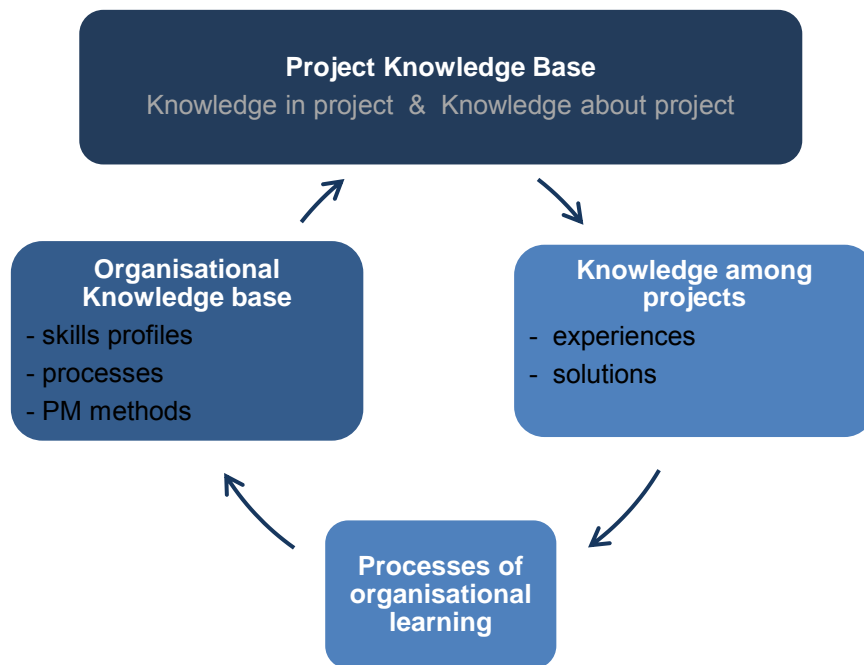


### 2.2 Organisational learning

Project knowledge management (PKM) is knowledge management in project situations and represents the link between the principles of knowledge management and project management (Hanisch, Lindner, Mueller, & Wald, 2009). Citing Schindler (2001), Hanisch *et al.*, (2009) further suggest that

PKM includes more than just knowledge within projects, as it also includes knowledge between projects and about projects. Knowledge within projects is closely linked to the project methodology and the communication practices in projects and it is this knowledge from and between projects that contributes to the organisational knowledge base through processes of organisational learning.

Figure 2.0 Knowledge management and learning in a project environment



Source: Adapted from Hanisch *et al.*, (2009)

Kotnour (2000) drawing on the work of Fiol and Lyles (1985), defined organisational learning as a process of changing organisational actions through new knowledge and understanding. Lampel *et al.* (2008) identified four different levels of project related organisational learning. The authors distinguish between inter-organisational and intra-organisational learning, as well as between inter-project and intra-project learning. They define intra-project



learning as referring to knowledge flow between project members within a project, whilst inter-project learning refers to creation and transfer of knowledge across projects. Intra-organisational learning occurs within and amongst the different divisions of an organisation when they, in a collaborative manner, contribute to knowledge creation and flow related to a specific project. Inter-organisational learning (cross-project learning) relates to knowledge transfer between two or more project orientated organisations working on a project. This research will aim to incorporate aspects of all four levels in determining the barriers that affect project learning.

## **2.3 Role of project management**

### **2.3.1 Projects orientation**

Organisations are becoming more projects orientated due to their need for learning and innovation to improve their competitive positioning (Lampel *et al.* 2008). Research by Swan, *et al.* (2010) found that the type of organisational context in which a project is located does influence learning achieved in a project and the extent to which that learning is transferred organisation wide. They report various factors within the PM environment such as relative number of projects undertaken by a project manager, project scope and available PM competencies and tools as playing a significant role in setting relevant organisational context.

Projects are unique and temporary endeavours with a varying work force and project participants must quickly to adapt to new circumstances and contents of

work. Availability of a suitable process of capturing and securing project knowledge to enable effective functioning under such circumstances is therefore of key importance in a project environment (Hanisch *et al.*, 2009).

### **2.3.2 Project success**

Project success is a multidimensional concept and difficult to define (Lavagnon, 2009). Whereas technical performance used to be the measure for project success, modern project management focuses on the balancing aspect of cost, time and quality factors as the most significant measure of project success (Cooke-Davis, 2004). Lavagnon (2009) in citing Jugdev and Muller (2005), notes that project success is a broader concept than PM success. He notes that PM success may lead to project success, but a project may also fail despite PM success. PM success is therefore neither a necessary nor a satisfactory condition for project success. In the absence of empirical research about project success, Lavagnon (2009) also found project success to be defined in terms of the project's predefined objectives; being the constraints of time, cost, quality or satisfaction.

Project success is positively associated with project knowledge and project knowledge is positively associated with project learning activities (Kotnour T. , 2000). Success in projects is to some extent reliant on the project team's ability to utilise knowledge and experience gained from previous projects undertaken by members or extracting project knowledge (experiences) from others' projects for use in their project (Sense & Antoni, 2003). Transferring of the project knowledge across current and future projects is accepted as critical to

developing dynamic competitive capabilities in the modern day globally competitive market place (Newell & Edelman, 2008). Nevertheless, Newell & Edelman, (2008) further noted that project teams frequently miss their stated objectives and gain limited organisational learning from their experiences. This is valid argument for exploring the causes of sub-standard learning within project orientated organisations.

### **2.3.3 Learning from projects**

#### **2.3.3.1 Project learning practices**

Project learning practices are the set of actions the project teams use to create and share knowledge within and across projects (Kotnour T. , 2000). The ability to attain continuous improvement has been identified as a significant means to secure operational efficiency and effectiveness to sustain the competitive advantage within an organisation (Wong, Cheung, & Fan, 2009). In the research done by Wong *et al.* (2009) they conclude that the ability to learn from mistakes should be a core competency of any project orientated organisation in their strive to improve project success. Their research focused on the impact of learning styles on leveraging from organisational learning acquired during project execution and builds on studies by Wong & Cheung, (2008) to confirm the contingent effect of organisational studies on performance outcomes.

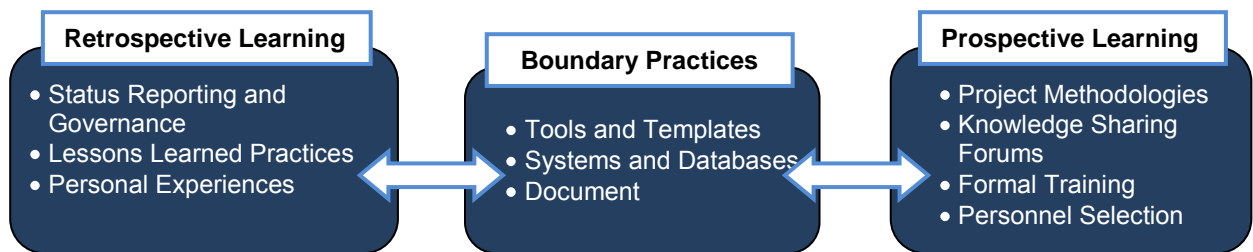
In research by Rhodes, Hung, Lok, Lien, & Wu (2008), they state that the effectiveness of knowledge transfer in organisations is influenced by various key factors such as the learning strategy, structure, culture and processes and supporting infrastructure existing within the organisation. It seems that

applicability of this finding to a projects orientated organisation needs to be confirmed.

### 2.3.3.2 Retrospective and prospective learning

Previous research by Julian, (2008) produced a revised conceptual framework to graphically illustrate the project learning processes within a project environment and facilitated by the project office. Figure 2.0 below depicts what the researcher calls the “collective brokering process”, as a sub-process of the learning processes going on within a projects environment.

Figure 3.0 Collective brokering processes to affect learning



Source: (Julian, 2008)

Retrospective learning practices include activities and processes aimed at generating and reviewing knowledge and experiences from past projects such as lessons learned practices. Tools and templates are employed to capture and store the experiences. Prospective learning practices include activities and processes aimed at transferring knowledge (experiences) from past projects to future projects. The transfer of project methodologies is typically accomplished through templates that are stored on organisations’ intranet portals for use across multiple projects. The tools and templates used are the boundary

practices. Boundary practices refer to those categories that are neutral and favours neither retrospective nor prospective learning categories. Boundary practices can be seen as a means by which process knowledge from the past can be entrenched into organisational routines to the advantage of future projects (Julian, 2008).

#### 2.3.3.3 Management support in project learning

Previous research in cross-project learning reveals that senior managers play an important role in facilitating this type of learning by connecting project members across the organisation (Newell, Bresnen, Edelman, Scarbrough, & Swan, 2006). They found that cross-project knowledge transfer by senior managers functioning in an intermediary role was the most widely cited mechanism for this type of organisational learning. This finding was confirmed in research by Julian, (2008) when participants in a survey overwhelmingly reported “support from senior management” as a key enabler of cross-project learning.

## 2.4 Factors impeding project learning

### 2.4.1 Inherent obstacles posed by institutionalised learning procedures

Literature on intra-project learning revealed a common theme in factors that appear to act as barriers in the lessons learned process and transfer of experiences across projects. Research by Julian, (2008) concluded that the

contents of the information being captured and stored by organisations present a barrier in itself when aimed at future cross project learning; as it does not necessary include all the right information. The author also highlighted the tendency of project practitioners to defer their reflection or learning activities until project completion or until it is too late to effectively gain from the learning experience.

Research by Kim and Wilemon, (2007) found that the most effective way of transferring learning in projects are through project team members and the documents they have generated. They however, concluded that methods for cross pollination in project learning are usually non-existent or not effective. This creates suspicion that organisational processes and systems are perhaps not in place to effectively facilitate the learning process.

An interesting finding by previous research is the perception by a large number of project team members that there is no value or benefits from being involved with lessons learned sessions, as it adds no value to their current project (Newell & Edelman, 2008). Drawing on research by Zollo and Winter (2002), Swan, Scarbrough, & Newell, (2010) surprisingly found evidence that learning mechanisms such as knowledge articulation and knowledge codification have little impact on project learning.

Research by Hanisch *et al.*, (2009) highlighted four project success factors, one of which is organisational methods which is not always project environment specific. The researchers stressed the importance of purposely selecting easy-

to use standards and processes for a project orientated business. The aim should be on easy usage with as little as possible effort to access systems and storing or finding relevant information. This provides evidence that existing procedures, processes and routines or personal perceptions and responses pose inherent impediments to effective learning and transfer of learning in project orientated organisations.

#### **2.4.2 Role of communication in learning and knowledge sharing**

An organisations competitive advantage lies in the knowledge residing in the minds of employees and the capability to harness the knowledge for meeting its business objectives (Tan, Carrillo, Anumba, Bouchlaghem, Kamara, & Udejaja, 2007). People will more readily consult other people for information rather than reverting to documentation for information (Mintzberg, 1973). In a project environment it is no different and communication provides the critical link between people, ideas and information which is critical for project success (Project Management Institute, 2004).

In a study by Hanisch *et al.*, (2009) it is found that communication is important across all levels of hierarchy and the research suggest the systematic support of knowledge exchange on an in-formal basis ranging from project rehearsals to company-wide events. Research by other researchers also confirmed the important role played by social networks in the transfer of knowledge (Newell, Bresnen, Edelman, Scarbrough, & Swan, 2006). Findings in a study by Rhodes, Hung, Lok, Lien, & Wu, (2008) suggest that *“good communication and a trust culture among employees enhance tacit knowledge transfer (socialisation) and*

*are vital to organisation innovation*". Social networks such as informal meetings, coffee gatherings and workshops are excellent means to share knowledge with colleagues (Foos, Schum, & Rothenberg, 2006). Project specific characteristics such as tight schedules and budgets or geographically dispersed projects, however, reduce the opportunities for social communication.

Bresnen, *et al.* (2003) and cited by Julian (2008) also found that the "*processes of knowledge capture, transfer and learning across projects relied heavily on social patterns, practices and processes among social networks and communities of practice*". Communities of practice (CoP) "*that are deliberately focused on knowledge sharing between projects need to be recognised*" (Ruuska & Vartiainen, 2005). According to Wenger *et al.* (2002) and cited by Ruuska & Vartiainen (2005) "*a community of practice is a group of people who share a concern, a set of problems, or a passion about a topic, and who deepen their understanding and knowledge of this area by interacting on an on-going basis.*" Their function of extracting and communicating knowledge across projects, in particular, can thus be beneficial to project orientated organisations. On the contrary, an employee's willingness to invest own effort into a CoP is a function of the CoP's performance and his perceived benefits and a CoP without fully engaged participants will therefore not necessarily perform or enhance perceived benefits (Wolf, Späth, & Haefliger, 2011).

Managers need to provide opportunity for social interaction to cultivate a nurturing team environment, as it is in the team context that team members find it easy to frequently interact with their peers. Normative pressures induced by



strong team culture may even create an obligation to share experiences with fellow team members. A team climate is also conducive towards development of knowledge sharing attitudes amongst team members (Xue, Bradley, & Liang, 2011).

#### **2.4.3 Trust amongst teams and across project teams**

*“Trust is a willingness to be vulnerable to the actions of another party based on the expectation that the other will perform a particular act important to the trustor, irrespective of the ability to monitor or control the other party”* (Mayer, Davis, & Schoorman, 1995). For project team members, having to admit to mistakes made during projects can be difficult, sensitive issue and needs careful handling, as defensive lessons-learned routines (members protecting self-interests) may hinder projects related organisational learning. In the enacted environment members may perceive a punitive culture which is not conducive to entrenching a knowledge sharing culture (Julian, 2008). Management has a responsibility to play a supportive roll in knowledge transfer as they should influence behaviour towards openness and transparency; it should be possible to communicate and tolerate mistakes (Hanisch *et al.*, 2009).

Research by Smyth, Gustafsson, & Ganskau, (2010) argues that organisational and inter-organisational cooperation operates to a large degree upon trust. Trust can enhance an organisation’s competitive edge and help improve its performance (McNeish & Mann, 2010). It is considered the foundational in forming and maintaining relationships Baier (1994) and cited by Smyth *et al.*

(2010). Kotnour, (2000) notes that the project learning processes should be supported by a comforting environment which allows team members to freely admit mistakes and discuss solutions for problems.

McEvily, Perrone, & Zaheer (2003) introduced the notion of trust as an organising principle in that it presents a logic by which work is coordinated and information is gathered and used within and across organisations. They further note that trust affects the relative position of actors within a social network and changes the shape and structure of the network. Trust, they say, implies the formation of new relationships within a network and not only grows the network, but through trust transfer, the density of relationships in the network increases through increased number of relationships in every link. In a study by McNeish & Mann (2010) they also found that trust plays various roles in knowledge sharing. It acts as an antecedent to knowledge sharing and in the context of relationships building, *“it operates to strengthen the relationship, and the relationship, in turn, provides more reason to trust”*. Research has shown that trust increases the willingness to undertake shared activity (McNeish & Mann, 2010; Mayer *et al.*, 1995). Research by Julian (2008) showed a network of strong relationships as an enabler of cross project learning.

Although explicit knowledge can be understood, verified and shared in an environment of little trust, sharing of tacit knowledge, which is personal knowledge and based on personal experience and values, becomes more difficult under such conditions (McNeish & Mann, 2010). Trust seems conducive to a sharing mentality and evidence from these findings are basis for an

argument that trust amongst project team members is a critical element in creating an environment conducive to knowledge sharing or project learning.

However, in research citing Burts, (1992) it is argued that although strong networking ties (which implies mutual trust) can augment knowledge exchanges in organisations, it is not always required or even desired. Weak ties, it is argued, allow for “*a wider diversity in knowledge creation and a more effective, knowledge richer, non-redundant knowledge transfer*” (Schleimer & Riege, 2009).

Culture is also of fundamental importance to the success of project knowledge management as pointed out in the study by Hanisch *et al.*, (2009). Their study further suggest that in order to build a trustful and cooperative environment within the project orientated organisation, cultural differences have to be specifically considered and addressed in appropriate ways. This is consistent with research by Lam & Lambermont-Ford, (2010) who found that national culture can strongly influence the design and shape of knowledge management.

Research by Maurer, (2010) found that trust is advantageous in project orientated organisations and allows access to project external and novel information and insights. Access to valuable outside information assists in exploitation of project opportunities. Their findings accentuate the significance of trust as a social pattern to effective project knowledge management. Unfortunately, the temporary nature of projects relates to high people turnover and the process of building and imbedding trust in a project environment therefore becomes challenging.

#### 1.1.4 Supporting infrastructure for organisational learning

In a relentlessly changing market environment, project orientated organisations needs to frequently re-assess and adapt their project competencies (Lampel *et al.* 2008). Deliberate investment in resources such as staff, infrastructure, procedures, processes and routines are required and specific budget funding should be available to facilitate and support learning activities in the organisation (Kotnour & Vergopia, 2005). Organisations thus need to put sufficient and deliberate systems in place to support and facilitate learning activities, if they want to implement systematic inter-project learning in the organisation (Zedtwitz, 2002).

A word of warning comes from the research by Hanisch *et al.*, (2009) who states: *“the best systems and methodologies for the storage and dispersion of knowledge gained in projects are useless if the employees resist them.”* They do however advise that a system of high quality and a systematic approach aligned with the needs of the project and organisational structures were found to sustain successful management of project knowledge. A similar finding comes from Narteh, (2008) who argues that learning can only take place when people have the capability to absorb knowledge and “are backed by organisational systems that support learning.”

Research literature, however, also suggests that an extended project effort to transfer knowledge from one project to another may negatively affect the costs, budget and schedule objectives (Landaeta, 2008). The researcher’s findings

emphasise the direct cost implications related to investments in over extended growth of transfer methods and technologies. It could thus be argued that, although cross-project learning is beneficial to project success, (Anbari *et al.* 2008), a cost-benefit issue comes into affect which may neutralise any perceived benefits.

Research by Julian (2008) confirmed that leaders within a project management office (PMO) setting makes available a system with useful structures and processes and put in place a culture to foster and facilitate organisational learning and continuous improvement in the project environment. Organisational routines have been highlighted by previous theorists and researchers as a means to embed collection of knowledge into the day-to-day tasks of organisational members (Becker, Lazaric, Nelson, & Winter, 2005). The organisational structure and imbedded systems, processes and routines are therefore an important focus for this study.

This research focused on enhancing project performance through intra organisational knowledge sharing, which includes geographically dispersed international companies within the same group of companies. Previous research suggests that intra organisational knowledge transfer, including that between affiliated organisations and stakeholders are greater than that between independent organisations (Riege, 2007). This serves as argument that commonality in supporting infrastructure is conducive to knowledge transfer and information sharing and may positively influence organisational learning.



### 3 RESEARCH PROPOSITIONS

Research propositions were formulated to address the research problem and those had been guided by the literature. The research issue addressed was the barriers to effective project learning which prevent organisations from leveraging future project successes. The research propositions included the following:

- i. Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of institutionalising the learning supporting procedures and routines.
- ii. Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of social communication.
- iii. Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of trust between project members.
- iv. Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of learning supporting and facilitating infrastructure in the organisations.

## **4 RESEARCH METHODOLOGY**

### **4.1 Introduction**

This chapter presents the research approach, design and methods used to research and analyse the problem statement in Chapter 1. The research process included a quantitative research process in the form of a survey and a minor qualitative component in the form of insights gained from a secondary data review. The research focussed on various multinational group companies, but within one global organisation and as such this approach can be considered a case study approach as pointed out by Perry (2001) and cited by Tobin (2006).

### **4.2 Research approach**

Research can have elements which are based upon an empirical or a non-empirical approach or it could contain a combination of elements from both these approaches (Tobin, 2006). If an empirical approach is considered, Tobin (2006) notes the following three primary dimensions which can be evaluated for use:

- Qualitative/quantitative
- Deductive/inductive
- Subjective/objective.



#### **4.2.1 Empirical /Non-empirical research**

In the process of scientific investigation, the collection of data forms a fundamental component of the research process (Welman & Kruger, 2005).

#### **4.2.2 Quantitative/Qualitative research**

Quantitative studies rely on exploration and interpretation of numbers and figures, whilst qualitative research bases its findings on words, sentences and narratives. There are no predetermined indicators for which type of study would be more appropriate than the other. Many research studies can be performed with either method or even a combination of both approaches (Blumberg, Cooper, & Schindler, 2008).

Since the purpose of this research was to confirm the barriers that impede inter-project and cross-project learning through investigating known issues rather than to probe for deep insights to uncover new information, a quantitative approach was deemed appropriate for this study. Digging for deep insight and uncovering new information is more typical for a qualitative approach.

#### **4.2.3 Deductive/Inductive research**

The authors Hussey and Hussey (1997) cited by both Welman and Kruger (2005) and Tobin (2006) refer to a possible deductive or inductive approach to research. According to Welman and Kruger (2005) deduction means testing of theory, which is more appropriate in a quantitative research approach.

Deductive inference means starting off with one or more proven or accepted true statements and then to conclude from that another logical true statement; going from the broad and general to the more specific. Induction, they note, means the collection of qualitative data and building of theory. The inductive approach means to start off with an individual case or cases and to then proceed to a general theory; in order to generalise to all cases based on the conclusions reached from observing one or more cases.

This research followed a deductive approach appropriate to quantitative research.

#### **4.2.4 Subjective/Objective research**

According to Tobin, (2006) another significant choice within the research paradigm is subjectivity and objectivity. Subjective research refers to the extent to which a researcher is involved in or influences the outcome of research. An objective approach refers to the extent the researcher distanced him or herself from the empirical work.

In this research an objective approach was adopted in line with the research objectives and quantitative approach.

### **4.3 Research design**

A research design is the strategy for a research study and represents the plan by which the strategy is to be executed (Blumberg, *et al.* 2008). A number of

different design approaches exist. Blumberg *et al.* (2008) describes several of which includes the following:

- i. Exploratory versus formal
- ii. Observational versus interrogation
- iii. Case versus statistical

Exploratory studies tend to be loosely structured and have the objective to develop hypothesis or research questions for further research. A formal design starts with a descriptive account of the current situation and follows with the hypothesis or research questions. It involves precise procedures and data source specifications with the aim to represent a valid current state and specific hypothesis to be tested or research questions to be answered (Blumberg, *et al.* 2008).

According to Blumberg *et al.* (2008), data from secondary sources can help a researcher decide what needs to be done and it can be a rich source of research propositions. This study thus followed an exploratory approach by refining the research propositions through a search of secondary literature. Blumberg *et al.* (2008) notes that discovery becomes easier if the researcher can analyse cases that provide special insight. This study took a case study approach with the intention to study project learning in 14 organisations belonging to the same global group of companies with perceived similar methodologies, processes and routines, but which are geographically dispersed and diverse in their culture and views.

The research objective was to ask “what” and “how” questions around the research topic. Hence, a more formalised, quantitative descriptive design was appropriate to the purpose and scope of the research. The type of research design selected was that of a survey design in line with the quantitative and non-experimental research approach. The research used an empirical approach backed by the non-empirical data obtained from a literature review. A quantitative study was performed to explore the complexity and outcomes of cross-project learning procedures in use at project organisations at the time of the survey execution. The study consisted of a 2-stage design that started off with a secondary data analysis which included prior studies, as well as exploration of some of the participating organisations’ own data. The main advantage of using secondary data are that the specific approach is quick and economic (Blumberg, *et al.* 2008).

The secondary data was augmented with a survey at participating organisations to gather insights into current work procedures, experiences and routines to help explore the research objectives. The survey consisted of an on-line Likert-scale type questionnaire that had been distributed to project management practitioners in target organisations.

The unit of analysis for this study was the project practitioners employed by the selected participating organisations. Firstly, their perception of how effective their institutionalised learning processes and routines function and secondly, the availability of learning supporting infrastructure in their specific organisational environment were explored. At the same time, the survey endeavoured to

capture the extent to which social communication is facilitated within their organisation and the existence of an environment of trust amongst in and amongst project teams. These measurements, all done in relation to project learning success within the relevant participating organisations, allowed inferences about the barriers being experienced by the project practitioners.

#### **4.4 Population and sampling**

A population can be described as an assemblage of all units of analysis a researcher may want to draw conclusions about and the idea of sampling is that by selecting some of the elements in a population, conclusions may then be drawn about the entire population (Blumberg, *et al.* 2008). In this research, the population of relevance was all project practitioners working with the 14 selected Howden Group companies. The sample frame consisted of all project practitioners belonging to the selected project orientated organisations.

A non-probability purposive sample of project participants was drawn from the list of all the project orientated Howden Group companies. A purposive sample is obtained where researchers use their experience to deliberately obtain units of analysis in such a manner that the sample they obtained may be regarded as being representative of the population (Blumberg, *et al.* 2008). This method of sampling was chosen for ease of access to the population and because it was the cheapest and easiest to conduct given the limited time frame for completing this study. None of the framed project practitioners were obliged to participate. It is therefore important to note that, in order to persuade them to participate in

the research survey, a possible relationship exists or might have developed, between the researcher and the respondents.

#### 4.5 Data collection, data analysis and data management

Table 1 reflects the data collection method, sampling technique and sample size for each of the proposed research phases (Blumberg, *et al.* 2008).

Table 1.0 Research Phase and sampling information

Research Phase	Aim	Data collection method	Sampling technique	Sample frame
1	Secondary data analysis Surveys	Document reviews Likert-scale type questionnaire	Non-probability purposive judgment sampling	80

The collection and analysis of data need to take place iteratively in order to obtain an in-depth understanding as the process progresses. The process of data management was continuous throughout the process and the efficacy thereof determined the quality of results.

##### 4.5.1 Data Collection

Data collection included analysis of secondary data by means of document reviews, followed by a Likert-scale type on-line survey. The purpose for collecting data was to determine the characteristics of intra-project and cross-project learning procedures and processes or routines in use by the target organisations. The first group of four questions (demographic questions)

determined demographics of the respondents, while the next 31 questions (survey questions) were aimed at gaining research information specific to the research propositions. These 31 survey questions were grouped in five groups containing six questions each and question 31 (Q31) as a separate group. The questions related to the first four groups were each aimed at a specific research proposition, while the fifth group was aimed at obtaining a measure of perceived successful learning within a respondent's organisation. The last group (or Q31) aimed at obtaining a ranking or measure of perceived importance of each of the factors being researched.

#### **4.5.2 Survey Questionnaire**

The six groups of 31 survey questions were based on insights that had been gathered from the literature review and that represented an attitudes measure designed to allow respondents to indicate how strongly they agree or disagree with carefully constructed statements that range from very positive to very negative toward a relevant attitudinal object.

The first 24 questions were grouped and categorised to address specific research propositions, while the next six questions (Q25 to Q30) were aimed at establishing a measure of perceived success in terms of participants learning and the extent where to their organisation is perceived to comply or facilitates project learning. The last question, (Q31) was aimed at establishing participants' perceptions of the relative importance of the various factors that may or may not impede learning. This question posed five alternative answers

and the question is structured such that it allowed for participants to select (rank) proposed answers in a sequence of importance to themselves. Where appropriate, questions were adopted (and adapted) from research questionnaires used in previous research. The results of questions 31(a) to 31(e) were used to test the outcomes as reflected by the grouped categorised questions in order to support the results. An overview of the survey questions and their purpose is reflected by table 2.0 below.

Table 2.0 Grouping of survey questions

Questions	Purpose	Applicable Proposition/construct
Q1 –Q6	Address research proposition I	Institutionalisation of processes
Q7 – Q12	Address research proposition II	Social communication
Q13 – Q18	Address research proposition III	Trust
Q19 – Q24	Address research proposition IV	Learning support
Q25 – Q30	Measure of learning success	Perceived “learning success”
Q31a –Q31e	Ranking of factors	All research variables for Q1 –Q24

The questionnaire was pre-tested by three project team members from a local Howden projects-orientated company to determine clarity of questions and general workability of the questionnaire. Based on the test outcomes and their feedback, the instructions for the last question were modified to remove ambiguity in how the ranking of answers should be attempted.

### 4.5.3 Data analysis

Univariate statistical analysis was used to analyse the survey in order to address the research propositions stated in Chapter Three. This included



descriptive statistics and frequencies to detect patterns and to explore relationships between variables (Blumberg, *et al.* 2008). These were followed by reliability checks and inferential statistics to test the research propositions.

A narrative approach was followed for analysis of information gained from secondary data. Narrative analysis is a powerful approach for conducting explorative research and was used to distil information from the data to allow insights into the perspectives of the respondents. (Blumberg, *et al.* 2008).

#### 4.5.3.1 Data Analysis for first research proposition

Six measurement questions (Q1 to Q6) included within the survey questionnaire were aimed at assessing the extent to which learning supporting procedures and routines in the target organisations had been institutionalised towards guiding intra- and inter-project learning in the organisation. This group was named f1.

#### 4.5.3.2 Data Analysis for second research proposition

Six questions (Q7 to Q12) included within the survey questionnaire were aimed at assessing the extent to which social communication takes place or is allowed to take place to enhance intra- and inter-project learning in the organisation. This group was named f2.

#### 4.5.3.3 Data Analysis for third research proposition

Six questions (Q13 to Q18) included within the survey questionnaire were aimed at assessing the extent of trust that exists amongst all project team members and between them and their superiors that may enhance intra- and inter-project learning in the organisation. This group was named f3.

#### 4.5.3.4 Data Analysis for fourth research proposition

Six questions ( Q19 to Q24) included within the survey questionnaire were aimed at assessing the extent to which learning supporting and facilitating infrastructure in the target organisations exists to guide intra- and inter-project learning in the organisation. This group was named f4.

#### 4.5.3.5 Rationale behind categorisation of questions

By categorising the questions to address this specific proposition, scale reliability checks were performed to use the overall score of the group of questions rather than using results on an individual question basis (obtained from individual questions supporting the proposition).

A further set of subscale scores was generated for each supportive question through a frequency count of specific answer choices and by determining the percentage out of total survey responses for each answer choice.

The assessment scores obtained from the four categories of results (f1 to f4) were used to determine how the measured impact of the proposed barriers correlates to the measured perceived project learning success. This measure for perceived project learning success was obtained from survey responses related to questions Q25 to Q30. This group (Q25 to Q30) was named f5.

#### 4.5.3.6 Rationale behind demographic questions

Demographic information was captured to enable comparison of results between different groups of respondents. It also allows an understanding of the make-up of the sample and the type of response errors that can be expected. The outcome of which is described in Chapter Five. Groups could be distinguished in terms of (i) country of origin, and respondents' (ii) age, (iii) qualifications and (iv) experience.

#### **4.5.4 Data Validity**

Due to the quantitative nature of the study, it was prone to biases typical to a quantitative research. These might have included response and non-response errors related to the survey. The availability of respondents and the effort placed by them on the completion of questionnaires might be a limitation on the overall quality and validity of the data obtained. Respondents naturally tend to be positive about them when asked about their attitudes or behaviour and there is a possibility that deliberate falsification of data or over optimistic responses could have been given to reflect a positive self image (Blumberg, *et al* 2008).

#### **4.6 Research Limitations**

This research was aimed at organisations within a wholly owned global Group of companies and although valid within the constraints of the sample frame, findings may not be generally transferable to any other organisations. The use of secondary data may be questionable for various reasons. It may not be detailed enough or since it was collected for another purpose, it may not cover the information relevant to the study (Blumberg, *et al.* 2008). Use of a case study might have limited the potential for generalisation of findings (Swan, Scarbrough, & Newell, 2010).

#### **4.7 Summary**

A quantitative descriptive approach was deemed appropriate for this study. Research propositions were explored and refined through a search of secondary literature and the research process then followed an objective deductive approach appropriate to a quantitative study. The type of research design selected was that of a survey designed in line with the quantitative and non-experimental research approach. The research used an empirical approach backed by the non-empirical data obtained from a literature review. Research was done by means of an on-line Likert-scale type questionnaire and secondary data review. The unit of analysis for this study was the project practitioners of various group companies within one international organisation. Respondents were obtained from a non-probability purposive sample taken from these companies. Four introductory questions contained in the on-line questionnaire

aimed at determine demographics of the respondents, while the next 31 survey questions were designed at gaining research information specific to the research propositions.

The research results are presented in the next chapter.

## 5 RESULTS

### 5.1 Introduction

This chapter describes the results of the data analysis. Insights gained from a review of company secondary data is followed by the research survey results. The survey results follow a three prong approach starting with descriptions of the survey responses and the coding scheme employed in analysing the data. This is followed by statistical presentation of the raw data obtained from the on-line questionnaire and concludes with a presentation of the specific results for each proposition.

### 5.2 Review of Company Secondary Data

A review of available company documents were done to look for evidence and to establish an understanding of the extent of project learning currently being done within the local companies. This was meant to provide some organisational context for preparation of the survey questionnaire and interpretation of survey results.

Evidence of regular project review meetings were found where reference to previous project failures, successes and relevant solutions are being referred to. Performance of “*post mortem*” meetings are a compulsory requirement of project management processes within the Howden group and stipulated as such in the organisation’s Group Operating manual (GOM). Actual procedures for execution are contained in the organisation’s Work Procedures

specifications (WPS). A copy of typical review documents related to a project *post mortem*-meeting is included under Appendix C.

Further evidence of organisational learning programmes includes an outsourced mentoring programme for young engineers and an “engineering forum” based on the company intranet. All engineers and project team members have access to the engineering forum to share and exchange any technical or interesting subject relevant information.

### **5.3 Sample for Survey**

#### **5.3.1 Sample Description**

Project members from project orientated companies within the Howden group were approached to voluntarily participate in completion of an on-line survey.

Participants were selected from a list provided by the Human Resources department and selection was based on their role and involvement in project activities in their respective companies or business units. This approach was followed for the sake of convenience and economy. The link to the on-line survey was e-mailed to 44 project participants in South African based Howden group companies by the researcher.

Permission was obtained from Howden Global management and an individual at global head office in Glasgow (responsible person) was briefed on the profile of prospective participants in order to distribute a further 40 on-line questionnaires to the international group companies. The responsible person identified 36 project participants as suitable for the purpose of participation in

the survey and provided all of them with the survey on-line link from the Global head office.

A total of 80 questionnaires were thus distributed locally in South Africa and to international group companies. The international respondents included project participants from organisations based in countries in Europe, North America, South America, Russia, China, India and Australia. Due to limited availability of suitable candidate respondents in some of these organisations, an even distribution could not be achieved amongst all these countries and low response rates were expected.

All responses, local and international, were completed and submitted on-line for retrieval and consolidation by the researcher. The survey was open for participation for a period of two weeks subject to response rates being acceptable. To enhance the response rate, reminders were posted one week after launching of the survey. The survey was also kept functional for submission of responses for a further week.

### **5.3.2 Responses**

From 80 questionnaires distributed, a total of 51 responses were received with two respondents who withdrew after having answered the demographics related questions only or in the second case, not having completed more than 50% of the questions. Both this incomplete responses were deemed null and void and discarded in total. A final sample size of 49 complete responses was thus achieved which represents a 61.25 % survey response rate and consists of 24



responses from the South African group companies and 25 responses from international group companies. The sample was considered of significant size to perform statistical calculations ( $n > 30$ ).

### **5.3.3 Response Bias Errors**

Response bias errors can be expected in the survey results. This could come in the form of social desirability bias, auspices bias or acquiescence bias (Zikmund, 2003). Learning from projects is not a new concept and many respondents have already been aware that learning has to take place; this could therefore introduce acquiescence bias into their responses. Social desirability bias is also expected in view of the top down distribution of the survey. Respondents, especially the international component, were aware that the survey is issued from (and probably supported by) global head office and they were likely to provide answers that protect their business unit or their own position. As this research was not conducted by an independent third party but by Howden employees, patronage or auspice bias may in a similar way have prevented respondents from revealing the full reality of the situation in their business unit.

### **5.3.4 Questionnaire and Coding Scheme**

The questionnaire, a copy of which is included under Appendix A of this report, consists of seven pages. Page one contains four demographic type questions. Pages two to page seven contain 31 questions related to the research propositions stated in Chapter Three.

According to Blumberg, *et al.* (2008) a coding scheme contains each variable in the study and specifies the application of coding rules to the variable. A coding scheme was deemed appropriate for this survey and the results for some sections were thus coded as follows:

- Responses to survey questions one to thirty (Q1 - Q30) were coded with series of numbers one to five. Starting with the response “*Fully agree*” = 1 and increasing to response “*Don’t Agree at all*” = 5.
- Coding for question 31 was different with ranking “*Most important*” = 5 and decreasing to ranking “*Least important*” = 1.

Questions were grouped and categorised to measure specific attributes, for example, measurement questions Q1 – Q6 on page two, measuring data related to the attribute of “institutionalisation of learning supporting procedures and routines” were grouped as variable f1. It is thus aimed at measuring respondents perceptions around the proposition related to that attribute. Similarly, Q7 – Q30, related to other attributes were grouped as variables f2, f3, and f4 respectively.

The group containing Q25 – Q30 measures level of learning success as perceived by the respondents. Table 3.0 below, represents a summation of the question grouping and categorisation used and indicates the link between the questions and respective attribute or propositions.

Table 3.0 Grouping and categorisation of measurement questions

Questions	Variables	Attribute	Proposition
Q1 – Q6	f1	Institutionalising procedures and routines	I
Q7 – Q12	f2	Social communication	II
Q13 – Q18	f3	Trust between project members	III
Q19 – Q	f4	Supporting and facilitating infrastructure	IV
Q25 – Q30	f5	Perceived “learning success”	common

Demographic questions were coded with number series starting from “1” up to the total quantity of answer options available per specific question. The answer options related to the question on country of location were coded “1” for South Africa and “2” for any other country.

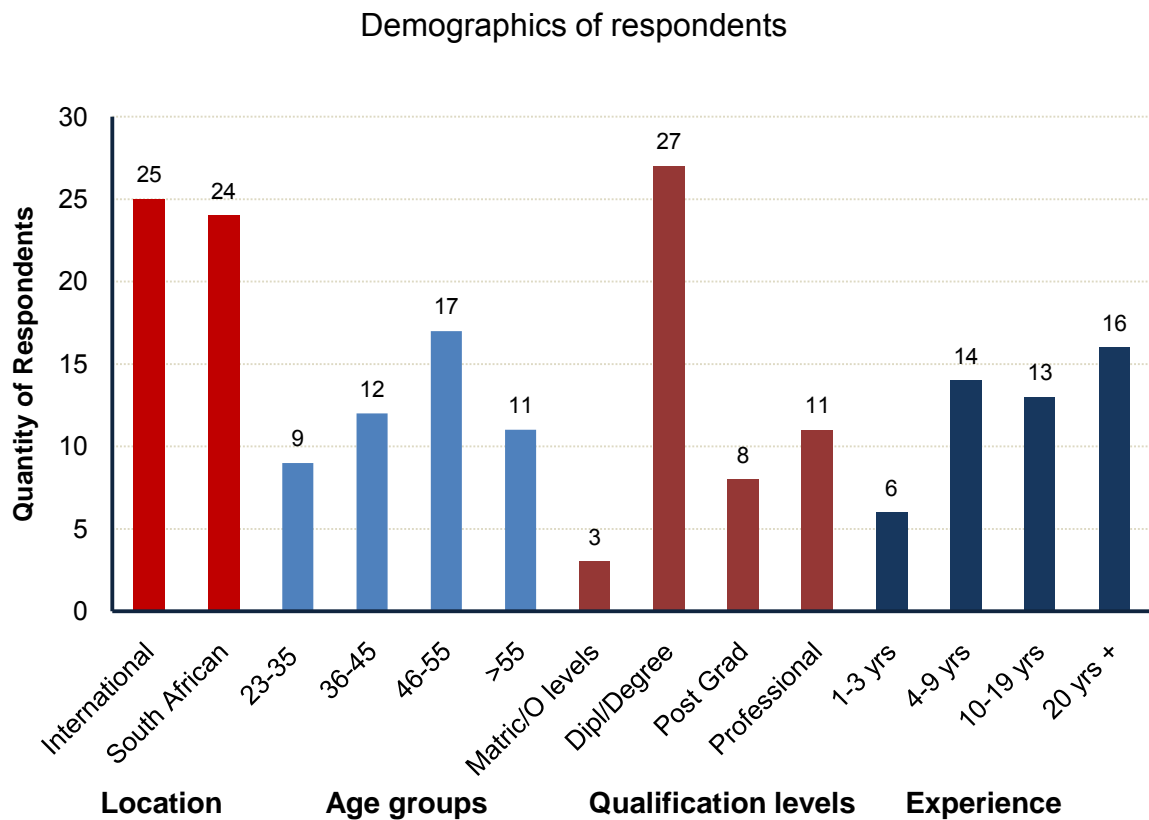
## 5.4 Analysis

All questionnaires were coded into a single spreadsheet and the number of occurrences per Likert-scale category (1 to 5) was recorded. Descriptive statistical calculations were performed on this data set.

### 5.4.1 Demographics of respondents

The sampling frame demographics shown in figure 3.0 below are reflected from a frequency perspective for the demographics, namely country grouping, age, qualification and experience.

Figure 4.0 Demographics of survey sample



#### 5.4.1.1 Location

Respondents were drawn from a wide variety of countries. A total of 25 respondents were from nine international group companies and the balance of 24 respondents from South African group companies. Representation per international country was too low for any significant inferences on a “per country” basis and they were thus grouped together for possible comparative purposes as an international group versus the South African group of respondents.

#### 5.4.1.2 Age

Ages of the respondents were deemed important as differences in age may lead to biases in terms of perceptions of how the factors affecting project learning are perceived. The age between respondents were relatively evenly spread between age groups 23-35 years (18,5%), 36-45 years (24,5%), 46-55 years (34,5%) and 55 years plus (22,5%). This provided a representative distribution across the range of age groups within the survey sample.

#### 5.4.1.3 Qualification

The project management discipline has historically been open for entrance to individuals with any qualification ranging from a Matric to post graduate or professional level. The researcher deemed an understanding of qualification levels of respondents important, as this may significantly impact the context for the age and experience profile of the sample. The majority of the respondents (55%) are diploma/degree qualified, and a further 38% hold a post graduate or professional qualification. They therefore have an educational background and conceptual ability to grasp the concepts of this research context.

#### 5.4.1.4 Experience

The number of years experience gained in a project environment was deemed important as it could be argued that with experience come new insights and perspectives. Different levels of experience may therefore lead to biases in terms of how the factors affecting project learning are perceived. An

understanding of the experience levels would thus be helpful in assessing any imbalance in respondents' perspectives.

The years of experience between respondents were relatively evenly spread with respondents between 1- 3 years experience (12%), 4-9 years experience (28,5%), 10-19 year experience (26,5%) and 20 years plus experience (33%). This spread provides a representative distribution across the range of experience within the survey sample with the lowest representation from the least experienced group.

#### **5.4.2 Reliability checks**

Reliability is the consistency of a set of measurements (or of a measuring instrument) and thus reflects whether several factors that propose to measure the same general construct produce similar scores (StatSoft, 2011). By performing reliability tests on the survey questions, the researcher could determine the consistency of support of each group of questions in support of the respective proposition rather than having to rely on support of individual questions.

The reliability of the measurements was evaluated using Cronbach's alpha ( $\alpha$ ). Reliability assessments were done on questions Q1 – Q30 to assess the Cronbach  $\alpha$  for the various groups of questions (f1 to f5). Table 4.0 presents the respective Cronbach  $\alpha$  obtained for each group of questions.

Table 4.0 Reliability of questions

Cronbach Coefficient Alpha		
Variables	Alpha	Alpha
f1	0.894	0.894
f2	0.831	0.831
f3	0.282	0.796
f4	0.816	0.816
f5	0.757	0.757

Cronbach  $\alpha$  for group f3 was found to be 0.282 (or  $<0.5$ ). By elimination of questions 17 and question 18, an acceptable Cronbach  $\alpha$  of 0.796 was obtained. For all Cronbach  $\alpha > 0.7$  it was concluded that the reliability scores of all the constructs are considered adequate as they exceed the cut-off of 0,70 (Blumberg, *et al.*, 2008). Thus, the scale is reliable for all constructs represented by the respective groups from f1 to f5.

### 5.4.3 Means for data groups

For a data set, the mean is the sum of the values divided by the number of values. The mean describes the central location of the data, and the standard deviation describes the spread. Since it was confirmed that the scale is reliable for all constructs represented by the respective groups f1 to f5, means were calculated for each of these groups rather than for individual questions.

### 5.4.3.1 Comparing Means for Questions 1 to 30

Table 5.0 below reflects a comparison of the respective means as calculated for the various groups f1 to f5.

Table 5.0 Comparison of Means

Simple Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
f1	49	2.53061	0.84140	124.00000	1.00000	4.16667
f2	49	2.27211	0.76504	111.33333	1.00000	4.00000
f3	49	1.84694	0.75487	90.50000	1.00000	3.75000
f4	49	3.12245	0.85036	153.00000	1.16667	4.83333
f5	49	2.57483	0.71772	126.16667	1.16667	4.00000

For group f1, which represents Q1-Q6, the mean equals 2.53. The mean for answers to this group of questions thus lays somewhere between answer choices “*neutral*” and slightly biased towards the answer choice “*partially agree*”.

For group f2, which represents Q7-Q12, the mean equals 2.27. The mean for answers to this group of questions thus also lays somewhere between answer choice “*neutral*” and slightly biased towards the answer choice “*partially agree*”.

For f3, which represents Q13-Q18, the mean equals 1.85. The mean for answers to this group of questions thus lays somewhere between answer choices “*partially agree*” and slightly biased towards the answer choice “*fully agree*”.



For group f4, which represents Q19-Q24, the mean equals 3.12. The mean for answers to this group of questions thus lays “neutral”.

For group f5, which represents Q25-Q30, the mean equals 2.57. The mean for answers to this group of questions thus also lays somewhere between answer choice “*neutral*” and slightly biased towards the answer choice “*partially agree*”.

#### 5.4.3.1 Comparing Means for Question 31

Table 6.0 Comparison of Means

<b>Simple Statistics</b>						
<b>Variable</b>	<b>N</b>	<b>Mean</b>	<b>Std Dev</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Q31a</b>	49	<b>3.87755</b>	1.09226	4.00000	1.00000	5.00000
<b>Q31b</b>	49	<b>2.87755</b>	1.07301	3.00000	1.00000	5.00000
<b>Q31c</b>	49	<b>2.89796</b>	1.08484	3.00000	1.00000	5.00000
<b>Q31d</b>	49	<b>4.08163</b>	1.05745	4.00000	1.00000	5.00000
<b>Q31e</b>	49	<b>1.44898</b>	0.89119	1.00000	1.00000	5.00000

#### 5.4.4 Correlation Tests

Correlation refers to statistical relationships between variables involving dependence and is calculated and expressed in terms of a correlation coefficient. Pearson correlation coefficient, which is sensitive only to a linear relationship between two variables, is a measure of the correlation (linear dependence) between two variables  $X$  and  $Y$ , giving a value between +1 and -1

inclusive. It is widely used in the sciences as a measure of the strength of linear dependence between two variables (StatSoft, 2011).

A Pearson correlation was done to establish the correlation between groups f1 to f5, with p-value < 0,05 (significant at the 5% level). A positive relationship exists between all groups f1 to f5.

A further correlation was performed to test the relationships between the various groups f1 to f5 relative to question 31 (Q31a to Q31e). In view of the small sample, a Spearman correlation was performed as this is type of correlation test is more suitable for small samples. No clear relationships were evident from this test.

#### **5.4.5 Differences between Independent Groups**

For testing of differences between independent groups, variance analysis can be performed (StatSoft, 2011). For multiple groups as represented by the four variables of the demographic portion of the survey data set (country, age, qualification and experience), analysis of variance (ANOVA) significant at 5% level (p-value <0,05) was performed. ANOVA compares the means of groups to test for significant differences between means of the various groups.

Prior to performing ANOVA calculations, the sub-groups within each of the three main groups Age, Qualification level and Experience level were reduced to increase the sample size for each remaining sub-group. This was done to allow more meaningful statistical comparisons without changing the essence of the

data. Table 7.0 below reflects the initial compilation of the three main groups with Table 8.0 listing the adjusted (consolidated) new sub-groupings.

Table 7.0 Initial sub-groupings

Age	N	Qualification level	N	Experience level	N
<23 yrs	0	Matric	3	<1 yr	2
23-27 yrs	3	Diploma/Degree	27	1-3 yrs	4
28-35 yrs	6	Post grad degree	8	4-9 yrs	14
36-45 yrs	12	Professional qualification	11	10-19 yrs	13
46-55 yrs	17			>20 yrs	16
>55 yrs	11				

The sub-groups for Age were reduce from six to four by combining age groups “<23 years” and “23-27 years” with group “28-35 years”. Similarly, the other sub-groups were consolidated.

Table 8.0 Adjusted sub-groupings reflecting consolidated response counts

Age	N	Qualification level	N	Experience level	N
<23-35yrs	9	Matric & Diploma/Degree	30	<1 yr & 1-9 yrs	20
36-45 yrs	12	Post grad & Professional	19	10-19 yrs	13
46-55 yrs	17			>20 yrs	16
>55 yrs	11				

Comparison of the means for the respective modified demographic groups in terms of the variable groups f1 to f5 revealed low levels of variance with the exception of “country”. Table 9.0 below reflects a difference in the means

(variance) between the South African (SA) and international group in terms of group f2 and f3. In comparison, little differences exist between the means of any of the other groups (age, experience level, qualification level) with regard to the groups f1 to f5).

Table 9.0 Comparison of Means with respect to respondents' location

Location (country)	n	f1	f2	f3	f4	f5
South African	24	2.5347	<b>2.5903</b>	<b>2.1771</b>	3.2917	2.8056
International	25	2.5267	<b>1.9667</b>	<b>1.5300</b>	2.9600	2.3533

#### 5.4.6 Frequencies

The purpose of frequency tables is to represent a simple method for analysing categorical (nominal) data. It is an exploratory procedure to review how different categories of values are distributed in the sample. For Question 31 respondents had to rate a five-point [Likert scale](#) assessing their agreement with a statement on a scale on which 1 denotes “least important” and 5 “most important”. Univariate frequency distributions were used to determine the number of times each answer choice was selected. The frequency distribution of their responses, proportion, and cumulative proportion of respondents are listed in Table 10.0 below.

Table 10.0 Frequency distributions for Survey Question 31

Q31a				
Q31a	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	2.04	1	2.04
2	5	10.20	6	12.24
3	11	22.45	17	34.69
4	14	28.57	31	63.27
5	18	36.73	49	100.00
Q31b				
Q31b	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	10.20	5	10.20
2	13	26.53	18	36.73
3	17	34.69	35	71.43
4	11	22.45	46	93.88
5	3	6.12	49	100.00
Q31c				
Q31c	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	6.12	3	6.12
2	18	36.73	21	42.86
3	13	26.53	34	69.39
4	11	22.45	45	91.84
5	4	8.16	49	100.00
Q31d				
Q31d	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	2.04	1	2.04
2	3	6.12	4	8.16
3	10	20.41	14	28.57
4	12	24.49	26	53.06
5	23	46.94	49	100.00
Q31e				
Q31e	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	36	73.47	36	73.47
2	7	14.29	43	87.76
3	4	8.16	47	95.92
4	1	2.04	48	97.96
5	1	2.04	49	100.00

## 6 DISCUSSION OF RESULTS

### 6.1 Introduction

This chapter interprets the research results and provides the main findings from the research. It focuses on the relationship between the research objectives stated in Chapter One, the relevancy of the applicable theory from the literature review under Chapter Two and the research propositions stated in Chapter Three.

In lieu of the four research propositions stated in Chapter Three, a Likert type questionnaire was formulated as a measuring instrument to determine real world answers to the research questions. The questions included in the instrument were designed so as to capture survey respondent's opinions with regard to the research constructs. The questionnaire also included questions for gathering of minor demographic information on respondents, which allows for inferences based on differences in demographic parameters.

The survey results are analysed and presented in Chapter Five. These include the results of the five rank order answers to question No 31. This specific question was formulated to attempt an understanding of respondent's inclination and expectations towards a learning conducive project learning environment in their organisation and/or their expectation to improve on the situation. This could provide clues for recommended management interventions to prioritise removal of different barriers to organisational project learning that may exist in their organisations.

Demographic correlations for the results were limited to the results for location age and experience based responses only. The results were measured against the location of respondents, as a cultural influence on how actions are performed was expected. Unfortunately, the response rates from different locations were too low to make significant inferences on a country to country basis and the research rather focussed on comparisons between two groups, the South African respondents and the international respondents.

Another aspect the researcher deemed sufficiently important for correlation testing was the level of experience of each respondent. Different approaches and opinions was expected from more experienced respondents, since they might have developed or adapted own personal ways and means to handle learning events or opportunities. A significant portion of the sample represented a homogeneous group of educated individuals. The relationships between responses and attributes related to respondents' age and level of education were therefore not considered sufficiently relevant for performing similar correlations.

## **6.2 Respondent response rate**

A 61,25 % survey response rate was achieved. In view of the dispersion of the purposive sample frame and the fact that it was based on voluntary participation, this response rate was considered acceptable and provided a statistical sample size of 49 which is sufficiently significant to perform statistical calculations.

### 6.3 Reliability of Groups f1 to f5

As the value obtained for group the f3 Cronbach  $\alpha$  was smaller than 0,5 level of significance, it represents unacceptable reliability. Cronbach  $\alpha$  can however, be “artificially inflated by making scales which consist of superficial changes” within a data set (StatSoft, 2011). Hence, the data set for f3 was examined for questions that negatively influence the reliability and after exclusion of two relevant questions (Q17 and Q18), a good Cronbach  $\alpha$  of 0.796 was achieved.

From the final Cronbach  $\alpha$  values listed in Table 4.0, it is evident there is consistency of support of each group of questions (f1 to f4) in support of their respective proposition. A similar statement is true for group f5. It was therefore not necessary to use individual questions for further statistical calculations, as the groups f1 to f5 offered reliable representation of the individual questions.

### 6.4 Demographics

A comparison between the international respondents and the South African respondents reveals that the means are similar with respect to f1, f4 and f5, but differ with respect to f2 and f3. The responses from both groups related to questions in groups f1, f4 and f5 are thus very similar and no clear statistical inference can be made regarding these groups from a location perspective. Their respective views on the impact of learning supporting procedures and routines and supporting infrastructure on project learning are similar. The



variance existing between the two locations in terms of groups f2 and f3 however, indicates that the responses from the international respondents is different to their South African counterparts when it comes to their view related to the impact of social communication and a trust environment on project learning, but similar for the other variables (f1, f3 and f5).

In comparison, little differences exist between the means of any of the other demographic groups (age, experience level, qualification level) with regard to all the groups (f1 to f5). This means that age, experience and qualification level of respondents have not had any impact on their responses to any of the questions raised. Or, from a different perspective, it can be concluded that the respondents replied similar to all questions irrespective of the differences in their age, experience and qualification levels.

As it is only those responses related to the impact of social communication and trust, it appears that culture has a clear influence on project members' perceptions and behaviour in the context of their social interaction and the levels of trust they experience in the project environment. This is significant, as it adds another dimension to the notions of enhanced social communication and trust environment. What may be a sufficient level of social interaction and a friendly and trustful environment to enhance free transfer of knowledge and experiences for some project members may be unacceptable to other project members purely from a cultural perspective. Cultural influences can therefore reduce an enabler of learning into a barrier of learning.

## 6.5 Discussion of Research Questions

### 6.5.1 Research Question 1

#### 6.5.1.1 Introduction

One of the objectives of this research was to explore the effectiveness of institutionalised lessons learned processes and routines within project orientated organisations. The purpose was to gain an understanding of the *status quo* within the target project orientated organisations in terms of how well these learning supporting processes and routines are entrenched in the operations and to compare it with the perceived success of project learning as reported by respondents. Feedback from respondents on group f1 questions provided insights on the status quo within the organisation and answers related to group f5 questions reflects the perceived level of learning success. Within that context the proposition “Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of institutionalising the learning supporting procedures and routines” were tested.

#### 6.5.2 Analysis

Questions in group f1 explored perceptions around impact of learning supporting and facilitating processes and routines on project learning. Thus analysing group f1, which represents Q1 - Q6, the mean was found to equal 2.53. The mean for answers to this group of questions thus lays somewhere between answer choice “*neutral*” and slightly towards the answer choice “*partially agree*”. This provides evidence that learning supporting and facilitating

lessons learned processes and routines in the participating organisations are institutionalised.

Questions in group f5 measures respondents' perceptions regarding the successfulness of project learning within their own organisation. Analysing group f5 responses, which represents Q25 - Q30, the mean is found to be equals 2.57. The mean for answers to this group of questions thus also lays somewhere between answer choice "*neutral*" and slightly towards the answer choice "*partially agree*". This provides evidence that project learning is perceived by respondents to be successful.

Question 31 was aimed at establishing participants' perceptions of the relative importance of the various factors that may or may not impede learning. This question posed five alternative answers and the question is structured such that it allowed for participants to rank the proposed answers in a sequence of importance to themselves. From the mean value of 3.88 for Q31a, it is inferred that institutionalising of project learning procedures and routines is perceived to be an important enabler of learning. Since most respondents are of the opinion that project learning is successful within their respective organisations, it can be argued that in view of the above, a lack of institutionalising of project learning procedures and routines are indeed seen to be a barrier to project learning.

### 6.5.3 Conclusion

This finding is similar to the outcome in a study done by Ajmal, Helo, & Kekäle, (2010) confirming that the lack of an appropriate system were perceived to be one of the most significant barriers for successful knowledge transfer in a project environment. This implies that well institutionalised procedures and routines to capture and share knowledge can be a significant enabler of successful project learning and a definite way to building competitive advantage.

## 6.6 Research Question 2

### 6.6.1 Introduction

Another objective of this research was to identify factors that affect the sharing of project knowledge intra-project, as well as, across other projects in the organisation and between organisations. What inhibits free communication and sharing? The purpose was to gain an understanding of the level of social communication that exist within the target project orientated organisations and to compare that with the perceived success of project learning as reported by respondents in group f5. Similar to above, respondents' feedback to f5 reflects the perceived level of learning success and context for testing the proposition "intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of social communication.

### 6.6.2 Analysis

Questions in group f2 explored perceptions around social communication and how it impacts project learning. Thus analysing group f2, which represents Q7-Q12, the mean was found to equal 2.27. The mean for answers to this group of questions thus also lays somewhere between answer choice “*neutral*” and slightly towards the answer choice “*partially agree*”. This is evidence that social interaction happens and therefore does play a role in communicating lessons learned.

The mean for questions in group f5, which measures respondents’ perceptions regarding the successfulness of project learning within their own organisation, equals 2.57. This provides evidence that project learning is perceived by respondents to be successful. This perception in conjunction with the pro-social communication perceptions inferred from the mean value of 2.88 for Q31b, it is deducted that social communication/interaction is perceived to be less important than other factors as an enabler for project learning, but there are no evidence that it is not an enabler for project learning. It can therefore be argued that the opposite is true; that a lack of social communication is perceived to be an inhibitor of project learning.

### 6.6.3 Conclusion

The finding that a lack of social communication inhibits project learning is in accordance with research by other researchers who also confirmed the important role played by social networks in the transfer of knowledge (Newell,

Bresnen, Edelman, Scarbrough, & Swan, 2006). A team climate is conducive towards development of knowledge sharing attitudes amongst team members (Xue, Bradley, & Liang, 2011) and as sharing of knowledge has been empirically confirmed to be imperative for team performance (Lee, Gillespie, Mann, & Wearing, 2010), it can be argued that it will also be critical to project success.

## **6.7 Research Question 3**

### **6.7.1 Introduction**

The objective to identify factors that affect the sharing of project knowledge intra-project, as well as, across other projects in the organisation and between organisations can be extended to the influence of the trust relationship between project team members and how that inhibits free communication and knowledge sharing amongst them. The purpose was to gain an understanding of the level of trust that exist amongst project team members within the target project orientated organisations and to compare that with the perceived success of project learning as reported by respondents in group f5. Similar to above, respondents' feedback to f5 reflects the perceived level of learning success and context for testing the proposition that intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of trust between project members.

### 6.7.2 Analysis

Questions in group f3 explored perceptions around an environment of trust amongst project members and how it impacts project learning. Thus analysing group f3, which represents Q13-Q18, the mean was found to equal 1.85. The mean for answers to this group of questions is thus positioned somewhere between answer choice “*partially agree*” and slightly towards the answer choice “*fully agree*”. This is clear evidence that in the targeted Howden organisations trust is not considered a concern in sharing experiences and lessons learned.

For group f5, which represents Q25 - Q30, the mean equals 2.57. This provides evidence that project learning is perceived by respondents to be successful. As this simultaneous perception of an organisation that enjoys project learning success exists, it can be inferred that a trust environment is an enabler of project learning. This argument is further supported by evidence deducted from the responses to Q31d below, which argues that trust and a friendly environment is highly rated and perceived by respondents to be important for project learning.

As alluded to in the previous paragraph, the mean for responses to Q31d is 4.1, which shows strong evidence that a friendly environment and environment of trust amongst project members is perceived to be a very important ingredient for enhanced project learning. The strong support for trust and a friendly environment in organisations where simultaneously a perception exists that project learning is successful, confirms that trust is an enabler of project learning and therefore critical for successful project learning.

### 6.7.3 Conclusion

Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of trust between project members. This finding is consistent with previous research on the positive relationship between the existence of a trust environment between project members in a project orientated organisation and project learning. Research by Lee, et al., (2010) also concluded that trust between project team members significantly predicts knowledge sharing amongs team members and appreciably enhances team performance. It can therefore be argued that a trust environment fosters successful project learning.

## 6.8 Research Question 4

### 6.8.1 Introduction

A third objectives of this research was to explore the extent to which learning supporting and facilitating infrastructure are being used in target organisations to enhance their project learning. The question is asked: “What learning facilities are available?” The purpose was to gain an understanding of the *status quo* within the target project orientated organisations in terms of what level of learning supporting facilities and infrastructure are available and to compare it with the perceived success of project learning as reported by respondents. Similar to the research question above, respondents’ feedback to f5 reflects the perceived level of learning success and context for testing the proposition that intra-project and inter-project learning in a project orientated



organisation is less likely to be successful if there is a lack of learning supporting and facilitating infrastructure in the organisations.

### 6.8.2 Analysis

Questions in group f4 explored perceptions around impact of learning supporting and facilitating infrastructure on project learning. Thus analysing group f4, which represents Q19-Q24, the mean was found to equal 3.12. The mean for answers to this group of questions thus lays “neutral” which indicates that respondents do not rate provision of learning supporting and facilitating infrastructure as important for project learning, however nor do they reject it as unimportant. Learning supporting and facilitating infrastructure is thus not perceived to contribute to project learning in the organisation, but there is simultaneously no evidence that it is not contributing.

The mean for Q31c is 2.90 which indicate a perception that learning supporting and facilitating infrastructure is less important for a project learning environment and rated relatively low in comparison to other factors. This reflects a neutral stance by respondents on whether it enhances project learning or not and indicates that this attribute is considered the least important enabler of project learning relative to the four attributes that were tested. This finding does however, not indicate that a lack of learning supporting infrastructure is not a barrier to project learning, but just that its contribution as an enabler is considered less important than those of other enablers.

The mean for questions in group f5, which measures respondents' perceptions regarding the successfulness of project learning within their own organisation, equals 2.57. This provides evidence that project learning is perceived by respondents to be successful under the current conditions in terms of availability of support infrastructure.

### 6.8.3 Conclusion

Intra-project and inter-project learning in a project orientated organisation is less likely to be successful if there is a lack of learning supporting and facilitating infrastructure in the organisations. This finding is also consistent with previous research that confirms that facilitating and supporting conditions does have a positive effect on teams' knowledge sharing behaviour. Empirical study by Mainga, (2010) also confirms that project organisations can benefit from institutionalising various learning supporting infrastructure or processes which augment the accrual of project knowledge. A capable learning-supporting organisational infrastructure is associated with project organisations' ability to adapt to the competitive, dynamic and rapidly changing modern day business environment.

## **7 CONCLUSION**

### **7.1 Reflection of Research Problem and Aims**

The intent of the study was to investigate and explore the barriers to effective project learning which prevent organisations from leveraging future project successes. The evidence from literature of persistent inefficiencies and poor return on learning from a project on the one hand and the potential business gains that can be generated if the learning is maximised and used, warranted further research into what causes this tendency of poor learning and what prevents effective use thereof. It expands on previous research which demonstrated that project learning correlates positively with a project oriented organisations' aspiration to put sufficient facilitating infrastructure and measures in place to overcome the inhibitors of their project members' relationships and communication to share experiential learnings.

### **7.2 Main Findings**

#### **7.2.1 Learning supporting procedures and routines**

Although projects are considered unique once off endeavours, the operations within a project organisation can be routinised to capitalise on previous project experiences. Routines create relational interaction between team members and create opportunity for transfer of tacit knowledge.

### **7.2.2 Social communication amongst project members**

The role of social interaction is very important in knowledge transfer amongst project team members. This study supports previous research on the criticality of reflection for learning and building of organisational capabilities. Project knowledge is captured from project meetings and in project reviews conducted at various stages, but actual sharing of knowledge and learning happens during reflection and interaction sessions between project team members. The influence of culture was highlighted as a likely influence on knowledge transfer as differences in beliefs values and practices between people could create unexpected barriers to knowledge transfer. Ample opportunity for social interaction between project members is therefore important to ensure alignment of values and practices in order to build relationships and mutual trust. Trust is both context and time bound and for building new relationships, social interaction and communication is required to assess intentions and trustworthiness.

### **7.2.3 Trust between project members**

The research findings are consistent with previous studies which suggest that trust can assist in enhancing group or organisational performance. Improved group processes positively impacts knowledge sharing; especially sharing of best practices, innovation and improvement of organisational performance. (McNeish & Mann, 2010). The presence of care increases trust. In an organisation where an atmosphere of care exists, team members will share knowledge and experiences with each other. To enhance project learning en

organisational performance in a project environment, management should take cognisance of the requirement for a more caring environment and the importance of trustworthy behaviour in relationships between project members. Trust by itself does not guarantee trustworthy behaviour (McEvily, Perrone, & Zaheer, 2003) and may have to be created through facilitating support and social communication, but with mutual trust team members perceive that interactions with others are safe and easy. This is similar to fighter pilots relying on mutual trust when locked into air combat (Gode-Sanchez, 2010).

#### **7.2.4 Learning supporting and facilitating infrastructure in the organisations**

Visible and engaged management support is important to enhance a knowledge sharing and learning culture within project orientated organisations. As also suggested in the literature by Narteh, (2008), learning can only take place in an environment which is back by organisational systems that support the learning processes.

### **7.3 Recommendations for Howden**

From the data captured it is evident that barriers to learning within the organisation still exist. Project orientated organisations within the Howden Group is not fully prepared to effectively capture historical experience residing in the minds of their project engineers and managers. Organisational strategies should thus be adopted to make leaders more accountable for capturing and transferring unique knowledge and experience. International organisations with

foreign subsidiaries must in particular be aware that it is of economic importance and value creating for them to understand the potential benefits to be generated from knowledge exchanges (Riege, 2007).

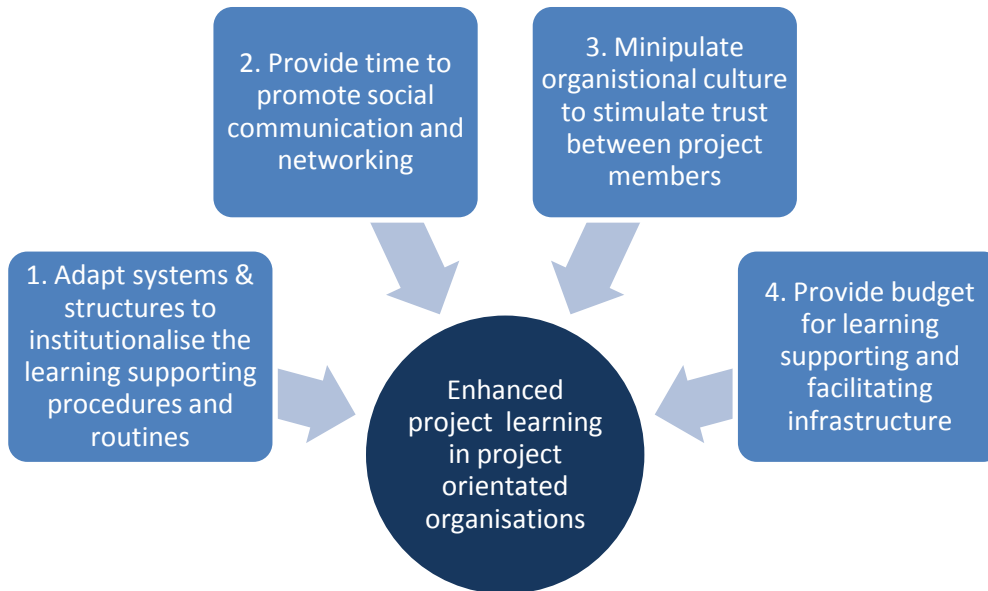
This research focussed on two themes, firstly the learning enablers in the organisational environment (institutionalised processes and systems and learning support facilities) and secondly on human relationships aspects (communication and trust).

## **7.4 Recommendations for the industry**

### **7.4.1 Barriers to learning exist**

This research confirmed the existence of high level factors impeding project learning in project orientated organisations. Although these represents a portion of many other potential variables, it embodies four significant high impact barriers which can be overcome if addressed at several levels. The proposed model in Figure 2.0 below, propose four high level corrective strategies whereby these barriers can be addressed by managers in project organisations. It is followed with some practical suggestions on how to action the challenge of overcoming the relevant learning inhibiting obstacles.

Figure 5.0 Barriers to effective project learning in project orientated organisations.



#### 7.4.2 Overcoming these barriers

Enhanced project learning can be achieved by ensuring that management take appropriate actions to address each high level barrier. With reference to Figure 5.0 above, a few action proposals per each barrier may include:

##### Item 1: Systems & structures

- Implement suitable knowledge capture and transfer mechanisms to limit work effort by providing correct tools and making sure processes is consistent with the methodologies employed by project team members;
- Ensure easy access and retrieval of captured information and knowledge;

- Force review routines into work methodologies by capturing the requirement in work procedure specifications.

#### Item 2: Social Communication

- Provide formal forums for sharing such as communities of practice or expert networks to facilitate learning or provide management support existing ones (Wolf *et al.*, 2011);
- Pro-actively plan and provide time for sharing of tacit knowledge and experience;
- Encourage networking opportunities and provide project staff with suitable environments such as electronic media (for example “*Twitter*” or “*Facebook*”) to pursue the objective.

#### Item 3: Enhancing trust

- Promote the notion of sharing of mistakes by rewarding it and punish hiding mistakes;
- Encourage openness and innovation with formal acknowledgement and reward;
- Enhance understanding of cross-cultural differences and implement training programmes to improve cross-cultural interaction, if required.

#### Item 4: Learning supporting infrastructure



- Provide clear direction on the organisations vision and objectives at all levels to ensure buy-in and invoke participation ;
- Ensure management support and regularly facilitate or participate in learning activities or routines;
- Provide funding for and ensure availability of appropriate tools, especially for the technologically advanced new generation. There is however empirical evidence that technology is less effective for transfer of tacit knowledge (McNeish & Mann, 2010).

## **7.5 Limitations and Recommendations for Future Research**

There are several limitations to this study. Although this research draws on previous empirical studies, it remains exploratory with key findings based on the purposive (convenience) sample. This approach poses some constraints on the external validity of the research results in Chapter Six. It investigates a single case of project orientated organisations within one international group of companies thereby limiting the unconditional application to other industries or sectors.

Similarly limiting, is evidence from previous studies by Riege (2005) suggesting that there are dozens of human organisational and technological obstacles to transferring knowledge. This is for example related to factors such as human propensity to learning in combination with any of those factors being explored in

this study. The contextual framework may therefore significantly influence the outcome of results in different organisations or industries.

The limitations to this study, however, imply some avenues for further research.

This study confirms previous research that a lack of communication impedes the transfer of tacit knowledge and learning. It also confirms that a lack of enabling environmental factors, such as learning support infrastructure impedes learning in project organisations. This research did not actively consider the influence of generation differences on learning impediments. Looking forward, there is a need to ensure that the application of latest technology is effectively applied to enhance communication. The so called “Generation X” claims to be more technologically inclined than previous generations; to what extend is this benefit being leverage to overcome barriers? Social communication no longer has to be restricted by a requirement for close proximity of participants in the learning process.

Another question to be asked, is to what extend are organisations empowering their younger generation employees (by making available budget) to exploit their technological advantage. An opposite strategy may be more effective whereby the learning focus is on prospective learners’ actively extracting knowledge rather than waiting transfer and receipt from others. Rather than having experienced old timers passing on their knowledge (for example through mentoring), the new generation should perhaps be allowed to more actively drive and dictate the learning process.

Although the knowledge and understanding of the various barriers and facilitators of project learning (or knowledge transfer in general) is growing and an awareness of these learning impediments is spreading, there still appear to be a significant lack of getting positive results. Little empirical evidence could be found to support suggested corrective managerial responses to overcome these obstacles. It is for example not clear whether addressing the human factors related to learning ability is more effective than say putting facilitating technology and systems in place. Further research will assist in moulding an understanding of how to effectively respond to the barriers of learning.

The influence of culture was highlighted in this study as a likely influence on knowledge transfer as differences in beliefs values and practices between people could create unexpected barriers to knowledge transfer. Despite these influences it was found that similar barriers to project learning are being experienced in South African operations in relation to those experienced by international project orientated organisations. South African managers therefore do not have to react differently to overcome these barriers, but can rely on internationally available knowledge and experience to build their strategies for enhanced project learning.

In conclusion, this study furthers our understanding of the potential impact of supporting infrastructure, institutionalised routines, social communication and trust in a project environment on the knowledge sharing and learning behaviour

of project team members in project organisations. The findings are helpful to organisations and specifically project management practitioners, for development of strategies to advance project learning and related competitive advantages.

## 8 REFERENCE LIST

- Ajmal, M., Helo, P., & Kekäle, T. (2010). Critical factors for knowledge management in project business. *Journal of Knowledge Management* , 14 (1), 156-168. doi: 10.1108/13673271011015633.
- Anbari, F. T., Carayannis, E. G., & Voetsch, R. J. (2008). Post-project Reviews as a Key Project Management Competence. *Technovation* , 28, 633-643. doi: 10.1016/j.technovation.2007.12.001.
- Baier, A. C. (1994). *Moral Prejudices: Essays on Ethics*. Cambridge: Harvard Business Press. ISSN 00318205.
- Becker, M. C., Lazaric, N., Nelson, R. R., & Winter, S. (2005). Applying Organisational routines in understanding organisational change. *Industrial and Corporate Change* , 14, 775-791.
- Blumberg, B., Cooper, D., & Schindler, P. (2008). *Business Research Methods*. Berkshire: McGraw-Hill Education.
- 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, 157-166. Retrieved from <http://0-www.sciencedirect.com.innopac.up.ac.za/science/article/pii/S026378630200090X>
- Carrillo, P. (2005). Lessons learned practices in the engineering, procurement and construction sector. *Engineering, Construction and Architectural Management* , 12 (3), 236.
- Cooke-Davis, T. (2004). *Project success*. (P. Morris, & G. Pinto, Eds.) New Jersey: Wiley Hoboken.
- Edkins, A. J., & Smyth, H. J. (2006). Contractual management in PPP projects: evaluation of legal versus relational contracting for service delivery. *ASCE Journal of Professional Issues in Engineering Education and Practice* , 132 (1), 82-93.
- English, A. (2005). *Levering knowledge management to enhance the performance of a project engineering company* . Gordon Institute of Business Science, University of Pretoria.
- Fiol, C. M., & Lyles, M. A. (1985). Organisational Learning. *Academy of Management Review* , 10 (4), 803-813.

Foos, F., Schum, G., & Rothenberg, S. (2006). Tacit Knowledge Transfer and the Knowledge Disconnect. *Journal of Knowledge Management* , 10 (1), 6-18.

Gode-Sanchez, C. (2010). Leveraging Coordination in Project-based activities: What can we learn from military teamwork? *Project Management Journal* , 41 (3), 69-78. doi: 10.1002/pmj.20178.

Goffin, K., Koners, U., Baxter, D., & Van der Hoven, C. (2010). Managing Lessons Learned and Tacit Knowledge in New Product Development. *Research Technology Management* , 53 (4), 39-51. Retrieved from <http://onlinelibrary.wiley.com/innopac.up.ac.za/doi/10.1111/j.1540-5885.2010.00798.x/pdf>

Hanisch, B., Lindner, F., Mueller, A., & Wald, A. (2009). Knowledge management in project environments. *Journal of Knowledge Management* , 13 (4), 148-160. doi: 10.1108/13673270910971897.

Julian, J. (2008). How Project Management Office Leaders Facilitate Cross-Project Learning and Continuous Improvement. *Project Management Journal* , 39 (3), 43-58. doi:: 10.1002/pmj.20071.

Kim, J., & Wilemon, D. (2007). The learning organisation as facilitator of complex NPD projects. *Journal of Creativity and Innovation Management* , 16 (2), 176-191. doi:10.1111/j.1467-8691.2007.00427.

Kotnour, T. (1999). A learning framework for project management. *Project Management Journal* , June, 32-38. Retrieved from <http://0-go.galegroup.com/innopac.up.ac.za/ps/i.do?&id=GALE%7CA54956546&v=2.1&>

Kotnour, T. (2000). Organisational learning practices in the project management environment. *International Journal of Quality & Reliability Management* , 17 (4/5), 393-406. doi: (Permanent URL): 10.1108/02656710010298418.

Kotnour, T., & Vergopia, C. (2005). Learning-based project reviews: observations and lessons learned from the Kennedy Space Centre. *Engineering Management Journal* , 17 (4), 30-38.

- Lam, A., & Lambermont-Ford, J.-P. (2010). Knowledge sharing in organisational contexts: a motivation-based perspective. *Journal of Knowledge Management* , 14 (1), 51-66. doi: 10.1108/13673271011015561.
- Lampel, J., Scarbrough, H., & Macmillan, S. (2008). Managing through Projects in Knowledge-Based Environments. *Long Range Planning* , 41 (Special issue), 7 - 16.  
doi:10.1016/j.lrp.2007.11.007.
- Landaeta, R. (2008). Evaluating Benefits and Challenges of Knowledge Transfer Accross Projects. *Engineering Management Journal* , 20 (1), 29 - 38.
- Lavagnon, A. I. (2009). Project success as a topic in project management journals. *Project Management Journal* , 40 (4), 6-19. doi:10.1002/pmj.20137.
- Lee, P., Gillespie, N., Mann, L., & Wearing, A. (2010). Leadership and trust: Their effect on knowledge sharing and team performance. *Management Learning* , 41 (4), 473-491. doi: 10.1177/1350507610362036.
- Mainga, W. (2010). An examination of the nature and type of "organisational learning infrastructure" that supports inter-project learning in Swedish consultancy firms. *International Review of Business Research Papers* , 6 (3), 129-156.
- Marlin, M. (2008). Implimenting an Effective Lessons Learned Process in a Global Project Environment. *UTD 2nd Annual Project Management Symposium Proceedings* (pp. 1-6). Dallas: Westney Consulting Group.
- Maurer, I. (2010). How to build trust in inter-organisational projects: The impact of project staffing and project rewards on the formation of trust, knowledge acquisition and pproduct innovation. *International Journal of Project Management* , 28, 629-637. doi: 10.1016/ijproman.2009.11.006.
- Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). An Integrative Model of Organisational Trust. *Academy of Management Journal* , 38 (3), 24-59.
- McEvily, B., Perrone, V., & Zaheer, A. (2003). Trust as an organising principle. *Organization Science* , 14 (1), 91-103. 1526-5455 electronic ISSN.
- McNeish, J., & Mann, I. J. (2010). Knowledge Sharing and Trust in Organisations. *IUP Journal of Knowledge Management* , 8 (1&2), 18-38. #29J-2010-01/04-02-01.
- Mintzberg, H. (1973). *The nature of managerial work*. Harper and Row.

- Narteh, B. (2008). Knowledge transfer in developed-developing country interfirm collaborations: a conceptual framework. *Journal of Knowledge Management* , 12 (1), 78-91. doi: 10.1108/13673270810852403.
- Newell, S. (2004). Enhancing Cross-Project Learning. *Engineering Management Journal* , 16 (1), 12-20.
- Newell, S., & Edelman, L. F. (2008). Developing a dynamic project learning and cross-project learning capability: Synthesising two perspectives. *Information Systems Journal* , 18, 567-591. doi:10.1111/j.1365-2575.2007.00242.x.
- Newell, S., Bresnen, M., Edelman, L., Scarbrough, H., & Swan, J. (2006). Sharing Knowledge Across Projects: Limits to ICT-led Project Review Practices. *Management Learning* , 37, 167-185. doi: 10.1177/1350507606063441.
- Newell, S., Edelman, L., Scarbrough, H., Swan, J., & Bresnen, M. (2003). "Best Practice" Development and Transfer in the NHS: The Importance of Process as well as Product Knowledge. *Health Services Management Research* , 16 (1), 1-12. doi: 10.1177/1350507606063441.
- Project Management Institute. (2004). *A Guide to the Project Management Body of Knowledge (PMBOK® guide)* (3 ed.). Pennsylvania: Project Management Institute, Inc.
- Rhodes, J., Hung, R., Lok, P., Lien, B. Y.-H., & Wu, C.-M. (2008). Factors influencing organisational knowledge transfer: implication for corporate performance. *Journal of Knowledge Management* , 12 (3), 84-100. doi: 10.1108/13673270810875886.
- Riege, A. (2007). Actions to overcome knowledge transfer barriers in MNCs. *Journal of Knowledge Management* , 11 (1), 48-67. doi: 10.1108/13673270710728231.
- Ruuska, I., & Vartiainen, M. (2005). Characteristics of knowledge sharing communities in project organisations. *International Journal of Project Management* , 23, 374-379. DOI: 10.1016/j.ijproman.2005.01.003.
- Schleimer, S., & Riege, A. (2009). Knowledge transfer between globally dispersed units at BMW. *Journal of Knowledge Management* , 13 (1), 27-41. doi: 10.1108/13673270910931143.
- Seningen, S. (2005, June 27). *Learn the Value of Lessons-Learned*. Retrieved April 2, 2011, retrieved from [www.projectperfect.com.au](http://www.projectperfect.com.au).



- Sense, A. J., & Antoni, M. (2003). Exploring the politics of project learning. *International Journal of Project Management* , 21, 487-494. doi:10.1016/S0263-7863(02)00063-7.
- Shenhar, A. J., & Dvir, D. (2007). *Reinventing Project Management*. Boston: Harvard Business School Press.
- Smyth, H., Gustafsson, M., & Ganskau, H. (2010). The value of trust in project business. *International Journal of Project Management* , 28 (2), 117-129. doi:10.1016/j.ijproman.2009.11.00.
- StatSoft. (2011, October 17). *Statsoft.com/Textbook*. Retrieved October 17, 2011, from Statsoft Web site: <http://www.statsoft.com/textbook/nonparametric-statistics/>
- Swan, J., Scarbrough, H., & Newell, S. (2010). Why don't (or do) organisations learn from projects? *Management Learning* , 41 (3), 325-344. doi:10.1177/1350507609357003.
- Tan, H. C., Carrillo, M., Anumba, C. J., Bouchlaghem, N., Kamara, J. M., & Udejaja, C. E. (2007). Development of a methodology for live capture and reuse of project knowledge in construction. *Journal of Management in Engineering* , 23 (1), 18-26. doi: 10.1061/(ASCE)0742-597X(2007)23:1(18).
- Tobin, P. K. (2006). *The use of story and storytelling as knowledge sharing practices: a case study in the South African mining industry*. University of Pretoria.
- Welman, J. C., & Kruger, S. J. (2005). *Research Methodology*. South Africa:Oxford University Press.
- Williams, T. (2003). Learning from Projects. *Journal of the Operational Research Society* , 54, 443-451. doi: 10.1057/palgrave.jors.2601549.
- Winter, M., Smith, C., Morris, P & Cicmil, S. . (2006). Directions for future research in project management: The main findings of a UK government-funded research network . *International Journal of Project Management* , 638-649. doi:10.1016/j.ijproman.2006.08.00.
- Wolf, P., Späth, S., & Haefliger, S. (2011). Participation in intra-firm communities of practice: a case study from the automotive industry. *Journal of Knowledge Management* , 15 (1), 22-39. doi: 10.1108/13673271111108675.

Wong, P. S., & Cheung, S. O. (2008). An analysis of the relationship between learning behaviour and performance improvement of the contracting organisations. *International Journal of Project Management* , 26 (2), 112-123.

Wong, P. S., Cheung, S. O., & Fan, K. L. (2009). Examining the Relationship between Organisational Learning Styles and Project Performance. *Journal of Construction Engineering and Management* , 135 (6), 497-507. doi:10.1061/(ASCE)CO.1943-7862.0000010.

Xue, Y., Bradley, J., & Liang, H. (2011). Team climate, empowering leadership, and knowledge sharing. *Journal of Knowledge Management* , 15 (2), 299-312. doi: 10.1108/136732711111119709.

Zedtwitz, M. (2002). Organisational learning through post-project reviews in R&D. *R&D Management* , 32 (3), 255-268.

Zikmund, W. G. (2003). *Business Research Methods* (7 ed.). Ohio, USA: Thomson South Western.

## 9 APPENDICES

### Appendix A: Survey Questionnaire

#### 1. MBA Research Survey

Thank you for taking the time to complete this questionnaire. It is much appreciated.

In partial fulfilment of the requirements of an MBA degree at the Gordon Institute of Business Science (University of Pretoria), all students are required to submit a research project. In this regard, I am researching barriers to project learning. This questionnaire focuses on intra- and cross-project learning in your organisation and explores your personal experience and perceptions.

This survey will be treated anonymous and no names or personal information other than that stated below will be captured. The questionnaire should take no more than 5 - 10 minutes to complete. The survey is anonymous and participation is voluntary. Should you not wish to provide feedback, you can withdraw at any time.

Please kindly complete and submit the questionnaire on-line. Should you have any concerns, please contact me at contact details provided below:

Researcher: Karel van Zyl  
Email: karel.vanzyl@howden.co.za  
Phone: +27829008364

Please provide demographic information below.

#### \*Where is your organisation/employer located?

- |                                    |                                       |   |
|------------------------------------|---------------------------------------|---|
| <input type="checkbox"/> Australia | <input type="checkbox"/> France       | <input type="checkbox"/> Spain                    |
| <input type="checkbox"/> Brazil    | <input type="checkbox"/> Germany      | <input type="checkbox"/> The Netherlands          |
| <input type="checkbox"/> Canada    | <input type="checkbox"/> India        | <input type="checkbox"/> United Kingdom           |
| <input type="checkbox"/> China     | <input type="checkbox"/> Russia       | <input type="checkbox"/> United States of America |
| <input type="checkbox"/> Denmark   | <input type="checkbox"/> South Africa |   |

#### \*Which is your age group?

- <23 yrs    
  23-27 yrs    
  28-35 yrs    
  36-45 yrs    
  46-55 yrs    
  >55 yrs

#### \*Indicate your highest qualification level

- Matric/O-/A-levels or equivalent    
  Diploma/Degree    
  Post Graduate Degree    
  Professional qualification

#### Indicate your experience gained within a project environment while having actively performed some project management role.

- < 1 yr    
  1-3 yrs    
  4-9 yrs    
  10-19 yrs    
  >20 yrs

2.

**In our organisation we explicitly use formal lessons learned (also called "post mortem") procedures to capture project learning during project reviews.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we do lessons learned procedures in a structured way during project execution until close out.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation members of other project teams have to formally share their project experiences/ learning during project reviews with our project members.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation senior management support and often attend formal lessons learned sessions during project reviews.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation project practitioners value the benefits from formal lessons learned sessions during project reviews.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation time and budget is allowed for sufficient lessons learned reviews during project execution until close out.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**3.**

**In our organisation we can exchange ideas with communities of practice to benefit from others' project learning and experiences.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we can exchange ideas and experiences with colleagues at a social (or informal) level.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we can exchange ideas and experiences with managers and/or superiors at a social level.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation it is culture to exchange ideas and experiences with colleagues and peers at a social level.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation time and budget allows for exchange of ideas and experiences with colleagues at a social level.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we can all benefit from freely exchanging ideas and experiences with colleagues at a social level.**

fully agree     partially agree     neutral     don't agree     don't agree at all

4.

**In our organisation I can openly and comfortably express my views, ideas, arguments, successes or mistakes at lessons learned reviews.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation I do openly express my views, ideas, arguments, successes and mistakes at lessons learned reviews.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation I freely share my expert experience with others in the organisation.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation other project members freely share their expert experience with any of their colleagues.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation there is personal reward in sharing my lessons learned experiences in the organisation.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**14. In our organisation there is potential for personal punishment or victimisation in sharing my views, ideas, arguments, mistakes with some colleagues.**

fully agree     partially agree     neutral     don't agree     don't agree at all

5.

**In our organisation we make use of readily available lessons learned repositories to draw on previous project learning/experiences.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we make use of a facilitator to lead lessons learned reviews to improve potential for learning.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we have appropriate facilities to exchange, capture, store and re-access the stored project learning/experiences.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we have dedicated project experts who champion lessons learned activities.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we have sufficient training and tutorial matter to guide project learning activities.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation infrastructure exist to allow easy access to lessons learned from historical projects.**

fully agree     partially agree     neutral     don't agree     don't agree at all

6.

**In our organisation project learning can be considered successful.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation learning across different projects can be considered successful.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation lessons learned procedures and methodologies are clear and established.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we have sufficient infrastructure, time and budget to perform project post mortems.**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we share project experiences in an informal manner (through social communication).**

fully agree     partially agree     neutral     don't agree     don't agree at all

**In our organisation we freely and comfortably share project experiences without any concern for having to do so.**

fully agree     partially agree     neutral     don't agree     don't agree at all



## 7. Ranking

In a project organisation, which aspects are more important than other in enhancing knowledge/experience sharing amongst any project team members.

**\*Please rank each of the following 5 possible scenarios, in order of importance to you:**

**I prefer a project environment "where....**

	Least important	not important	Neutral	somewhat	Most important
a. where documented procedures, processes and routines to facilitate performing lessons learned exist".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
b. where communities of practice and opportunities for social interaction with colleagues to exchange project related ideas and experiences exist".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
c. where supporting infrastructure such as an on-line central repository and computer hardware for capturing/sharing of project knowledge exist".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
d. where a friendly environment for open exchange of any project related experiences mistakes, solutions with colleagues or senior management and a reward system to reward performance excellence".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
e. in which the contribution of project experiences and benefits of project learning is not valued important enough to justify any special attention.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix B: Survey Statistical Data

f1

<b>6 Variables:</b>	Q1 Q2 Q3 Q4 Q5 Q6
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Simple Statistics							
Variable	N	Mean	Std	Sum	Minimum	Maximum	Label
Q1	49	2.20408	0.95698	108.00000	1.00000	4.00000	Q1
Q2	49	2.46939	0.98111	121.00000	1.00000	5.00000	Q2
Q3	49	3.04082	1.01979	149.00000	1.00000	5.00000	Q3
Q4	49	2.48980	1.10156	122.00000	1.00000	4.00000	Q4
Q5	49	2.26531	1.05624	111.00000	1.00000	5.00000	Q5
Q6	49	2.71429	1.11803	133.00000	1.00000	5.00000	Q6

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	0.894074
Standardized	0.894441

Cronbach Coefficient Alpha with Deleted Variable					
Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
Q1	0.670636	0.882376	0.673075	0.882596	Q1
Q2	0.777733	0.866522	0.780382	0.865815	Q2
Q3	0.639576	0.886975	0.635900	0.888249	Q3
Q4	0.755471	0.869128	0.755525	0.869764	Q4
Q5	0.717196	0.875255	0.715244	0.876084	Q5
Q6	0.740960	0.871671	0.739821	0.872240	Q6

f2

<b>6 Variables:</b>	Q7 Q8 Q9 Q10 Q11 Q12
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Simple Statistics							
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q7	49	2.51020	1.17478	123.00000	1.00000	5.00000	Q7
Q8	49	1.89796	0.91844	93.00000	1.00000	4.00000	Q8
Q9	49	2.20408	0.97851	108.00000	1.00000	4.00000	Q9
Q10	49	2.32653	0.98716	114.00000	1.00000	5.00000	Q10
Q11	49	2.75510	1.12788	135.00000	1.00000	5.00000	Q11
Q12	49	1.93878	1.02892	95.00000	1.00000	4.00000	Q12

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	0.830590
Standardized	0.835546

Cronbach Coefficient Alpha with Deleted Variable					
Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
Q7	0.506825	0.826397	0.503294	0.829791	Q7
Q8	0.609085	0.803071	0.607720	0.809203	Q8
Q9	0.766610	0.770615	0.772219	0.774864	Q9
Q10	0.769605	0.769596	0.778735	0.773455	Q10
Q11	0.677297	0.786690	0.672777	0.795906	Q11
Q12	0.343232	0.853047	0.353031	0.857829	Q12

f3

<b>6 Variables:</b>	Q13 Q14 Q15 Q16 Q17 Q18
---------------------	-------------------------

Simple Statistics							
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q13	49	1.93878	1.06865	95.00000	1.00000	5.00000	Q13
Q14	49	1.73469	0.86061	85.00000	1.00000	4.00000	Q14
Q15	49	1.71429	0.95743	84.00000	1.00000	4.00000	Q15
Q16	49	2.00000	0.93541	98.00000	1.00000	4.00000	Q16
Q17	49	3.06122	1.23167	150.00000	1.00000	5.00000	Q17
Q18	49	4.00000	1.17260	196.00000	1.00000	5.00000	Q18

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	0.282262
Standardized	0.405754

Cronbach Coefficient Alpha with Deleted Variable					
Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
Q13	0.376884	0.027595	0.481323	0.164122	Q13
Q14	0.507650	-.016452	0.539095	0.119757	Q14
Q15	0.431007	0.010818	0.475145	0.168771	Q15
Q16	0.503209	-.042884	0.499974	0.149976	Q16
Q17	-.007375	0.363202	0.019300	0.464461	Q17
Q18	-.518090	0.675444	-.513546	0.709194	Q18

f3 (adjusted)

<b>4 Variables:</b>	Q13 Q14 Q15 Q16
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Simple Statistics							
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q13	49	1.93878	1.06865	95.00000	1.00000	5.00000	Q13
Q14	49	1.73469	0.86061	85.00000	1.00000	4.00000	Q14
Q15	49	1.71429	0.95743	84.00000	1.00000	4.00000	Q15
Q16	49	2.00000	0.93541	98.00000	1.00000	4.00000	Q16

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	<b>0.795996</b>
Standardized	0.797724

Cronbach Coefficient Alpha with Deleted Variable					
Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
Q13	0.703712	0.693682	0.717857	0.692000	Q13
Q14	0.731636	0.691027	0.712076	0.695030	Q14
Q15	0.596916	0.750116	0.597072	0.753249	Q15
Q16	0.427880	0.827340	0.429472	0.831285	Q16

f4

<b>6 Variables:</b>	Q19 Q20 Q21 Q22 Q23 Q24
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Simple Statistics							
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q19	49	2.97959	1.01015	146.00000	1.00000	5.00000	Q19
Q20	49	3.40816	1.17115	167.00000	1.00000	5.00000	Q20
Q21	49	3.16327	1.17875	155.00000	1.00000	5.00000	Q21
Q22	49	3.12245	1.31708	153.00000	1.00000	5.00000	Q22
Q23	49	2.97959	1.19878	146.00000	1.00000	5.00000	Q23
Q24	49	3.08163	1.16970	151.00000	1.00000	5.00000	Q24

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	0.816411
Standardized	0.818503

Cronbach Coefficient Alpha with Deleted Variable					
Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
Q19	0.583272	0.788427	0.583252	0.789598	Q19
Q20	0.576179	0.788102	0.572806	0.791847	Q20
Q21	0.683987	0.764114	0.690351	0.765945	Q21
Q22	0.564311	0.792393	0.565451	0.793424	Q22
Q23	0.555943	0.792599	0.552096	0.796275	Q23
Q24	0.529562	0.798052	0.532860	0.800352	Q24

f5

<b>6 Variables:</b>	Q25 Q26 Q27 Q28 Q29 Q30
---------------------	-------------------------

Simple Statistics							
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum	Label
Q25	49	2.53061	1.04287	124.00000	1.00000	4.00000	Q25
Q26	49	2.51020	1.08248	123.00000	1.00000	4.00000	Q26
Q27	49	3.04082	1.22405	149.00000	1.00000	5.00000	Q27
Q28	49	2.97959	1.19878	146.00000	1.00000	5.00000	Q28
Q29	49	2.34694	0.90257	115.00000	1.00000	5.00000	Q29
Q30	49	2.04082	0.91194	100.00000	1.00000	5.00000	Q30

Cronbach Coefficient Alpha	
Variables	Alpha
Raw	0.757318
Standardized	0.761639

Cronbach Coefficient Alpha with Deleted Variable					
Deleted Variable	Raw Variables		Standardized Variables		Label
	Correlation with Total	Alpha	Correlation with Total	Alpha	
Q25	0.763470	0.648257	0.755832	0.655976	Q25
Q26	0.563841	0.703847	0.569407	0.709056	Q26
Q27	0.491896	0.726067	0.463010	0.737348	Q27
Q28	0.392926	0.754383	0.372026	0.760431	Q28
Q29	0.343809	0.757710	0.379924	0.758467	Q29
Q30	0.476483	0.728835	0.502462	0.727023	Q30

## Appendix C: Secondary Data



From: Ronnie Dauvellier  
Direct Dial: 011 240 4182  
Email: rdauvellier@howden.co.za

### Memo

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Attention: Andrew Twyford Date: 6 January 2009  
Cc: John Hall, Ben Goniwe  
Subject: Xstrata Alloys Lydenburg

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Hi Andrew,

The list below is items to be discussed in a Post Mortem Design Review Meeting. I feel that each area must be dealt with separately and possible in different individual meetings.

1. INPUT INFORMATION
  - a. Identify the design input information given at the tender stage.
  - b. Performance tests to be done to prove the system.
2. DESIGN DETAILS
  - a. Initial design during enquiry
  - b. Final design for manufacture
  - c. Peter Raley design review or input rejected.
  - d. Chris Coetzee design review
  - e. Size and design of equipment
    - i. Battery limits HES/Xstrata
    - ii. Civil work
    - iii. Gas analyser
    - iv. Purge gas point and supply
    - v. Furnace control pressure
    - vi. Water cooled ducting
    - vii. Quench tangential inlet
    - viii. Quench throat and actuator
    - ix. Quench tank
    - x. HP tangential inlet
    - xi. HP Throat and actuator
    - xii. Wet elbow
    - xiii. Eliminator tank
    - xiv. Explosion doors on ducting position and sizing.
    - xv. Ducting from Eliminator to Primary Fan.
    - xvi. Spade damper before and after the fans
    - xvii. Compensator design and positions
    - xviii. Fan design
    - xix. Fan outlet ducting

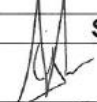


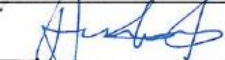




- xx. Stack damper and actuator
- xxi. Recirculation ducting
- xxii. Recirculation damper and actuator
- xxiii. Reflux design
- xxiv. Stack and flare
- xxv. Main seal pot
- xxvi. Fan seal pot
- xxvii. Stand-by fans operation guarantee
- xxviii. Tie-in to Furnace C
- xxix. Instrumentation and control
- xxx. P&I D and PFD
- xxxi. O & M manual
- xxxii. What is government standards?

### 3. CHANGES TO THE DESIGN DURING INSTALLATION

- a. Quench assembly
  - i. Water inlet nozzles on the tangential section
  - ii. Additional water sprays on the banjo
  - iii. Flanges changed on the pipe work
  - iv. Valve below the Quench tank
  - v. Support structure under the tank brace removed
  - vi. All flanges to be Table D
  - vii. Slurry discharge pipe diameters
- b. HP inlet and Wet Elbow
  - i. Water inlet nozzles on the tangential section
  - ii. Wet elbow modified to suit position of equipment
- c. Eliminator tank
  - i. Slurry discharge pipe diameters
- d. Ducting to Primary Fan
  - i. Change of duct route
  - ii. Spade damper
  - iii. Flexible
  - iv. Connection to stand-by fans
  - v. Tie-in to Furnace C
- e. Fans
  - i. Input information from HES
  - ii. Fans running at 1200 rpm maximum
  - iii. Motor rating and costs
  - iv. VSD rating and costs
  - v. Anti-vibration mounting and HD bolts
  - vi. Explosion panels size and position
  - vii. Shaft seal and quantity of water required
  - viii. Flexible connections and installation details
  - ix. Test points on fans
  - x. Water sprays onto blades
  - xi. Coupling design
  - xii. Motor base plate design
  - xiii. Bolt adjustment on motors

**ATTENDANCE REGISTER**  
**POST MORTEM ON XSTRATA LYDENBURG**  
**HELD ON 18 MAY 2010**

NAME	TITLE	SIGNATURE
K Govender	QC Manager	
J Glover	QC Consultant	
Vischal Rambridge		
Ben Goniwe	Proj Engineer	
John Hall	APPLICATIONS	
Ronnie Dauvillier	APPLICATIONS	

## MINUTES OF POST MORTEM MEETING

PROJECT: Xstrata Lydenburg Gas Cleaning Plant; Furnace A & B

JOB No. : 47374

ATTENDEES: See attendance register

PURPOSE: To evaluate project performance with respect to Quality, Time and Costs,  
With the view to identify possible improvement areas.

Welcome by Kevin Govender and noted that Xstrata Lydenburg Project had many issues and needs more than one meeting to complete the post mortem. Post mortem will take stages to complete.

### CUSTOMER EXPECTATIONS:

ITEM	DESCRIPTION	Responsible
1.	JH has stated that the client at the time of placing the order made many changes due to staff turnover. This resulted in some misunderstanding and confusion in the project as it progressed.	JH
2.	The client relied on Howden to supply all specification as there were not sure of the requirements.	
3.	First design calculation was produced in May 2006.	
4.	Original stack was changed but not stipulated by the client.	
5.	Volume was constant throughout the project (see tender file for details).	
6.	At the end of the Project the Client was satisfied by giving Howden a Handover Document.	

### DESIGN:

ITEM	DESCRIPTION	Responsible
1.	At the tender stage Howden Fan Equipment was given all information regarding the power supply at three separate stages. This was ignored by HFE and a average power supply was given which led to paramount complications during commissioning of the plant. Noted: 160kW motor failed and 200kW was used.	VR
2.	HFE should give us the power at every stage and not an average power supply.	JH
3.	RD indicated Howden Projects should stipulate in the inquiry Documentation what is required when dealing with Fans, which may include variable speed drives.	RD
4.	Another problem experienced, was the client selected the wrong motors and fan for the projects.	RD
5.	Noted that 200kW motor did not work to data pressure and density. Moisture and performance details needs to be tested for clarification.	BG/JH
7.	Projects requirements is correct e.g. Volumes for inlet pressure, fan static pressure, inlet density, fan absorbed power per stage, fan speed, and recommended motor power per stage is required.	VR
8.	RD suggested if another order is placed with Howden Fan Equipment,	RD

	all responsibilities which includes manufacture, install, commission and performance of fan should be outsourced to them.	
9.	VR indicated that exclusions in the order need to be looked at very carefully before placing an order.	VR
10.	RD suggested extra insurance cover be taken on all equipment.	RD
13.	VR suggested Howden Projects check its calculations prior to the next meeting.	
14.	JH suggested Civil company to be employed to assess civil work during the tender stage.	

PLAN OF ACTION:

Programme to be checked by John Hall.  
Ronnie to check volumes.  
Major problem experienced with the fans and explosion panels to be looked into.  
Site measurements to be taken with precision.  
Suryers should be employed during tender stage.

DRAWINGS:

ITEM	DESCRIPTION	Responsible

JOB EXECUTION:

ITEM	DESCRIPTION	Responsible

SUPPLIERS PERFORMANCE

SEE SCHEDULE A ( list all suppliers )

ERECTION STAGE

ITEM	DESCRIPTION	Responsible

SUPPLIERS PERFORMANCE

SEE SCHEDULE B ( List Erectors and other suppliers )

COMMISSIONING

ITEM	DESCRIPTION	Responsible


**COSTING FINANCE**

ITEM	DESCRIPTION	Responsible
1.	Project started only with budget prices (see tender file).	
2.	Final budget price was in April 2006.	

**RESOURCES**

ITEM	DESCRIPTION	Responsible

**PREVENTION**

ITEM	DESCRIPTION	Responsible

**IMPROVEMENT**

ITEM	DESCRIPTION	Responsible

Form MPMM 01 Rev 01