A study of agile project management methods used for IT implementation projects in small and medium-sized enterprises

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Abstract

Project management methods have been developed from industry practices and international standards to ensure a higher rate of success for information technology projects. These have been widely used in large organisations effectively. However, when projects are implemented in a small or medium-sized enterprise environment, there is often a lack of an established method of project management or skilled project implementers who can use methods used in large organisations. As project workers find themselves pressured to become more responsive to business demands, it is becoming commonplace for smaller organisations to forgo formal project management practices. This is often due to the fact that small projects are viewed as simple to deploy, suffer from a lack of resources, or are given low prioritisation by the organisation. Additionally, the current project management standards are frequently perceived by SMEs as complicated and overly bureaucratic, something undesirable in regards to time-constrained or low-budget projects. Agile development is one solution to the problem of overly complex methods that has recently been adopted in the field of software production, and has gained considerable popularity with smaller organisations.

This research investigates the current state of formalised project management and how these methods could be modified for a small or medium-sized enterprise, especially in relation to information technology implementation projects. A mixture of traditional project management methods and newer agile development methods were utilised, with the goal of establishing that a combination of the two methods that can assist with project success, particularly in the case of resource-poor medium-sized organisations. The acceptance of this method by the technology workers and stakeholders involved was also investigated. In an economic age where businesses are required to do more with less, a project management method that can help with successful implementation could prove beneficial to many organisations of this size. Arising out of agile development, agile project management has great potential to fill this role, and it was with this goal in mind that this research was conducted.

Keywords

Agile, project management, scope change, unstable environment, PMBOK, Scrum, SME, small projects, hybrid project management, changing requirements.
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Abbreviations

CEC Commission for the European Communities
CMMI Capability Maturity Model Integration
COBIT Control Objectives for Information and related Technology
CPM Critical Path Method
ERP Enterprise Resource Planning
IPMA International Project Management Association
ICT Information and Communications Technologies
IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronics Engineers
ISO International Organization for Standardization
IT Information Technology
ITIL Information Technology Infrastructure Library
NASA National Aeronautics and Space Administration
PERT Program Evaluation Review Technique
PINO PRINCE In Name Only
PMBOK Project Management Body of Knowledge
PMI Project Management Institute
PRINCE Projects in Controlled Environments
RUP Rational Unified Process
SME Small to Medium-sized Enterprise
WBS Work Breakdown Structure
XP Extreme Programming
Statement of Original Authorship

I hereby declare that this submission is my own work and that the intellectual content of the thesis is the product of my own work. To the best of my knowledge it contains no material previously published or written by another person, nor material which has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made.

I also declare that any contribution made to the research by others is explicitly acknowledged.

Daniel G. O’Sheedy

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Daniel G. O’Sheedy
Publications arising from this Research

During the process of this research, the preliminary results were presented at an international academic conference, in addition to being published in a scientific journal.

Conference presentation details


Journal article details

1. Chapter 1 - Introduction

1.1. Background to the research

This introductory chapter provides a summary of the background to the research, before introducing the research problem and specific details relating to the research, including delimitations and key assumptions. The structure of this chapter has been constructed using the recommendations proposed by Perry (1998) and is depicted in Figure 1.

![Diagram of Chapter 1 structure]

**Figure 1: A graphical representation of the structure of chapter 1**
Source: developed for this research
Project management methods have been developed from industry practices and international standards to ensure a higher rate of success for information technology projects. These methods have been widely used in large organisations effectively. However, when projects are implemented in an SME (Small and Medium-sized Enterprise) environment there is often a lack of an established method of project management or skilled project implementers who can successfully use methods used in large organisations (Ilincuta and Jergeas 2003). As project workers find themselves pressured to become more responsive, reacting ever more quickly to business demands, it is commonplace for smaller organisations to forgo formal project management practices. This is often due to the fact that small projects are viewed as simple to deploy, suffer from a lack of resources, or are given low prioritisation by the organisation (Rowe 2007). Even the PMBOK (Project Management Book of Knowledge) published by the PMI (Project Management Institute), the current de facto project management standard based on best-practice, can be perceived by SMEs as complicated and overly bureaucratic, something undesirable in regards to time-constrained or low-budget projects. Agile development is one solution to the challenge of overly complex methods. This newer style of production has been established in the field of software development, and has gained considerable popularity with smaller teams (Schwaber 2004; Chin 2003).

IT implementation projects occurring in the SME environment is an area that has not received a lot of research attention, mainly due to research problems stemming from sample sizes, lack of organisation resources to support such research, and the inherent uniqueness of SMEs (Hunter 2004). However, this industry sector should not be ignored, as nearly 99% of all businesses are categorised as an SME (CEC 2005, p. 5), forming an essential segment of the economy.

This research will investigate the current state of formalised project management and how these methods could be modified for an SME environment, especially in relation to IT implementation projects. A mixture of traditional project management methods and newer agile development methods will be utilised, to investigate if a combination of these can assist with implementing a project successfully, particularly in the case of resource-poor SMEs. The acceptability of this combination of methods by the SME IT workers involved will also be investigated. In an economic age where businesses are required to do more with less, a project management method that can help in successful implementation could prove beneficial to many SMEs.
1.2. Research problem and propositions

This research will be conducted using an action research methodology, as the aim is to bring about change in the organisation, improving a situation with the help of the participants. The efforts to achieve this goal will be guided by endeavouring to answer the following research question:

*Research Question 1: To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment?*

It is hypothesised that combining traditional project management methods with procedures and tools derived from the agile development methods will produce a modified project management method that can produce favourable results in the management of IT projects in an SME environment. However, as this is more than theoretical research, to test this research question a toolkit of appropriate tools and procedures will need to be developed. This will enable the effectiveness of the proposed method to be observed, at the very least in a conceptual form. This therefore raises two secondary research questions:

*Research Question 2: What tools and procedures will need to be included in a toolkit, combining methods to assess the primary research question?*

*Research Question 3: What are the results of implementing such a toolkit in an SME environment?*

The aim of these secondary research questions is to establish if it is possible to produce a toolkit to test the concept of research question 1, and whether this combination of traditional and agile project management methods can improve the success of IT projects. However, the possibility may arise that the toolkit does not work as intended, or that the proposed combination of methods is not the ideal solution that it was hypothesised to be. In this case, another solution that was not initially contemplated may arise during the research phase, and the theories behind the research would need to be once again examined as to their appropriateness. This would produce a situation where the theory was emergent, and the research is driven by the data rather than the theories.
1.3. Justification for the research
Extensive project management research has been accomplished in specialised industries such as construction, engineering, and information technology, and these larger industry sectors have been able to increase the value of project processes with the application of formalised project management methods (Thomas and Mullaly 2008). More recently industry sectors that do not traditionally have a history of project management are also investigating whether these management practices can bring about improved project success (Carden and Egan 2008). This is primarily due to the fact that practitioners in these emerging fields have witnessed the results achieved through the use of project management, such as better utilisation of resources and scheduling. These organisations have also seen that improved project success can result in fewer business disruptions, allowing them to concentrate on their primary objectives (Thomas and Mullaly 2008).

Not only are organisations benefiting from using project management for building products and delivering solutions for external clients, but internally the value of project management for the control of IT project delivery and execution has been acknowledged, and has also become a topic of research in the past few years. Many of these recent studies have centred around researching large and complex IT projects (Glass 2006a; Shore 2005), the uptake of risk management in large IT projects (Cooper et al. 2005; Kappelman, McKeeman, and Zhang 2006), or improving control of software development projects (Bechtold 1999; El Emam and Koru 2008). However, little effort seems to have been invested into the area of IT integration and migration projects, especially when these projects are encountered in an SME environment.

Projects involving IT implementation are an area of IT that nearly every organisation must deal with. This type of project can comprise such tasks as integrating a new ERP (Enterprise Resource Planning) system into the current IT infrastructure, moving server installations from physical to virtualised hardware, or planning and introducing a new group collaboration portal, to list but a few examples. These tasks all fit the definition of a project as defined in section 1.6, as they are all temporary endeavours with a defined goal, and the possibility of a project conclusion exists. These projects should not however be confused with the everyday operational work encountered in an IT department.
Unlike project work, operational work is primarily ongoing and the primary function is to maintain the infrastructure of an organisation. This is by definition not considered a project, as will be discussed later in chapter 2, as it does not terminate but rather continues in a new direction according to business strategy (PMI 2008). The field of IT service and maintenance management has been formalised with the introduction of several IT service management standards, such as ITIL (IT Infrastructure Library), COBIT (Control Objectives for Information and related Technology) and the ISO/IEC 20000 standard. In Figure 2 the associations of the distinctive IT management frameworks have been depicted, with the proposed area of research, PMBOK and agile, highlighted at the bottom. This is an area that still shows a great deal of potential for growth, and one that researchers will be able to build upon in the future.

Figure 2: IT management frameworks grouped by corresponding management areas
Source: developed for this research
Extensive research has been devoted to the specific area of software projects though. This is due primarily to the importance that software plays in the success of a business, and one of the motivating factors behind this research has been to investigate the successful development of quality software in a timely manner, especially in rapidly changing and unpredictable situations (Fioravanti 2006; Augustine et al. 2005; Benko and McFarlan 2003). This research has led to the development of several agile methods, where small software teams have abandoned the traditionally process-heavy methods of development in favour of more reactive methods of software development. This style of development has been largely adopted by small and medium-sized development teams working in an SME environment.

There are abundant definitions of what constitutes an SME, depending on which country or economic region these organisations are situated in. In 2003 the Commission of the European Communities refined the definition of an SME, as shown in Figure 3. The same paper also reports that in 2003 there were approximately 23 million SMEs in operation in the European Union, providing an estimated 75 million employment places, and accounted for 99% of all enterprises (CEC 2005, p. 5). Despite hurdles encountered when conducting research in organisations of this size, due in part to the heterogeneous nature of SMEs, the potential for improvement for these organisations is vast. This research work will be conducted within two Austrian publishing and media companies with an approximate total of 130 employees, situating the organisations in the SME range of 1 to 250 employees as noted in Figure 3.

Projects occurring in an SME environment encounter some rather unique challenges, as it is common for the SME environment to undergo change, when compared to that of a large organisation. Additionally, project roles are often assigned to a minimum amount of people, and frequently the project manager is charged with the management as well as the physical execution of the project. These organisations generally adopt a non-bureaucratic method of conducting business, due in part to their flat organisational structures, and consequently more formal methods can lead to problems (Turner, Ledwith, and Kelly 2008). In light of these factors, an agile method with a foundation in a proven method, such as a combination of the PMBOK and agile methods, could be beneficial in such a situation, and is therefore a worthwhile topic for further investigation (Turner, Ledwith, and Kelly 2009).
Traditionally the research instruments employed in IT research have consisted predominantly of surveys, interviews and case studies (King 2006). This research will investigate the issue of agile project management methods in an SME environment, using an action research methodology. The goal of using this particular method is to provide a fresh perspective to the problem, and will inspect whether formalised project management methods can be modified for the unique requirements of an SME environment, especially in relation to IT implementation projects. This modification will take the form of an amalgamation of traditional project management methods and the more recent agile development methods, with the ultimate goal of determining whether a modified project management method can be developed that can assist SME organisations in their future project work. Such a method has the potential to enable SME IT workers to attain a higher level of competence, and subsequently achieve an improved success rate for IT projects.

Figure 3: The definition of an SME as established by the European Union
Source: The Commission of the European Communities (CEC 2005, p. 14)
This area of research is particularly worthy of further investigation, as every SME must undertake IT implementation projects at some time or another, and this research will contribute to the project management practices knowledge for SMEs, especially in relation to IT implementation projects. Its results will hopefully be of assistance to IT workers and management involved in this type of IT project, helping to bring an increased level of success to future project work.

In addition to the practical concerns, this research will contribute to the project management literature, as it expands the knowledge of an area that has not been fully researched, adding understanding and information to the body of knowledge that future researchers can in turn expand upon. It attempts to address issues relating to IT project success in SMEs and how this success can be improved. It also puts to the test whether an amalgamation of formalised and agile methods can improve IT project success in an SME. One of the primary aims of this research is to produce a work that future researchers can build upon.

1.4. Research methodology
After framing the primary and secondary research questions to determine the exact nature of the problem at hand, three major research requirements became apparent that will need to be addressed.

The first requirement is that a thorough background investigation into the topic of project management will need to be undertaken, especially in regards to IT projects, and how these integrate into a SME environment. A review will be made of the pertinent literature to gain a full understanding of the current status of the research regarding project management. This search will be further narrowed to focus on IT projects, and include information about IT in the SME environment and how these organisations manage projects. The literature review will then be used in two main roles. The first role of the review is to provide a solid foundation upon which the research action plan can be designed. Existing models will be reviewed, and the course of action will be shaped in part by current and past studies into similar areas.
The second role of the literature review is to provide continual feedback during the research process, as a triangulation method that will be used to confirm emerging research findings. As issues or findings arise in the research the literature is consulted for confirmation or clarification, to determine if these findings are adherent to existing literature and therefore able to be considered valid. This approach also guards against inadvertently wasting precious time and resources on research that may have previously been investigated by another researcher.

The second requirement is to develop an overall plan, to ensure that the action research can proceed in an organised and structured manner. The literature review will be used in the development of this plan, in conjunction with initial interviews conducted with key participants of the organisation where the research is being conducted. This will provide not only an academic insight into the research problem, but also specialist knowledge supplied by the participants.

The third requirement is to test the proposed agile project management method by devising a toolkit. This prototype toolkit will be used to investigate whether this proposed method is built upon sound reasoning and whether it can be put into operation. This tests whether the method is built upon sound reasoning, and also whether it has practical value. This is an important aspect of action research, as the research aims to provide a solution for a problem in the social environment being investigated, in addition to the scientific aspect. By conducting the research in a field situation, the research can be demonstrated to be practical, as well as theoretically stable.

There are two main goals to this particular action research, one practical and the other scientific. The practical goal is to implement change in the researched organisations by improving the project management method of these SME environments, using a mixture of agile and traditional methods. The scientific goal is to contribute to the scientific body of knowledge, thus expanding the literature in relation to agile project management. To achieve both of these goals action research has been chosen as the research methodology, as it satisfies both of these criteria, providing a vehicle for organisational change and establishing a proven method of scientific enquiry (Dick 2002). Action research has already experienced good results in this type of environment, and is especially good for new areas of scientific inquiry.
Action research is better described as a research strategy or meta-methodology, than a strict cookbook or set of rules on how to approach and research a problem. While it is often qualitative in approach, it does not rule out the inclusion of results gained from quantitative instruments if they are deemed to be valuable in uncovering the answers to the question at hand. The main focus of this approach is to implement change, without excluding the research aspect with the introduction of practice. In this particular research, the action research will commence with qualitative tools, such as interviews, researcher observations, and recorded conversations with key participants. This data will be subsequently analysed and the findings implemented into the ongoing research.

The research will take place in the organisation where the researcher is employed. Due to the position that the researcher holds and the size of the companies involved, it is possible for the researcher to gain full access to the organisation. This is beneficial for the research process, as an external researcher may not have the same opportunities of insight afforded to them. However this access also poses its own problems, as the potential for the personal bias of the researcher to appear in the research findings is a real concern.

The topic of researcher bias has been investigated in-depth and concerns primarily the topic of validity, or whether the findings can be viewed as accurate and true (Wilson 2004; Moghaddam 2007) There are many techniques available to a researcher to combat bias though, including implementing triangulation of findings, participant feedback, and most importantly, reflexivity (Johnson 1997). Reflexivity is a technique where the researcher actively and critically reflects on potential biases when conducting the research. Through this critical reflection, the researcher aims to become more self-aware and endeavours to control biases that could unduly influence the findings.
1.5. Outline of the research report

The thesis outline has been developed using the structured five chapter thesis framework as described by Perry (1998, p. 4). This framework has been adapted to produce the following chapter layout that will be used for this research thesis:

Title page
Abstract (with keywords)
Table of Contents
List of Tables
List of Figures
Abbreviations
Statement of Original Authorship
Acknowledgments
Publications Arising from this Research

Chapter 1 - Introduction
1.1 Background to the research
1.2 Research problem and propositions
1.3 Justification for the research
1.4 Research methodology
1.5 Outline of the research report
1.6 Key definitions
1.7 Delimitations of scope and key assumptions
1.8 Conclusion

Chapter 2 - Literature Review
2.1 Introduction
2.2 Parent discipline 1: Project management
2.3 Parent discipline 2: Software development
2.4 Parent discipline 3: Small and medium-sized enterprises – the challenges
2.5 Immediate discipline: IT projects in an SME environment
2.6 Conclusion

Chapter 3 - Methodology
3.1 Introduction
3.2 A detailed description of the research environment
3.2 Justification for the paradigm and methodology chosen
3.3 The research procedure explained
3.4 Implementation of the action research
3.5 Data collection and coding
3.6 Justification of sample selection
3.7 Limitations of the methodology
3.8 Ethical considerations and cultural implications
3.9 Conclusion
Chapter 4 – Data Analysis

4.1 Introduction
4.2 Pilot interviews
4.3 The project management framework design process
4.4 Action research: the initial test and design cycles
4.5 Action research cycle 1
4.6 Interim survey
4.7 Action research cycle 2
4.8 Action research cycle 3
4.9 Conclusion

Chapter 5 - Conclusions and Implications
5.1 Introduction
5.2 Conclusions about the research questions
5.3 Implications for theory
5.4 Implications for project management policy and practice
5.5 Conclusions and recommendations arising from the research
5.6 Researcher’s thoughts about personal development
5.7 Limitations of the research
5.8 Further research potential in this field
5.9 Conclusion

Bibliography
Appendices

1.6. Key definitions

Small and Medium-Sized Enterprise: Since the majority of the research will be undertaken in Austria, the definition for SMEs as set out by the Commission of the European Communities (CEC 2003) will be used, defined as an organisation with an employee count ranging from 1 to 250. Micro enterprises, with an employee headcount of less than 10, are a sub-category of small enterprises and will also be included in the SME definition.

Project: The definition of a project for the purpose of this research is a condensed version of that established by the Project Management Institute (PMI 2008, p. 5):

A project is a temporary endeavour undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project’s objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists.
**Project Management:** Project management, as defined by the Project Management Institute (PMI 2008, p. 6): ‘...is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.’ The majority of current project management standards agree with the fundamentals of this definition, and for the sake of this research project management will be defined as a system of management designed to ensure project success.

1.7. **Delimitations of scope and key assumptions**

One of the delimitations to this research concerns the size of the companies being researched. A preponderance of the IT project management research has been conducted in large organisations. This reduces to some extent certain problems related to data collection, as the sample size is potentially larger with these organisations. This is an issue that will need to be addressed when researching this topic, as the size of an SME will result in smaller sample sizes and raises issues of research transferability. The research will take place in two closely-linked media and publishing companies. One company consists of approximately 70 employees, whereas the second has approximately 60 employees. The research will occur in both companies and will test the research transferability to a degree, as these companies have two distinctly different management and organisation styles. This will therefore test how the proposed project management method functions in two differently structured organisations.

A second delimitation is the sampling of the people selected for the initial discovery interviews. A judgment sampling approach will be used in this instance, which involves choosing subjects who are most able to provide the information that the researcher requires (Sekaran 2003). These interviewees will be chosen from both companies, with attention paid to their role and the specialist knowledge of the company that they may possess. In such a situation, where a sub-section of the group possesses the best knowledge, a cross-sampling of the entire population will not normally produce different results.

A final delimitation is the SME environment where the research will take place. The two companies are of sufficient size to provide a suitable test environment and both are in the SME range. The researcher also possesses the ability to introduce an action research process into the organization to test the theory and bring about change, a crucial factor of the action research process. And finally, the two companies involved have regular IT
implementation projects underway so that the theory can be iteratively refined and tested. There is an element of distinctiveness to these companies though, as the products and the external business partnerships form a very unique research environment. Nevertheless, the underlying concepts are sufficiently common, such that it may be possible to make some general comments about the applicability of the results to other organisations of similar size.

1.8. Conclusion

This chapter has established the foundation for the rest of the thesis. It commenced with a graphical structure of how the chapter is structured. It then progressed to briefly outline the background of the associated fields related to the problem, and what this research hopes to achieve. The primary research question was then introduced, asking:

*To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment?*

Since this question needs to be tested, it gave rise to the secondary research questions:

*What tools and procedures will need to be included in a toolkit, combining methods to assess the primary research question?*

*What are the results of implementing such a toolkit in an SME environment?*

This chapter then progressed to justify why there is a need for this research, and the proposed research methodology was summarised. It also discussed why action research is an appropriate choice in a situation where organisational change and scientific enquiry are being combined. Next the format of the report was presented, with minor changes introduced to adapt to the action research method chosen. A few key terms were defined, before establishing the delimitations of the research and explaining the situation in which this research will occur.

This chapter has introduced the research study, and has provided the basis upon which the rest of the thesis can be constructed. The next chapter will discuss the academic research that relates to this work, and introduce the relevant industry standards.
2. Chapter 2 – Literature review

2.1. Introduction

The first chapter introduced the research problem that raised the question of whether combining agile and traditional project management techniques would improve project success in an SME environment. This chapter presents the academic literature pertinent to the research, and places it in context of the research. The aim of this chapter is to provide the background information of the research topic and to show the gaps in the research literature, so as to identify the areas this research will focus on. The main function of this chapter is to establish a solid foundation of the existing literature, and to investigate the primary research question:

\[ \textit{To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment?} \]

To investigate this question properly a comprehensive investigation of the relative research areas will initially need to be undertaken. This will provide a brief history of these topics, and also details of the main areas where research has previously been conducted. This is an important step in the complete process for two key reasons. It ensures that this research is not a repetition of work that has already been completed, thus ensuring that time and resources are not wasted. The second reason for the literature review is to provide the research with a frame of reference in relation to the complete scientific body of work. This establishes the tone of previous research, and forms the introduction for this particular research methodology, which will be discussed in detail in chapter 3.

In conclusion, this chapter will endeavour to critique the existing project management and software development methods, and methodically demonstrate the short-comings of these practices when implemented in an SME environment. The gap in the current literature will be clarified, and then it will be briefly demonstrated how this research endeavours to address this gap. This chapter establishes the foundation for chapter 3, where the research methodology will be explained and discussed.
The structure of this chapter is depicted in Figure 4, illustrating how the research literature relates to the research topic, and how these combine to form the immediate discipline.

Introduction

Parent discipline 1: Project management

Parent discipline 2: IT implementation

Parent discipline 3: Small and medium-sized enterprises – the

Immediate discipline: IT projects in an SME environment

Conclusion

Figure 4: A **graphical representation of the structure of chapter 2**
Source: developed for this research
2.2. Parent discipline 1: Project management

This section will discuss in sufficient detail the parent discipline of project management from the literature, and how it is relevant to the research questions. The research that has been conducted in this field to date will be presented in this chapter, summarising the key elements that have been developed over the years. These elements will then be associated with the research presented in this thesis. The first step of this section will present a brief history of project management and a critical review of the pertinent literature, establishing a foundation upon which extra topics will be added.

2.2.1. Definitions of project management

The foremost discipline and thematic thread throughout this research is that of project management. Therefore, to form a solid basis to this chapter, the definition of project management needs to be established. The Macquarie Dictionary (2010) was initially consulted for the definition of the separate components of this term.

Project: Something that is contemplated, devised, or planned; a plan; a scheme; an undertaking.

Management: The act or manner of managing; handling, direction, or control.

When the definitions of these two words are combined, then project management could therefore be defined as ‘the act of managing or controlling something that is contemplated, devised, or planned.’ However, as this is purely a dictionary based definition it lacks a frame of reference, or the context to which this applies. To expand on this definition, two of the most popular project management standards were consulted for their definition of a project. These project management standards are the PRINCE2 (Projects In Controlled Environments) method and the PMBOK (Project Management Book of Knowledge) framework, and they will be discussed in detail later in this chapter.

The PRINCE2 standard (OGC 2005, p. 7) defines a project as:

A management environment that is created for the purpose of delivering one or more business products according to a specified Business Case.
This source also gives a second definition of a project as:

A temporary organisation that is needed to produce a unique and predefined outcome or result at a prespecified time using predetermined resources.

Therefore in a PRINCE2 environment, the definition of a project focuses more on the organisational structure that has been convened to produce an outcome, rather than the actual business endeavour to create those products or outcomes, with the focus firmly on the management aspect.

The PMBOK (PMI 2008, p. 5) has an extended definition of a project, though the main points are defined as such:

A project is a temporary endeavour undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project’s objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists...

The PMBOK (PMI 2008, p. 6) expands on this topic further, with a definition of project management:

Project management is the application of knowledge, skills, tools, and techniques to project activities to meet the project requirements.

Here it can be seen that the definition in the PMBOK is similar to PRINCE2, though it takes a slightly different approach. For a start, in the PMBOK the two terms are defined separately, with equal importance given to the endeavour and the management of the endeavour itself. This definition resonates more with the work involved in this research, as one of the pressing research questions deals with how to modify a portion of the management aspect and customise it for an SME environment. Accordingly, for the purpose of this work the definitions as set out in the PMBOK were used, and when referring to project management this definition will provide the basis.

After establishing the definition of the foundational concept of project management, the next step was to complete a thorough review of the academic literature involving this topic. This would form a solid foundation upon which to progress with the research.
2.2.2. A history of project management
In this section a brief history of the emergence of modern project managements will be described, recounting how the discipline has evolved over the years.

2.2.2.1. The early development of project management
Project management is not a concept that has been pioneered in this century. Throughout the ages there have been abundant large-scale construction projects, including such endeavours as the raising of the pyramids, the construction of Stonehenge, and the establishment of roads and aqueducts by the Romans (Kwak and Aanbari 2008). Mankind has thus been involved with projects even before the formalisation of project management. From approximately the 15th century, large construction projects saw the introduction of engineering aspects to ensure that these projects were completed on time. Engineering was coming of age as a science and many of the advancements in this field were due to the continual research that was being undertaken (Morris 1994).

2.2.2.2. The initial project management tools are introduced
One of the first tools introduced for the control of engineering jobs was the Gantt chart. Henry Gantt introduced the first version of this tool between the years 1910 to 1915, just before World War I. This war caused a shift in thinking among many people of the time, and Gantt’s goals and motivation reflected his opinion that too many business people were focused on the production of profits, rather than the production of much needed goods. He argued that these industry resources could be better utilised, increasing the output of factories and businesses to better serve the community. Therefore by introducing this chart system, Gantt’s initial goal was to empower managers and workers, by providing them with the ability to determine where production resources were being under-utilised. Once the war was underway, it came to the notice of the army that factories where Gantt’s method was in place had a higher production rate, and he was consequently brought in as a consultant for the improved production of much needed war supplies (Clark 1923).
Figure 5: An example of a basic Gantt chart
Source: developed for this research

The Gantt chart was a major leap forward in the thinking of its time, because it not only made it possible to control complex situations with a fairly simple tool, but it was also able to be implemented by a wide range of people (Clark 1923). Even today the humble Gantt chart, as demonstrated in Figure 5, is being used to guide the scheduling of many projects. The chart depicts the time needed for certain tasks and the order in which these tasks need to occur. This provides not only a visual plan of project task, but also the dependencies between the unique tasks and the teams implementing those tasks.

2.2.2.3. The cold war and the emergence of project management

By the end of the 1930s the world was once more at war, and the US military was striving to produce a nuclear device. This saw the push for expedited nuclear research in the US, and the foundation of the Manhattan Project (Gosling 1999). This was an extremely complex undertaking, and whilst this project lacked the management tools and techniques that were to emerge later in history, it was characterised by a large portion of the underlying principles of planning and directing that make up modern project management methods (Morris 1994).

The 1950s ushered in the cold war between the US and the Soviet Union, with both countries struggling for nuclear supremacy. The Atlas missile programme was the first step by the US to counter the military might of the Soviet Union, and the first version of this rocket was launched in 1957. With the fourth revision of this rocket, the US had its first fully functional intercontinental ballistic missile, and the arms race increased in tempo (Chertok 2010). This accelerated military research and development, and ushered in a new breed of missile with the launch of the Polaris program. Project management tools subsequently received a developmental boost as well, with the progress of systems management tools such as PERT (Program Evaluation Review Technique).
2.2.2.4. Scientific tools gain a foothold in project management

The initial goal of PERT as a tool was to control the process of missile production with a finer granularity than was previously possible. For each task the project manager supplies estimates of the most optimistic duration time, the most pessimistic time, and the most probable time. The mean of these estimates is then calculated, and is denoted by the symbol $\mu$, whereas the calculated variance for each task is denoted by the symbol $\sigma$ (Klastorin 2003). With this tool an estimate for the duration of each phase of the project is able to be predicted and tracked, providing managers with a powerful tool for task sequencing. The critical path through the project is then able to be identified, enabling project managers to understand the sequence of tasks that will require the most time for completion (Morris 1994). One of the important features of this tool was that it introduced the possibility for project managers to include uncertainty into consideration when calculating the duration of tasks in a project. This was a major step in the management of projects that contain uncertainty. An example of a classic PERT model has been depicted in Figure 6.

![An example of a classic PERT model](source: modified from Klastorin (2003, p. 139))
Whilst PERT was being developed for government projects, companies specialising in process-heavy projects such as construction and mineral exploration were also developing a tool with comparable features, namely CPM (Critical Path Method). Although CPM displays similarities to PERT, the two models do possess a few minor differences in the implementation. Whereas PERT uses a mean value and variance to determine the length of each task, CPM uses a single time value for each task. A classic example of a CPM model is depicted in Figure 7. Here the CPM calculations are displayed, showing the ES (Earliest Start) and the LF (Latest Finish) times for each task, providing the critical path through the project. CPM time estimates are deterministic and are usually sourced from historic data from previous projects, and therefore appropriate for construction projects. In comparison, the time estimates for tasks using the PERT method are probabilistic, and are better suited to situations where there is limited historic data, or when the environment is rather unique.

Figure 7: An example of an activity on the node network, with CPM calculations
Source: modified from Klastorin (2003, p. 87)
Another major difference between the two methods is the time/cost trade-off analysis that was developed for the CPM method. A task may normally require four weeks for completion, though with additional resources it may be possible to complete the task in three weeks. The project manager is then able to weigh the time/cost benefits of the situation and determine whether it would be more beneficial to invest more resources, or more time in the task. Having this type of flexibility in the execution of projects is an important part of the project manager’s toolkit, as this gives them the option of moving the execution of tasks in a project timeline.

These two methods were at the forefront of the move towards a more scientific mode of management, though as a scientific discipline project management was still in its formative stages. These tools were however some of the initial techniques for project control, and provided the catalyst for research into improved methods (Shenhar and Dvir 2007). As projects became larger and more complex, US government departments and large construction companies introduced these management techniques to gain a level of control that was previously not available. Initially this was to control complex engineering tasks, including major construction projects such as the Alaskan pipeline, aerospace and aeronautics projects, and the production of advanced missile systems (Morris 1994). These were unique and expensive projects which required the benefits of project management, due to distinctive problems and challenges that arose in these situations (Kwak 2005). Therefore the necessity for project control grew naturally out of these complex environments.

2.2.2.5. The role of project manager is established, and the toolset is expanded

It was towards the end of the 1950s that companies began to realise that a project manager was a necessary role for the successful control of projects. These managers were given the responsibility of the successful implementation of the project from beginning to end (Stretton 2007), establishing a new role that diverged from the traditional functional management roles. The introduction of the project manager started a shift in the way that projects were viewed by industry and academics, as the need for a specialised role to handle this type of purpose-specific work became clearer (Gaddis 1959).
The next expansion to the project management toolset came in 1961, when Russian Yuriy Gagarin succeeded in circling the globe in Vostok 1. Spurred by this event, the US government charged NASA (National Aeronautics and Space Administration) with the task of landing a man safely on the Moon by the end of the decade (Chertok 2010). The moon missions were extremely expensive, and though the objective of the project was clear, project managers were confronted with uncertainty about many of the technical aspects of the tasks. To combat this uncertainty the US Department of Defense and NASA jointly released new cost and task control methods. These included such tools as Work Breakdown Structures, Earned Value, schedule controlling as well as enhanced procurement procedures (Morris 1994). The PERT method was also adapted from a purely time-based estimating tool method to an improved cost/benefit analysis method.

Management science research surged ahead in this time, with the introduction of tools such as Material Requirements Planning, Value Engineering, Cost Analysis, and Quality Assurance, to name but a few. Many of these tools have been refined and improved over the years and are still in use today, and have since become standard practices in project management.

The 1960’s saw the establishment of project management as a separate management discipline, with the founding of two of the major project management associations. The IPMA (International Project Management Association) was founded in 1965, and has in excess of 40,000 members from almost 40 countries (IPMA 2009). The Project Management Institute was founded in 1969, and has over 420,000 members and credential holders from 170 countries (PMI 2009). These two organisations have been active in promoting research into this field, and produce respectively the peer-reviewed journals International Journal of Project Management and Project Management Journal. These are just two of the journals that promote the advancement of scientific research into the field of project management, an advancement that has seen the rise of several distinct schools of thought when it comes to researching project management and how it fits into the overall picture of the organisation.
2.2.3. The major project management schools of thought are established
As demonstrated so far in this chapter, research has quite often driven the progress of project management, introducing new tools or improvements on old methods and techniques. Through the decades there has been a variety of research conducted concerning project management, and one of the outcomes of this research has been the establishment of several schools of thought. It has been argued that there are nine main schools of thought that have arisen from this project management research, where researchers differ in their opinion of how a project should be viewed and managed (Anbari, Bredillet, and Turner 2008). A few of these relevant schools of thought will be briefly examined, to demonstrate the breadth of project management research that they encompass and how these schools of thought interact with one another.

2.2.3.1. Process school of thought
The process school has been popular during the last decade, with research focussed upon the refinement of the project management processes. These processes encompass the tasks and goals of normal project work, and are used to control the project from commencement to completion. Government bodies and large corporations particularly favour this approach, as these organisations have a pressing need for structured control of project work. Two of the more pervasive methods in this category are the PRINCE2 method and the PMBOK framework (PMI 2008; OGC 2005). The processes of these methods are continually being refined and improved in response to advancements and changes in this field.

2.2.3.2. Optimisation school of thought
Project management as it is known today grew out of operations research. This approach also focuses upon process control, and is where the development of certain tools came from. From this school of thought we see the emergence of tools that were discussed in earlier sections of this chapter, such as CPM, PERT and Gantt charts. The aim of this research is to treat the project as an adjustable machine, whereby sufficiently refining the project inputs will improve the outputs. In this approach project processes are targeted for continual improvement, as these can be refined while still keeping within the specifications of a project. Critical Chain and Six Sigma are two methods that focus primarily on continual refinement to improve execution times and delivery schedules, and these methods are also being merged with project management techniques.
This type of approach is ideally suited for projects where there is an occurrence of repeated elements and the scope is well defined, such that processes and work flows can be measured and monitored and then refined and improved. To properly implement Six Sigma in an organisation can be quite costly, and this has led to a lean version so that smaller organisations can benefit from these techniques while reducing implementation costs (Dirgo 2005). However, once these process-oriented methods are implemented in projects that contain a significant portion of uncertainty, they start to lose their effectiveness (Bredillet 2002). This school of thought is not ideal for this research, as the focus of this school is primarily on projects that contain processes that are stable and situated in predictable project environments, two factors that are often lacking in SME environments as they often possess a low degree of standardisation in their processes and procedures (Turner, Ledwith, and Kelly 2009).

2.2.3.3. Modelling school of thought
As projects became more complex, the optimisation approach matured into the modelling approach, as project managers increasingly needed to gain an overview of these projects. Modelling has progressed to such a point that even the soft effects of a project can be modelled to a degree, including such areas as customer interactions, the consequence of scope change, and even the subjective effects of certain managerial decisions (Williams 2002). This approach aims to improve the complete system by combining hard and soft systems, and is an ongoing area of research (Ahlemann 2009). This school, much like the optimisation approach, works well in projects where the end product is well defined, but is not particularly useful in an unstable environment or where the scope is extremely unique.

2.2.3.4. Success school of thought
The success school of thought focuses on ensuring project success for the benefit of the organisation. This area of research concentrates on factors that have the potential to influence the success of a project and the mitigation of failure. This is especially important as projects increase in size and complexity and the likelihood of failure also increases. This has led to the development of areas such as risk management and team building, two factors which are especially important for an SME organisation (Cooper et al. 2005; Frame 2003).
Due to the size of the organisation, projects undertaken by SMEs are predominantly smaller in size than those in large organisations (Turner, Ledwith, and Kelly 2009). These small projects are often viewed as low risk, due to their size and the resources involved. However, an SME will have a smaller resource buffer in the event of a project failure, and therefore risk management for these projects is necessary to ensure as high a rate of project success as possible (Rowe 2007). Team work is also an important factor for SMEs, as small cohesive teams contribute to improved project work.

2.2.3.5. Behavioural school of thought

One progressive area of research encompasses the view that project management is but one component in a social system, with a web of interactions to other components of the total system (Anbari, Bredillet, and Turner 2008). The goal of this behavioural school of thought is to clarify the social aspects of the project teams.

Research into team behaviour and the development of project leadership skills are just two of the topics under investigation in this category (Turner and Müller 2006; Amason et al. 2007; Turner and Müller 2005), in addition to knowledge management to improve the organisation (Xu et al. 2009), managing virtual teams, and the problems associated with globally spread teams (Khazanchi and Zigurs 2005). These are areas that can also affect an SME, especially when the organisation is conducting international projects, a practice which brings with it some of these issues mentioned here.

2.2.3.6. Contingency school of thought

The contingency school is particularly relevant to the topics covered in this research. This is an emerging area of the project management discipline, with project managers recognising that adjustments are required for projects taking place in different industries and settings (Anbari, Bredillet, and Turner 2008). A management style that is successfully used for the management of large construction projects will usually not provide satisfactory results when applied against small-scale software projects. Even within the same industry this disparity can be experienced, as large software projects can be managed with CMMI (Capability Maturity Model Integration) or RUP (Rational Unified Process) methods, whereas the project team for smaller software projects may find these methods to be administratively burdensome (SEI 2006; Runeson and Greberg 2004). This has consequently lead to the development of methods that use a more contingency-based style of management, and these modified methods have been utilised by small teams to produce
software in changeable environments (Chin 2003; Schwaber 2004; Sone 2008). This school of thought will be one of the major areas from which the proposed style of project management will be formed for this research, due in part for the need for this contingency style in the research environment, and for the reduced level of bureaucracy in this style of management.

In this section the details about how project management came into being was briefly discussed, and how it grew in popularity. The classic project tools were also investigated, a large of which are still in use today. In the next section the focus will turn to research into project management and how it has progressed over the years.
2.2.4. The progress of project management research

This section of the literature review examines the progression of project management research over the years. Kloppenborg and Opfer (2002) performed an in-depth review of the completed research in the field of project management from 1960 through to 1999, sourced from approximately 3,500 academic dissertations, journal articles and reports. The percentage of articles published per decade is depicted in Figure 8. Here it can be seen that as the project management discipline matured the amount of corresponding research also increased, with a pronounced increase in the 1990s. Indeed, over 60% of all the research occurred in the 90s, demonstrating that the scientific field of project management is maturing at a rapid rate.

Figure 8: Percentage of project management research articles per decade
Source: developed for this research; data source Kloppenborg & Opfer (2002, p. 12)
The industries that this research focussed on over these decades can be observed in Figure 9. This diagram depicts how the research was disproportionately distributed across industry sectors, with certain sectors receiving substantially more attention than others. The majority of the research has focussed on project management in the construction and information technology industries, accounting for 66% of all research conducted in this discipline (Kloppenborg and Opfer 2002). This is in accordance with the history of project management that was discussed earlier in this chapter, as these were two of the main industries where project management first emerged. As other industry sectors saw the benefits of implementing a project management method, the research expanded into these industries as well. This expansion is continuing today, as more industry sectors adopt project management techniques for projects that are departing from the traditional engineering approach (Winter et al. 2006).

As research into this discipline progresses so the breadth and depth of the areas of project management also increases. As can be seen in Table 1, there has been a natural progression in the areas being researched over the decades.

Figure 9: **Percentage of project management research articles per industry sector**
Source: developed for this research, data source Kloppenborg & Opfer (2002, p. 12)
<table>
<thead>
<tr>
<th>Decade</th>
<th>Research Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960s</td>
<td>The first steps into researching project management as a scientific discipline are taken.</td>
</tr>
<tr>
<td>1970s</td>
<td>Heavy focus on cost and schedule control, performance measurement, work breakdown structures and life-cycle management. Research involving PERT and the introduction of design-to-cost and lifecycle management, as well as leadership and conflict management in projects.</td>
</tr>
<tr>
<td>1980s</td>
<td>Research is increased. Research is focussed primarily on design-to-cost and life-cycle costing. The appearance of risk management, cost/schedule control systems, team building, earned value and quality management. Initial reports about knowledge-based systems start to appear.</td>
</tr>
<tr>
<td>1990s</td>
<td>Significant amount of research now occurring. Research is focused on team building, leadership and motivation. Further study undertaken about risk management, quality management and communications.</td>
</tr>
<tr>
<td>2000s</td>
<td>Project team culture gains significance, especially for virtual and geographical spread teams. Project Manager competency is valued and emphasised. Information and knowledge management for projects becomes important, as projects grow in size and complexity.</td>
</tr>
<tr>
<td>2010s</td>
<td>Current relevant trend: Agile and iterative project management methods gaining popularity.</td>
</tr>
</tbody>
</table>

Table 1: Project management research, categorised and separated into decades
Even though a topic may have been academically investigated, this does not mean that it is then abandoned altogether. An example of further research involves the PERT method, which was introduced in its classic form in the late 1950s. In the 1970s further research was conducted involving PERT, where scheduling became a major focus (Moder and Phillips 1970). This revitalised a classic project management tool and made it more applicable for current projects. This is not a unique case though, and many tools and methods have been revitalised, or recombined with other methods, producing new and innovative tools and methods. It was in this spirit that this research has been carried out. Older and more established management methods and tools will be investigated, to determine whether a recombination of methods and tools can produce a solution to a modern situation, namely the problem of managing projects in a fast-moving SME environment.

2.2.5. Determining if project management provides value to an organisation

Despite the abundant research conducted across many industries and countries, there was no definitive answer as to the actual benefits an organisation could reap by implementing project management. Thomas and Mullaly (2008) therefore investigated whether an organisation could receive added value by implementing these techniques. This multi-million dollar project took more than three years to complete and combined the results of case studies, surveys and interviews, to provide an extensive review of project management value. In addition to establishing that project management can indeed add value to an organisation, one of the results that emerged from this study describes the balance between cost and value creation when project management techniques are implemented.

This finding, as depicted in Figure 10, shows that at a certain point the law of diminishing returns comes into effect. As the total investment in project management practices is increased, the results show ever smaller increases in total value gained. Therefore once the perfect balance has been achieved, it becomes illogical for the organisation to invest more resources into improving project management practices (Thomas and Mullaly 2008). Thus each organisation needs to establish the correct balance of procedures and methods to manage projects in their environment.
Furthermore, the optimum investment for project management was shown to be unique to each organisation. What may be optimal for one organisation may not necessarily be applicable to another, even if the organisations are of similar size and operating in the same industry. This research highlights the important role that the project manager must play in determining the correct method and amount of project management for a particular organisation. Additionally, once the project manager arrives at a decision for the type of project management style they will implement, further adaptation must occur per project, as even at the project level there is a broad range of difference between project types in the same organisation (Shenhar 2001; Turner, Ledwith, and Kelly 2009). Once again the requirement for flexibility and resourcefulness on the part of the project manager is made apparent.

Figure 10: Creating value and value destroyers
Source: Thomas and Mullaly (2008, p. 358)
2.2.6. Project management basics
In the previous sections of this chapter the academic progress of project management was investigated, and how it developed over the years. Before the industry standards that have emerged over the years are examined, the basic building blocks of project management will be introduced, and how these tools interact with one another.

2.2.6.1. The traditional project management iron triangle
When implementing a project, a project manager will find that there are several constraints to be aware of and taken into consideration. Traditionally in project management this is comprised of three constraints, as depicted in Figure 11, namely time, cost and scope. This triangle is known as either the iron triangle of project management constraints, or the golden triangle of project management success. The constraint time refers to the amount of time required to complete the project successfully, and is frequently referred to as the project schedule. Cost, or budget, is in reference to how much the project will cost to complete. And finally, scope, sometimes called specification, refers to the product or end result of the project.

![The project management iron triangle of constraints](image)

Figure 11: The project management iron triangle of constraints
Source: developed for this research
Just as with a geometric triangle, where if one of the sides is adjusted it will affect the other two sides, so changing a constraint in a project can affect the other two constraints. The iron triangle was later refined, with quality being added as an extra constraint. These constraints have been once again refined, and in the latest PMBOK (PMI 2008) these constraints now include scope, quality, schedule, budget, resources and risk. For project success these constraints need to be taken into consideration, as they can all play an important role and influence the success of a project.

2.2.6.2. Time constraint

The constraint time is associated with the timing of the individual project tasks in relation to the project deadline. This usually includes the start and completion dates, and in the event that a project is delivering a product in stages, then it will most likely include timing for the separate sections of the project. This is an important management tool to enable the best deployment of resources, and is necessary in situations where one task is dependent on another. Scheduling is an important issue that needs to be tightly controlled in a project, as even with conscientious planning tasks may not always occur when they should, with delays affecting the entire project timeline. The remaining tasks may need to be re-examined and the timing adjusted several times during the project (PMI 2007).

In a world of strict deadlines and timelines scheduling is an important topic, and this has led to the establishment of manuals and standards to assist organisations in providing the best scheduling practices for projects. The practice standard from PMI (2007) aims to deliver a set of tools to the project practitioner so that they can assert a better control on the timing of projects. This includes such tools as project calendars, work periods and milestones, in addition to processes for optimising the project update cycle.

2.2.6.3. Scope constraint

Every project requires an objective, as this determines what must be accomplished. The scope is the work that needs to be completed, in order to successfully deliver the result that the project has been formed to achieve. Uncertainty in regards to the scope can cause substantial problems, and can impact on the success of the project (Atkinson, Crawford, and Ward 2006). If any of the project goals is unclear the project team will be unable to determine the best way to achieve these goals, as they may have a different understanding of what is required to the project sponsor. Therefore correctly determining and agreeing on the scope of the project is an important initial step.
Because scope defines the project, this constraint is comprised of several components. As mentioned previously, arriving at agreement about scope is highly important. When a project includes multiple parties scope planning becomes more critical, as the addition of extra parties can increase the possibility of misunderstanding and misinformed conclusions. This is where an important tool, the WBS (Work Breakdown Structure) becomes invaluable for the management of project scope (Khan 2006). Contractors and other project workers can be explicitly assigned work so that it is clear who must complete which task and in which time-frame, and what the expected result from these tasks will be.

**2.2.6.4. Budget constraint**

The budget is the third constraint included in the iron triangle of constraints, and one that receives a lot of attention in relation to failed projects. If the project scope and schedule cannot be altered, then this constraint will usually need to be altered to allow for project completion. The budget will often be the determining factor in deciding exactly how a project will be executed, as one of the decisions that may need to be made is whether to buy or build the solution. Depending on available internal resources and the available external offerings, this decision will influence whether a certain service is supplied internally to the organisation or sourced from external contractors and suppliers (PMI 2008).

Managing the budgetary constraint also involves calculating the necessary funds pertaining to risk management. If it is deemed that a particular detrimental scenario has a high probability of occurring during the project implementation, funds may need to be assigned to diminish or minimise any potential negative effects. This is usually designated in the budget in the form of a contingency reserve.

**2.2.7. Major project management standards in use today**

The 1980s and 90s saw the IT industry come of age, and complex computer systems were developed and implemented by corporations and government organisations worldwide. As IT projects became more prevalent, and organisations grew to depend upon their computer systems and IT infrastructure ever more heavily, these organisations saw the need for methods specifically tailored to this area. The standards that have been developed over the years diverge in the IT industry areas that they address, with some standards focusing solely on software engineering, whilst others focus more on the broader discipline of project management.
In this section some of the more widespread project management standards will be briefly critiqued, as to their suitability for managing projects in an SME environment. The standards that will be discussed in this section are the PRINCE2, Hermes, and V-Modell and methods, in addition to the PMBOK framework. This is by no means an exhaustive list of all project management methods currently available in the field. However these four were considered the most influential and wide-spread standards for the environment in which the research was conducted.

2.2.7.1. The PRINCE2 method from Britain

The PRINCE (PRojects IN Controlled Environments) method was introduced in 1989 by the British government, for the purpose of managing complex IT projects. It was later redesigned in 1996 to form the PRINCE2 method, and since then this method is viewed as more of a generalised project management method. This method has been rigorously adopted by the British government, as well as by a portion of the private sector throughout the United Kingdom. One of the drivers to this adoption is that the British government requires contractors to implement PRINCE2 for most government projects, thus assisting in part with the dispersion of this method (OGC 2005, 2009).

![The PRINCE2 process groups surrounded by the main components](image-url)

Figure 12: The PRINCE2 process groups surrounded by the main components
Source: (OGC 2005, p. 12)
The 45 processes of the PRINCE2 method are divided into 8 main groups, as shown within the central rectangle in Figure 12. The authors of PRINCE2 state that it is a fully scalable method for large as well as small projects (OGC 2005), however the approximately 40 activities included in this method need to be individually assessed and modified for smaller projects. Each of the major areas needs to be addressed and guidance is given in the standard, though how they are actually adapted is left to the discretion of the project management team. Therefore, to use such a method on small projects requires an in-depth knowledge of the method on the part of the project manager. Not all project professionals agree however that the PRINCE2 method is as adaptable as promised, and while the benefits for large and complex projects has been acknowledged, the value of this method in connection with small projects is questionable (Nicholson 2004). As the name implies, Projects In Controlled Environments, this method is best suited to controlled environments where projects can be carefully planned, and is therefore not ideally situated for the control of projects in an environment where uncertainty abounds (OGC 2005; Nicholson 2004).

Several city councils in Britain, such as the Isle of Anglesey City Council, are working to produce a modified version of the PRINCE2 method that will be used for the control of smaller projects. Such modified methods are commonly referred to as PRINCE Lite, or PRINCE2 Lite, and use a similar framework to PRINCE2 without the whole weight of the method needing to be applied to a project. However, these methods are often derisively referred to as PINO (PRINCE In Name Only) by advocates of PRINCE2, and there are still limits as to where this modified version can be successfully deployed. One version of this modified method views projects with a projected duration shorter than 15 days as not viable to be considered as PRINCE2 Lite projects, as they may become hindered by paperwork and processes. Another issue for the widespread uptake for this method is that this is a customised method that is generally produced internally by an organisation, and is not released for use by the general public.
2.2.7.2. The V-Modell method from Germany

The German federal government introduced the V-Modell project management method in 1993. It was initially designed for the management of software projects, though it has since been expanded to include all IT projects. This method is not to be confused with the US version of the V-Model, as while they may appear similar and were developed at approximately the same time, over the years they have diverged significantly in their application and theory. This method has been regularly revised over the years, and the most recent version is known as V-Modell XT (eXtreme Tailoring), which is widely in use by government bodies throughout Germany (BMI 2006, 2009). The recent addition of the tailoring feature is in recognition to the fact that not every project can be managed with the same processes and style, and that changes need to be made for each unique project situation.

The processes of this method are demonstrated in Figure 13. It is a method rich with processes, and makes use of project phases with decision gates at the end of each phase. A decision gate is a process whereby the process manager will determine if the phase goals have been achieved, and whether the project should be allowed to continue to the next phase. One of the more important considerations for this research was whether this method could be adapted to work well in a small project environment, where uncertainty is a major concern. It has been noted by the advocates of this method, that the smaller the project is the more effort is required to implement this project management style. Irrespective of this fact, it is still asserted that small organisations can also reap benefits from the efficiency of standardisation (BMI 2006), though more research needs to be conducted in this particular area before a definitive statement can be made.
Figure 13: **The V-Modell method process phases**  
Source: (BMI 2006, p. 1.19)

Whilst the V-Modell method has been developed principally for the management of information technology projects, it is more suited for large and recurring projects. Due to the structure of this standard, it is primarily suited to the government environment where it is currently deployed, and brings with it benefits arising from project process standardisation and control. This style of project management is predominantly a linear method though, and is slow to adapt to changes in the project environment. Although with major adaptation work it may be possible to customise this method, so that it can be used for the control of small and non-standard projects, it was not considered the ideal method for this research.

**2.2.7.3. The Hermes method from Switzerland**

The Hermes method was first introduced in Switzerland in 1975, and has been developed specifically for the management of ICT (Information and Communication Technologies) projects. It was later revised in 1995 to resemble the German V-Modell method. Although initially this method was introduced for the control of software projects, it was later expanded in its application to include other types of IT projects as well, and is now compulsory for all IT projects undertaken in connection with the Swiss federal government (FSUIT 2004, 2005).
In addition to the government using this method a portion of the Swiss private sector has also adopted Hermes to manage IT projects. Since 2004, the public sector in Luxembourg has also adopted the Hermes method to control IT projects (Blau 2006), due in part to the long-standing partnership between Switzerland and Luxembourg. As a result, the manuals for the Hermes method are primarily available in the German and French languages, two of the official languages of Switzerland and Luxembourg.

![The Hermes method with details of the process progression](source.png)

Figure 14: **The Hermes method with details of the process progression**
Source: (FSUIT 2004, p. 7)

The usual progression of the Hermes project phases can be seen in Figure 14. Each phase of the project produces a result, and these results are used as control points or decision gates, where the project management team decides if the project should be allowed to proceed to the next phase. In addition to this linear approach, the Hermes method has been modified to allow for situations that are not strictly straightforward, where the project does not move steadily through the process phases in a linear manner.

As depicted in Figure 15, when the project involves systems adaptations it may be possible to implement iterations at certain points in the overall process. This allows a project using the Hermes method to respond to both changes and problems that may take place during the implementation process, allowing system adaptation projects to be more flexible in their approach.
Figure 15: The Hermes method with iterations points in the project progression
Source: (FSUIT 2005, p. 52), translated from German

One of the main reasons that this method was investigated for useful attributes is that this method enjoys a substantial following in the German-speaking community, primarily due to its deployment by the Swiss government as mentioned earlier. The popularity of this method is slowly increasing in the commercial world, and a minor following acquired in Austria, where this research was conducted. The concept of tailoring Hermes to the project is a concept that is also starting to be discussed in regards to this method, where the project processes are adapted to the size of the project. Project managers are realising that what is needed for a large project may not necessarily be required for a smaller project (FSUIT 2005). However, whilst the use of iterations and tailoring to the size of the project may go some way to adjusting for small projects, primarily this method is designed for an ordered environment, and for the control of large and complex projects.

An additional problem that this method faces, from a research perspective, is the lack of information available to researchers in the English language. Procedure manuals are currently available in the German and French languages, as these are two of the official languages of Switzerland, though there are only a few condensed introductory articles available in English. There are currently no plans by the authors of this method to translate the manuals into English, and this makes it difficult for researchers who are not fluent in German or French to investigate this standard in future research. In the English-speaking world there is a noticeable lack of academic literature relating to the Hermes method, and only a minor amount of articles are available in German-language journals. Due to these several factors it was therefore decided that this method was an unsuitable choice for this research.
2.2.7.4. The PMBOK framework from the United States of America

Whereas many organisations in Western Europe and Australia currently implement the PRINCE2 method, one of the more widespread project management frameworks is the PMBOK (Project Management Body of Knowledge) which has been developed by the PMI (PMI 2008). As it is one of the most wide-spread systems of project management it has become a de facto standard in the world of project management, and is currently implemented by government bodies and private sector organisations throughout the world.

Although some practitioners view the PMBOK as a project management method, the aim of the PMBOK is to provide a collection of the current best practices in this field (PMI 2008). This body of knowledge forms a framework for the management of projects rather than a management method. As a result, the project manager will need to determine exactly which processes will be deployed, and with which level of complexity these processes will be implemented. As noted in an earlier section discussing the PRINCE2 method, the proper amount of processes put into practice for a specific project will vary depending on the relevant events within that project. This can be quite a daunting task for the project manager, as the current version of the PMBOK contains 42 unique project management processes. These processes are categorised into five process groups, and comprise of initiating, planning, executing, monitoring and controlling, and closing. The interactions between these distinct groups are depicted in Figure 16.
Because of the widespread availability and popularity of this framework, in addition to the flexibility available for deployment, it was decided that PMI’s PMBOK framework would be used as the project management foundation for this research.
2.2.8. Research into small projects starts to increase

As the practice of project management increases in the breadth of application, researcher and practitioner attention has turned to the topic of smaller projects. The aim of this attention has been to determine if these projects could also benefit from the introduction of specialised procedures and processes. It has been noted that on the whole larger companies conduct large projects, and smaller companies conduct small projects. Consequently it has been noted that there is a need for a project management style that is specifically tailored to this environment (Turner, Ledwith, and Kelly 2009).

The main issue that practitioners and researchers encounter with the traditional project management methods is that they are often too bureaucratic to be implemented successfully or with an impact in an SME environment. As more research is conducted in this field it is becoming more apparent that SMEs require a method that is specifically tailored to the company size and environment (Turner, Ledwith, and Kelly 2008, 2009; Rowe 2007). Whilst project management tools and techniques in larger corporations have been keenly and deeply investigated (White and Fortune 2002; Bryde 2003; Kloppenborg and Opfer 2002), only a small amount research has focussed on the topic of project management in smaller organisations. This topic is where this research shall focus, and one of the aims of this work is to add to the knowledge in this area, bringing some extra clarity to the issue in the process.

2.3. Parent discipline 2: Software development

After a careful investigation of the relevant project management standards available, it has been determined that the PMBOK is the most suitable framework to form the foundation of this research. This foundation is only one portion of the equation however, and the missing factors needed to be identified before the alteration process could commence. The next stage in the process is to determine how to customise this framework and make it more responsive for the SME environment, especially when dealing with rapidly changing or uncertain environments. For this vital element, some of the practices in use by software developers will be investigated. There have been several advances in the field of software development, which have arisen from problems similar to those encountered in this research. It was therefore decided that this area of IT would be investigated, to determine if this particular field contained the missing piece of the equation.
2.3.1. The progression of software development

As with project management, software development was founded initially in the engineering fields, following the fundamental structure of these disciplines. A classic example of the early style of development is embodied in the waterfall model, which was introduced in the 1960s and gained popularity in the 1970s and 80s. This model, as depicted in Figure 17, is a method of producing software that is phase driven. Each phase of the overall development produces a result, which is then used as an input for the next phase (Leffingwell and Widrig 2003). If a phase fails to produce a result or is not completed, then the next phase cannot properly proceed and the development process is delayed.

Figure 17: The waterfall model of software development
Source: developed for this research
Whilst this style is now viewed as obsolete and an inflexible approach to software development, it has been implemented quite successfully in the past, especially for the production of secure operating systems and computing environments for government bodies. However, as technology progressed organisations began to encounter development issues, especially when creating products that required user interaction, or where the requirements were only partially understood during the design stage (Boehm 1988). A major issue with this model was that, the further along the phases a change or a correction was introduced, the more expensive it was to implement this change. As in the project management field, when initial requirements are less established, such a phase-based system will also encounter problems in the software development field.

Eventually organisations realised the inherent drawbacks of the waterfall style of development, and endeavoured to improve the process of software production. This became a pressing issue when computer hardware became considerably less expensive to implement, as suddenly software was able to play a greater role in the complete computing experience. At the end of the 1980s the spiral model was introduced, as depicted in Figure 18. This model promised to deliver a more incremental development model, and took the risk factor into greater consideration (Boehm 1988).
The spiral model introduced the concept of incremental development, which quickly became an integral part of software production. This allowed developers to produce a usable prototype of the end product, thus enabling end-users to provide input on how to refine the prototype for the ultimate product (Leffingwell and Widrig 2003). This was a break from the traditional method of design-and-build as depicted by the waterfall model, and was an important advance in development techniques. As IT developments progressed, technology and the business opportunities associated with it emerged extremely quickly. The IT industry was progressing so quickly that it was often no longer feasible for a business to practice the more traditional methods of development. The traditional process usually involved planning, designing, and building one or two prototypes to fully test the
concept, before releasing the software to the end-user. Organisations now required improved results in an even shorter time frame, and improvements in development methods were therefore required.

Whilst the spiral method was an improvement for development, the next major milestone in this field came with the introduction of the iterative approach. Introduced in the 1990s, this method was a hybrid approach that adopted the practices from the waterfall and spiral models, introducing the concept of iterative development (Kruchten 1995). This initial iterative approach to software development was later expanded to form the basis of the RUP (Rational Unified Process) software development framework (Kruchten 2000). This framework has undergone regular refinement and is still in use by many organisations today.

As depicted in Figure 19, software development using this framework occurs incrementally, with the amount of effort for a particular process group represented by the width of the coloured bar on the time line. This framework allows for scope changes to be introduced throughout the project, with a reduction in the level of risk in comparison to older development methods. This reduction in risk is primarily achieved by focussing on high-level problems in the earlier development stages. One of the attractions of this method is that it can be heavily customised to specific projects, and only the necessary effort needed for that particular stage of development is undertaken. Additionally, phases in the development can also occur sequentially or concurrently, depending on the requirements of a project (Leffingwell and Widrig 2003). This allows a development team to be more flexible in their approach, and provides them with greater possibilities when implementing a software project.
These three software development models establish the foundation for the next section, where two popular software development standards will be briefly examined.

2.3.2. Software development standards: Their strengths and weaknesses
The following standards originate from the field of software development, and are important to the research as they establish the background for the emerging software development methods that cater specifically to smaller software projects.

2.3.2.1. ISO/IEC 12207:2008 systems and software engineering
The ISO/IEC 12207:2008 international standard has been developed expressly for the purpose of software development, and provides the necessary processes for the control of complex software projects (ISO/IEC-IEEE 2008). This is one of the more important standards in software development, and establishes a framework that is currently in use by many government bodies and corporations. This standard has been formalised by the International Organization for Standardization in cooperation with the Institute of Electrical and Electronics Engineers, and this modular framework can be used for the creation and maintenance of software.
The ISO/IEC 12207:2008 standard defines 43 system and software development processes, and as highlighted in Figure 20, 6 of these processes are specific to project management. Many corporations have implemented this standard in an endeavour to improve their software production practices, and it has proven to be a useful method over the years. Such a standard enables a large organisation to standardise processes, with the goal of continual process improvement. Although this standard is a valuable tool designed specifically for the software industry, software developers working in small organisations often found that it was excessive for their needs. For a small organisation quite often the business focus is on surviving in a competitive market, with few resources available for the task of process improvement (Paulk 1999). For this reason many small organisations often avoid implementing such standards, due to the resource overheads incurred.

![Diagram of ISO/IEC 12207:2008 standard processes](image)

Figure 20: The project management processes of the ISO/IEC 12207:2008 standard
2.3.2.2. Capability Maturity Model Integration

Another software development standard that has emerged is the CMMI (Capability Maturity Model Integration) model designed by the SEI (Software Engineering Institute). This standard emerged from a set of models developed by the US Department of Defense and the US National Defense Industrial Association, where the initial goal was to produce a united and flexible framework for improved software production (Boehm and Turner 2003). Similar to the ISO/IEC 12207:2008 standard, this model is process oriented and separates the processes of software development into four distinct categories, where similar processes are organised for the control of software projects, one of which is project management (SEI 2006). The CMMI model enables the development of stable and quality software through the use of standardised processes, where measurements and controls can be implemented and tested. Large complex software development projects are ideally placed to implement this development model.

Figure 21: CMMI project management processes with links to other process groups
Source: (SEI 2006, p. 57)
There are 22 processes detailed in the CMMI model, grouped into the 4 major categories of process management, project management, engineering, and support. These groups are distinct in the roles they play, though they affect and interact with other groups. The advanced project management processes are detailed in Figure 21, with the interaction links shown connecting the other process areas.

These software development models and standards have been successfully used to produce software now and in the past, a fact which must not be discounted. Nevertheless, a recurring theme seen throughout the literature is the challenges some small organisations face when implementing the more traditional methods of software development. This can include issues brought about by the resource requirements of these methods, or the challenges faced when producing software for a rapidly changing environment. These problems were confronted head-on with the introduction of agile methods of software development.

2.3.3. Agile software development is introduced

In 2001 a group of developers convened to discuss the future of a new generation of software development methods. These methods were not as process-heavy as earlier methods tended to be, and one of the main results from this meeting was the agreement to the term ‘agile’. This term would be used to represent the kind of method that was able to respond quickly to changes in software project requirements. Another major outcome from this meeting was the establishment of the Agile Manifesto, where the core values of agile development were made clear (Beck et al. 2001a):

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

- **Individuals and interactions** over processes and tools
- **Working software** over comprehensive documentation
- **Customer collaboration** over contract negotiation
- **Responding to change** over following a plan

That is, while there is value in the items on the right, we value the items on the left more.
These four statements form the basis for the agile methods, and are explained in greater detail in the principles of the Agile Manifesto, a copy of which can be viewed in Appendix B. The principles of the agile community diverged from the traditional development mindset, in that not only would these developers be willing to accept change, even late in the development cycle, but would welcome it and strive to deliver a product that could maximise the benefit to the organisation. The main focus of the agile movement is to produce software quickly, without being constrained by the bureaucracy of the traditional methods. Many different styles of agile development have arisen, but two of the most popular are Scrum and Extreme Programming. In the next section these two agile methods will be examined to determine how development flexibility is achieved using this style of software development.

2.3.3.1. Two agile methods are investigated: Scrum and Extreme Programming

The early 1990s saw the introduction of Scrum, a popular agile method in the software development field. The name Scrum originates from a rugby term, where a team works closely together for sporting success. One of the main foundations upon which the Scrum method is built is the engineering concept of empirical process control (Ogunnaike and Ray 1994, p. 364):

> It is typical to adopt the theoretical modeling approach when the underlying mechanisms by which a process operates are reasonably well understood. When the process is too complicated for the theoretical approach... the empirical approach is the appropriate choice.

When dealing with engineering process control there are two main models. The defined process control model can be used for the control of processes that are well understood, and where the process output is reasonably predictable. By refining the process inputs, the output can in turn be improved and refined using this model. Agile methods stem from the concept of empirical process control, which is useful when the process outputs are not fully understood.

The process of software development using the Scrum method proceeds using the three concepts of visibility, inspection and adaptation. Firstly the concept of what comprises a successful completion is established, so that interested parties know when a task is complete. Secondly, the output of the team is subjected to inspection at regular intervals, to determine if there are discrepancies or deviances from the proposed goal. And finally, if deviances are discovered, these are handled by adapting the development process, before
starting the whole cycle once again. This is an acceptable method for empirical process control where the processes are not fully defined, or where the process outputs are unpredictable.

The process of software development using the Scrum method has been depicted in Figure 22. The product backlog consists of a list of features that should be included in the end product, and is usually prioritised by the value each feature will bring to the organisation and the development effort needed to produce that feature. This list is used as an input for the sprint backlog, where a sprint is a time-based iteration of the product development cycle. The development team uses the sprint backlog to drive the tasks that are completed in each cycle. During this sprint there are regular inspections so that the team can be sure that progress is always heading in the right direction (Schwaber 2004).

Figure 22: The software development processes using the Scrum method
Source: (Boehm and Turner 2005, p. 33)
Another important tool used with Scrum is the sprint burn down chart, which is usually displayed where it is easily visible to the developers and other interested parties. As shown in Figure 23, the burn down chart depicts the remaining project work, versus the time left to complete the software development. This chart can be used to track the development progress, and as a motivation tool for the software team.

Extreme Programming, often referred to simply as XP, was developed in the late 1990s. This is one of the more commonly used agile software development methods, and is designed for small or medium-sized teams faced with producing software in situations where the requirements are vague or undergo rapid change (Beck 2000). A primary goal of XP was to introduce a programming method that could successfully react to change throughout the whole development process, without incurring the drastic costs of change associated with the traditional development methods. This development style uses a system of continuous planning and feedback, as depicted in Figure 24, to produce regular incremental releases of the final product, whilst simultaneously enabling the developers to enact change and improvement.
The XP method is designed around four key values which create a balance between the needs of the human element and the needs of the organisation: communication, simplicity, feedback, and courage (Beck 2000). The value of communication is a central point, where the goal is to keep the lines of communication between programmers, management and customers open. One technique to achieve better communication is to prefer face-to-face conversations over electronic methods, thus increasing the speed of communications and removing a potential source of misunderstanding. The value of simplicity requires the team to focus on the simplest solution available that will produce the desired result. The third value of feedback involves the practice of using continual testing to verify that the product being developed is on target and functional. And the final value involves having the courage to make difficult decisions when it becomes obvious what needs to happen. Some decisions can be harder to enact in a project, especially when emotions are involved or a major amount of work has been invested into a feature that is no longer valid, or has been implemented incorrectly.
Implementing an agile development method does not signal the end of development problems for an organisation however. Whilst these methods enable small teams to compete with larger corporations in some areas, and respond more nimbly to change, it should be noted that when a software development team grows to a certain size the actual benefits gained from using an agile method decrease, and the potential for failure increases (Boehm and Turner 2003). It has been shown that agile methods can encounter real development issues, such as resource allocation and design review problems, which an organisation should not dismiss lightly before embarking on an agile development path (Glass 2001; Boehm and Turner 2005). Whilst not a silver bullet, agile development does provide some useful techniques to tackle real problems that small development teams are experiencing.

Despite the issues that agile development methods may face, there is sufficient evidence available that organisations are solving real-world problems by putting agile development into practice. These problems are somewhat similar to the issue involved in this research, on how to adapt a traditional method of project management to an SME environment. It was therefore worthy of consideration that agile methods combined with more traditional project management methods could potentially provide the desired solution. However before arriving at a final decision the literature discussing SME environments needed to be briefly investigated, to determine if this would be a good fit.

2.4. Parent discipline 3: Small and medium-sized enterprises - the challenges
In this section a brief outline will be presented of the challenges that small and medium-sized businesses encounter, and the unique advantages that these organisations possess. Firstly the role of IT in the SME environment will be discussed, due to its importance in this research, and then other potential SME issues will be briefly examined.

2.4.1. The importance of SMEs, and the unique challenges they can encounter
Small business is an important part of the economy, as nearly 99% of all businesses in the European Union are categorised as an SME (CEC 2005, p. 5). One sign of a robust economy is a large SME segment, which can help to grow the private sector in emerging countries (Ayyagari, Beck, and Demirguc-Kunt 2007). Whereas they form more of an integral part of the economy in developing countries than in developed countries, they are still viewed as a major part of the economy that needs to be taken into consideration
(Hallberg 2000). By helping SMEs to overcome problems researchers assist a portion of the economy to grow and prosper.

The more developed a country becomes, the more the balance of employment shifts to the larger corporations. Though larger organisations account for a smaller percentage of the total number of businesses, they employ a majority of the employees and have extra resources available to invest on problems that occur in the business. An SME environment has accompanying research problems that need to be addressed, due to low sample sizes and difficulty of access to these research fields. These prohibitive factors have therefore made research into SMEs less attractive than research occurring in larger organisations. This also includes the study of project management techniques that occur in these smaller organisations.

Smaller organisation can experience some unique challenges when it comes to finding suitable finance choices, as these organisations quite often operate with smaller cash reserves (Thong, Yap, and Raman 1994). This lack of financial resources in turn reduces the amount of assets that an SME possesses, which in turn reduces the ability to access credit. In developing and non-developed countries alike, SME organisations encounter problems accessing finance from formal financial organisations, and this in turn limits not only entry to the market but also the growth of these businesses (Beck and Demirguc-Kunt 2006). A lack of access to financial resources not only limits the organisation’s expansion potential, but also means that they are usually the most affected in times of crisis due to their cash-poor status (CEC 2009). Since these SMEs are also customers of other businesses, when the SME sector is impacted there is a knock-on effect to their suppliers of goods and services.

Another problem that an SME can face is in regards to human resources. An SME can lack the necessary employee skill set to push the company forward, usually due to a deficit in the financial resources needed to attract more skilled workers. There is often therefore a necessity for workers in an SME to take on multiple roles, and attempt tasks outside of their normal area of expertise. Conversely the organisation can outsource certain tasks to specialists, bringing in the necessary knowledge from an external company. While this may alleviate the problem of a lack of knowledge in the organisation, it can also add an additional financial burden to the business (Thong, Yap, and Raman 1994). This is typically the case with the project management role in an SME environment. A manager...
will take on the additional role of project manager whilst also attending to their everyday work, placing the burden of an extra workload on this person. Not possessing project management training can affect their success rate, and even pairing a project manager with the wrong type of project can be detrimental, as a project manager’s personality plays a major role in their success as well (Dvir, Sadeh, and Malach-Pines 2006).

An SME functions quite differently to larger organisations in regards to the business management style employed. With flatter management structures, simpler planning and control systems, and more flexible processes in place, the processes and techniques that work well in a large organisation are quite often not suitable for a smaller environment (Ghobadian and Gallear 1997). What produces a successful result in a large company does not necessarily work in a smaller organisation, as the structure and operating styles are altogether different. Since many SMEs have a simpler management style in place, the project management method that is to be used in such a situation must match this. The project management style must therefore be flexible, with simple controls, and able to respond to change quickly and easily. The non-bureaucratic style of SMEs requires a non-bureaucratic style of project management, something that the complex project management tools of larger organisations are unsuitable for, and unable to provide (Turner, Ledwith, and Kelly 2008). This field is starting to attract the attention of researchers, and research is slowly forging ahead into project management styles which are especially designed and modified for the SME environment (Ilincuta and Jergeas 2003; Murphy and Ledwith 2007).

2.4.2. The importance of technology in an SME organisation
Towards the latter half of the 20th century technology began to alter the way that people lived their lives. The rise of technology has been referred to as the Third Wave of humanity’s progress. Humanity has already experienced two major changes in history, firstly the agricultural age where man lived a primarily agrarian life, followed later by the industrial revolution, where industry became mechanised. This information age change is occurring in a very condensed time frame, such that the average person alive today will experience major changes throughout their lifetime (Toffler 1980). However, not all researchers agree though, and some take a more moderate stand when debating whether humanity is currently experiencing an information age. This is primarily due to the fact that definitions are relatively ill-defined and vague, and no-one has actually determined how far technology has progressed, to determine whether we are living in an information society age or not.
As Webster (2002, pp. 10,1) frames the problem:

Asking for an empirical measure – in this society now how much ICT is there and how far does this take us towards qualifying for information society status? How much ICT is required in order to identify an information society?

Whether humanity is indeed on the crest of a revolutionary wave, or transitioning gradually into an information age, it is obvious that humanity is indeed influenced by technology in many ways.

Initially only large organisations possessed the resources to implement computer systems, as the technology was expensive and complicated to configure, requiring highly specialised technicians to tend to room-sized computer installations. Advancements in computer manufacturing brought with it the introduction of the affordable personal computer, in turn providing businesses of all sizes with the opportunity to take advantage of this new technology. This in turn enabled the average business to increase production with fewer resources, which in turn improved the competitive situation for many businesses (Winter and Taylor 1996). SMEs especially were able to increase their competitiveness and production with the help of technology, and IT has since established itself as an indispensable tool for small business.

The information age has introduced a variety of new means of conducting business. IT is an extremely fast moving industry, and organisations willing to leverage new and emerging technologies can establish a strategic advantage for themselves. With the ability to build stronger customer relations, SMEs can gain an advantage in such areas as product substitution and differentiation, or with the reduction of supply costs (Porter and Millar 1985; McFarlan and Nolan 2003). Increased access to information has also reshaped industry structures, enabling SMEs to compete in some markets with global organisations. This flood of information has in turn necessitated the introduction of knowledge management systems in an attempt to filter and exploit this valuable resource.

The majority of the knowledge management literature focuses on large organisations, as these organisations usually possess the required financial resources to implement such systems. However SMEs can also gain a competitive advantage from implementing a knowledge management system, as they can often times use a more flexible approach than the traditional systems that large organisations have in place (Xu and Quaddus 2005, 2006;
Maguire and Koh 2007). This flexibility enables an SME to react more quickly to change and produce results faster than a less nimble competitor. Technology adoption by SMEs has been an area of research that has attracted the attention of researchers in recent times (Bharati and Chaudhury 2006). Value creation in the business brought about by technology, the potential for economic improvement, and employment creation are all technology-related areas that have been discussed and researched in great detail.

One aspect where SME organisations are surging ahead is in the area of industry specialisation. These organisations are therefore operating in a wide range of industries as a result of this specialisation, producing a broad array of products and services. The owners of these companies are quite often specialists in their chosen field, and have identified a gap in the market which they can take advantage of with their industry specialist knowledge. As a group therefore, SMEs are known for their heterogeneity, due primarily to the specialist nature of the services and products that these organisations deal with. These managers are therefore highly trained in the industry domain knowledge that they possess, and as a result are very focussed on the goals of the business.

The managers in charge of operating an SME are predominantly the founders of the organisation, and it is also common for families and close associates to be employed for the operation of these businesses (Blackman 2004). Traditionally an SME will focus on local markets, and will contain procedures that are manually initiated, or are simple in their execution. However, with the introduction of technology it is becoming easier for small organisations to move away from this approach to business. These businesses are now able to take advantage of complex procedures by leveraging technology. IT investment for an SME is either primarily aimed at providing cost savings and process improvement, or to stimulate business growth and increase competitive advantage. In this second area it has been shown that SMEs who implement IT in alignment with strategic business goals have often been able to reap benefits for their business (Levy, Powell, and Yetton 2001).

The business owner plays a key role in this knowledge sharing process, and a successful manager will ensure that the proper processes are in place to enable the spread of knowledge on a regular basis (Omerzel and Antoncic 2008). The problem of knowledge transfer is particularly felt in an SME, as a majority of the operational knowledge is held within the head of the business managers or other key personnel. Additionally as a majority of the processes and procedure that are used are established as a result of the expert’s
skillset, it is difficult for them to ascertain which knowledge is necessary to be transferred, and which is common knowledge (Peherstorfer and Schmiedinger 2006).

The information technology component in an SME, whilst playing an important role, generally takes a simpler form in such an organisation. This simpler style of IT implementation can take the form of using less complex tools for accounting and communication, and other fundamental IT structures in the company. As an SME must stay flexible to cope with the emergent nature of their business, often time the IT environment is also developed and implemented in an emergent manner. This can also mean that updates are often reactionary and in response to a crisis, rather than planned and focussed on specific outcomes (Powell and Levy 2006). This situation is often so because an SME organisation is primarily focused on survival, rather than concentrating on the future potential of IT systems and technology. Technology therefore needs to be more flexible in such an environment, adapting to the special needs and requirements of the SME organisation. This is also the case when dealing with IT project management in an SME organisation.

IT has the potential to form the basis for the future success of SMEs, and can also help with financial stimulation, and providing organisational longevity and stability (Lester and Tran 2008; Pavic et al. 2007). One of the areas that can influence success is when an SME employs technology to partner with their customers. This enables the organisation to form a relationship with these customers, and allows them to be more flexible in their approach and response to changing requirements. That being said, an SME does need a strategy when it comes to technology investment, as this will assist with the success of the implementation.

Not all commentators agree however that IT provides such a strategic advantage. It has been claimed that the use of IT in business is now so ubiquitous and inexpensive to implement that IT no longer forms the basis of a competitive advantage, and that resources are actually wasted by implementing emerging technology too soon (Carr 2003, 2004). Regardless of the standpoint taken, IT is becoming increasingly prevalent in SMEs, and is changing the way that business is conducted worldwide, enabling SMEs to become more flexible in their approach and more responsive to external demands (Barba-Sánchez, del Pilar Martínez-Ruiz, and Jiménez-Zarco 2007; Levy and Powell 1998).
Another point that should be considered is the nature of the SME, and here a distinction needs to be made as to entrepreneurial nature of a portion of SMEs. The goals of a small business owner may diverge from the start-up entrepreneur. The small business owner owns and operates an SME, but their goals may be to provide a source of income for their family. An entrepreneur however, may start out as an SME, but the end goal of the business is to grow the business, becoming more successful (Carland et al. 1984). The technology needs of these different types of organisation are entirely different, and demonstrate that SME technology requirements need to be considered on a case by case arrangement. This distinction between small business owner and entrepreneur also emphasises once again the heterogeneity of SMEs. The entrepreneurial style of SMEs are affected to a large extent by the founders, and this introduces a greater degree of difference into the equation (Chell 2008). This in turn decrees that a technology solution for an entrepreneurial SME will need to be more flexible in its nature, due to the uniqueness and flexibility required for this style of organisation.

2.4.3. The importance of IT strategy and planning in an SME organisation

The importance of IT in an SME has been discussed in the previous section, and the advantages and benefits of technology to such an organisation were highlighted. With the judicious use of IT an SME may be able to gain a competitive advantage and increase the impact that they have on the market. However, in order to gain the best advantage of this technology an SME needs to have a detailed vision to assist with the implementation processes. In this section the literature will be briefly examined to establish the importance of establishing a long-term IT strategy and plan in an organisation. This is especially important in an SME environment, and can assist to move an organisation from a reactive mode of operation to a more proactive one.

The owners and managers of a company establish that organisation with a vision of what they wish to achieve. This vision is the goal of the organisation, and whilst it is different for each organisation, it might include such goals as maximising profits for the owners, providing a secure income for their family, delivering a vital service to the community, or creating a platform to launch a revolutionary idea into society. Each of these goals will require a customised method to obtain the desired results, and the vision of the SME manager will play a vital role in how the direction and style of the organisation’s operations are enacted (Chell 2008; Blackman 2004). To demonstrate the differences between differing types of SME organisations two examples will be briefly examined.
An SME owner who operates a retail business may be motivated by the prospect that they will be able to create a secure employment position for themselves. The vision in this instance is to provide a product that the community enjoys, enabling the business to be a continuing success over many years. This success in turn provides the owner-manager with a secure source of income, and consequently a sense of financial stability for themselves and their family. A majority of family-owned businesses are placed within this category, as they are not operated purely for profit maximisation, but rather with the long term goal of business longevity in mind (Goffee 1996). Therefore expanding the business into new markets is not a key issue in this situation, and the implementation of technology is adapted to promote the goals of achieving this particular vision.

The manager of newly established technology company however, may have the vision of bringing their technology-based product to as wide a market as possible. The goal for this organisation is to increase the usage of that particular product, with the end goal of increased profits and market exposure for the organisation. Here the vision is quite different to the retail business example, and the processes used to achieve this goal are dissimilar. However, irrespective of the type of SME organisation, both will require a plan to leverage the best use of technology to achieve their goals.

The motivating factor behind the use of strategic planning is to improve the effectiveness of the enterprise. This improved effectiveness allows the organisation’s resources to be better applied to the goal of achieving the vision as established by the organisation’s managers. Although strategic planning lost popularity in the 1980’s due to advances in business theory, this method is now enjoying a revival in business, with advancements emerging in this field (Mintzberg 1994). There is however a notable difference between strategic planning and strategic thinking, when dealing with organisational strategy. As Mintzberg (1994, p. 107) noted, ‘Strategic planning isn’t strategic thinking. One is analysis, and the other is synthesis.’ Whilst a full review of business strategy and planning is outside the realm of this literature review, it is useful to briefly consider the salient points of this topic, to establish the association to IT implementation in an SME setting.

As demonstrated with the two examples of differing SME organisations, an SME is established with a vision unique to that organisation. This vision and organisational culture may be explicitly acknowledged, or may be intrinsic in the actions and ideas of the founders (Hall, Melin, and Nordqvist 2001). Irrespective of whether the goals are explicit
or intrinsic in the organisation, the founders of an SME will have some type of vision for the organisation. To fulfil that vision, there needs to be a plan of action put into place. This ensures that the organisation is unitedly working to achieve the goals of that vision, as without a plan the efforts of the organisation will remain unfocussed and resources may be deployed in a suboptimal manner.

In the process of achieving the vision of an organisation there have been two major modes of action, as they apply here, and a distinction needs to be made between strategic planning and strategic thinking. Strategic planning is primarily favoured by professional managers who examine and interpret the data that is collected from multiple sources, using planning tools and techniques that set out a formalised and step-based approach to achieving the organisational goals (Gibbons and O’Connor 2005). This method of goal achievement aims to reduce the risk involved with implementing a vision, and is predominantly favoured by organisations which are conservative or risk-averse. These organisations adopt a more emergent style of planning, preferring to expand the organisation steadily over a period of time. Although there may be benefits for an SME to employ such a method of action, researchers have noted that the majority of those organisations are not utilising strategic planning skills to increase growth (Ladzani, Smith, and Pretorius 2010). Rather, these organisations are tending towards a method of goal achievement that can be referred to as strategic thinking.

Owner-managers are generally less comprehensive in their management decision-making style, when compared to professional managers (Gibbons and O’Connor 2005). These managers are predominantly less comprehensive in their management style, and generally employ a more intuitive style of decision-making. This allows them to turn the organisation’s vision into reality without relying on a comprehensive plan in place for each possible contingency. This usually arises because the entrepreneurial organisation continually reviews and determines where their advantage lies, and develops a plan on how to best leverage this advantage. Whereas some researchers note that strategic planning is critical to an organisation’s success (Rigsby and Greco 2003; Hambrick 1982), for certain types of SME organisations, strategic thinking is even more valuable. This style of implementing strategy is a more creative and spontaneous mode of action, though decidedly less structured in its approach, as the plan for success is loosely defined and changeable.
As a result of this less structured mode of strategy implementation, SME managers’ decision-making skills usually tend to follow a more adaptable style, in order to cope with this constant state of change and uncertainty. Due to the seemingly ad hoc manner of this management style, professional planners have voiced their concerns about the effectiveness of this style of management, although it has been noted that this style can produce better results for the smaller-sized organisations (Gilmore, Carson, and Grant 2001). This is primarily because strategic thinking becomes even more effective when the environment is in a state of change, or when encountering events that were not initially planned for (Mintzberg and Rose 2003).

One of the main pitfalls to using a planning approach is that formalised planning systems fail to produce better results than a skilled human mind. Whereas the strategic planning models can examine and make sense of quite large amounts of data, these models are not useful to comprehend and synthesise the information (Mintzberg 1994). For that final step the manager needs to cross the gap between what is known, and what they believe to be the best way to take advantage of that knowledge.

Strategy is important to an SME, regardless of whether the goals are achieved through the use of formalised strategic planning or the more adaptive strategic thinking. It has been noted that SMEs who possess even a semi-formal plan for implementing IT are able to increase the value of their business, and have a higher chance of reaching the goals set out in their organisation’s vision (Côté, Vézina, and Sabourin 2005; Galbraith, Rodriguez, and DeNoble 2008). Conversely, an SME that does not have a business plan is leaving the success of the organisation to chance. Small businesses in particular need to plan for success, as the chances of failure in the initial years of a new venture are quite substantial (Watson and Everett 1999). These organisations therefore need to have a vision, and implement technology in the best possible way to achieve that vision. Small businesses are historically not taking full advantage of technology, and must plan to stay current with the emerging ideas, if they wish to remain competitive (Bridge and Peel 1999). Using agile methods and strategic thinking, hopefully they can bridge the knowledge gap and remain current with technology solutions.
The managers of an SME play a particularly significant role in the deployment of the strategy, especially in comparison to a large organisation. This is because often a manager in an SME will need to perform multiple managerial functions, often in roles that may seem contradictory or non-complementary (Andersson and Tell 2009; Tahir, Mohamad, and Hasan 2011). It has also been noted that managers in an SME environment are generally more willing to take on risk, display an entrepreneurial spirit, and are willing to grow, whereas managers from larger organisation are predominantly more methodical and risk adverse (Sadler-Smith et al. 2003). The managers of SME organisations are predominantly less strategic in their practices, and implement more intuitive practices than their counterparts in large corporations. And though it has also been demonstrated that there are several distinct SME management styles, this management style gap is even more pronounced between professional managers and SME owner-managers (Gibcus, Vermeulen, and de Jong 2004).

This intuitive management style can also cause issues for the SME manager though. Often times the manager is so busy with the tasks of running the business with limited resources, that education is given a reduced priority when assigning resources. This reduces the influx of new ideas, and restricts the manager from expanding the horizon of their decision-making abilities (Tahir, Mohamad, and Hasan 2011). This lack of education can have an additional negative effect on the implementation of technology projects, as SMEs may not have the resources for training in newer technology, and may miss out on opportunities that the larger organisations can afford.

As presented in sections 2.2 and 2.3 of this literature review, organisations have been able to take advantage of the benefits of the formalised software development and project management methods, especially when dealing with complex and large projects. However, if these formalised methods are put into action in an SME environment or an environment where a lot of change is occurring then they begin to lose their effectiveness. As a result, these organisations have started to turn to more agile methods in an effort to take gain an advantage from implementing smaller teams, deploying the more responsive processes involved with these working styles. In this manner, strategic thinking and agile development share many similarities and complement one another. In order to successfully implement an agile development style in an organisation, the SME managers will need a more strategic thinking style of operation. Without this, the agile development becomes mired in formalised processes and inflexible planning.
With a less formalised approach to decision-making, SME managers have seen that it is possible to achieve a faster rate of growth by implementing this flexibility. However, the organisation needs to adapt to the environment in order to make the best use of resources and opportunities. Consequently, to steer the organisation through these changes successfully the owner needs to ensure that the vision remains clear, and openly demonstrate this vision to the organisation (Mazzarol, Reboud, and Soutar 2009). This need for continual change highlights that the organisational culture is important for an agile method to be successful. Without the right people, both in the management team and in the operational-level staff, the chances of introducing such a working style will be very limited in the success that it can achieve.

Since the personality of the manager and the organisational culture are quite important to the success of an agile method, the cultural aspects that are ingrained in an organisation must also be examined. In the next section the cultural aspects of the country where the research was conducted will be briefly investigated, and how this could affect the outcomes.

2.4.4. IT and the Austrian SME

As this research was conducted in Austria, we will briefly take a look at the current SME environment in this country and examine any unique characteristics and constraints which may arise from this situation.

In a recent paper by Turner, Ledwith and Kelly (2010) they noted that in their view, generally Austrian companies would adopt a more autocratic way of dealing with employees, when compared to other European countries. However, the results that Hofstede (2001) arrived at demonstrate a slightly different viewpoint. Hofstede investigated the cultural differences between inhabitants of different countries in his work, comparing and indexing the cultural attributes of countries. He noted that Austria as a country exhibits quite a low power distance index. A low score in this index typically presents itself in the work organisation in the form of a flat organisational structure and democratic leaders. It also produces managers who rely heavily on personal experience, making decisions based on past encounters. Additionally, these types of managers were noticed to rely heavily on their subordinates, and subordinates in turn expect to be consulted on matters, such that a consultative leadership style will often produce the best results in this type of culture. Austria also possesses a high uncertainty avoidance index.
score, which measures a society’s tolerance for uncertainty. As a rule, people living in a society with a higher score are more tolerant of opinions different to their own, and attempt to have as few rules as possible.

Though there are many large multi-national organisations operating in Austria, this research was undertaken in an entrepreneurial SME environment. Thus it was an ideal environment to introduce a new method of conducting projects in a team-oriented manner, as this is a style of working that would fit well into the culture of this country. The tolerance for uncertainty in the organisation also seemed higher than average, due to the type of work, and the market within which they were operating. This boded well for a positive reaction to the research, where new ideas would be introduced into the work-place, and different processes would need to be discussed.

Although the Austrian market has some unique characteristics, due to globalisation and the fact that Austria is a developed industrialised country many of the issues and findings pertaining to SMEs in other developed counties also apply to Austria (Fink, Harms, and Kraus 2008). Additionally, common company strategies and methods of doing business were comparable to organisations situated in other developed countries, establishing similarities with SMEs in those countries (Leitner and Güldenberg 2009). These similarities across countries enabled the use of research that had been completed in other countries to be applied to this unique situation.

Businesses are experiencing a new information age where IT forms an integral part of the infrastructure. Not only large organisations but also SMEs are able to gain an advantage by implementing IT in their business. This then raises the question, of how to improve the success of these IT projects in an SME environment.
2.5. Immediate discipline: IT projects in an SME environment

The fundamental areas of the literature have now investigated. The main area that was investigated involved project management, examining the progression and the breadth of this field wherein the research will occur in. The attention of the literature review was then focussed on the specific research environment of the SME environment. The next section of this chapter will focus on exactly how all of these topics interconnect, and how the research will combine agile development techniques and traditional project management methods, to improve IT implementation projects in an SME environment.

2.5.1. The current state of IT project management in SME environments

Despite the importance of technology to business, as noted in the previous section, the topic of IT project failures has been historically a focus point for many academic papers and reports. Similarly, the popular press has also frequently commented on the failure of large IT projects. Quite spectacular statistics involving the failure rate of these types of projects have been reported, particularly in relation to software development projects. The CHAOS report has been widely referenced by pundits and academics alike, where it is claimed that the average cost overruns for software projects range from 178% to 214%, and an average project has a success rate of 16.2% when measured against time and budget constraints (The Standish Group 1995, 1999). This report has been criticised however due to the absence of proper definitions and academic statistical methods in the paper. Although academics have repeatedly made formal enquiries regarding the scientific methods and processes employed, these requests have been either ignored or refused by the Standish Group. This lack of academic openness raises questions therefore as to the validity of the results, especially when evaluated against comparable academic work that has shown significantly lower failure rates (Glass 2006b; Jørgensen and Mołókken 2006).

The proper definition of what constitutes success is important, as even in situations where projects are delivered on time, on schedule, and deliver the product specified, they can be deemed a failure by the stakeholders concerned (Baker, Murphy, and Fisher 1983). Conversely there have been projects with rather large budget overruns that have been viewed as producing a successful outcome, especially when dealing with large public works projects. This is often due to the notion of perceived success, which is unique for each project. This perception may not include budgetary concerns, but rather the successful delivery of the product or service resulting from the project. This demonstrates
that project managers must keep in mind when dealing with different stakeholders that the concept of success or failure can be subjective.

Even if the failure rates of software projects as stated in the CHAOS report are inflated, as some researchers claim (Glass 2005), this still leaves the question as to why IT projects are often viewed as more difficult to manage. One reason for this difficulty is because these projects are frequently unique, formed from numerous connected activities and involve a wide range of different systems. These layers of complexity can thus help make a simple software project a difficult task. Another source of problems is the issue of communications. Communication between engineers, users and business managers can further complicate issues, as each group employs their own unique communication style when dealing with others (Tenopir and King 2004). Although there will be deviations within the group, generally each type of person has their own method of problem solving and means of communications. What may seem normal and come naturally to one group may prove to be a difficult concept for another. This may then be manifest by a breakdown in communication, with teams working on a project from different angles.

Management teams have seen these problems in the workplace, and noticing the success of project management have therefore introduced these methods to IT projects in an attempt to gain a form of control. As discussed earlier in this chapter however, these project management methods have often been founded in an engineering environment, where the management systems were developed primarily around controllable items possessing a degree of predictability, rather than the more flexible aspects of human interactions. Issues can therefore arise when such engineering-focused systems are employed and the project leader does not possess the additional important personal skills needed to manage these relationships (Cooper et al. 2005; Amason et al. 2007).

Once an SME has decided to implement project management techniques, it would seem that it is a relatively straightforward matter of choosing the appropriate method and applying the practices to future projects. However, there are real issues with the existing methods when used in conjunction with small IT projects. In such a situation, the project method may be used in a setting that it was not designed for, with a team style that it is ill-suited for. This in turn reduces the effectiveness of the chosen project management method, and increases the probability of project failure. As noted in an earlier section discussing the more common project management standards, the majority of these standards are ill-suited
for an SME environment. The linear implementation style, in addition to the in-built bureaucracy of these methods, often makes them a poor choice for an environment which requires a flexible and adaptable approach to managing projects. Thus a style of project management is needed that can provide the benefits of the traditional methods, whilst remaining flexible enough for the SME environment.

2.5.2. The way forward: An amalgamation of formal and agile methods

The popular project management standards and methods are excellent tools for large and complex projects, but when applied to smaller projects and teams they quickly become unwieldy. Software project management has experienced progress in the area of small and changing projects, with the introduction of agile software development methods such as XP (Extreme Programming), Scrum development, Feature Driven Development and Lean software development, to name some of the more common examples. Although these methods differ in application, and each has its own area of strength, for the sake of this research these methods will be grouped together and referred to as agile methods.

By using these iterative and less formalised methods small teams can produce software more efficiently, and are able to react in a timely manner to project changes (Chin 2003; Augustine et al. 2005; Schwaber 2004). The strength behind these methods is that they promote teamwork and collaboration in the project, introducing a sense of cohesion and joint purpose. This is especially useful in an SME environment, as the teams are smaller and need to work cohesively together to produce the best results.

Another major strength behind agile development is the concept of iterative development. The project is broken into small components which are completed in an incremental manner. These development iterations may cover a time span of one to four weeks, depending on the complexity and overall time frame of the software project. Although the software is developed in an incremental manner, this does not result in a finalised product at the end of each cycle. Rather, each component delivers a portion of the overall package, so that features or functionality can be tested for appropriateness and to determine whether they are addressing the correct issues. This incremental manner is another strong benefit of the agile methods, in that it allows the software developers to make adjustments to their product at the end of each cycle. Rather than waiting for the end to resolve issues, problems are discovered during the development process, and adjustments can be included into the subsequent development cycles. This is particularly useful in a scenario where the
end product is very unique. Testing at the end of cycles may reveal weaknesses in the design that can be removed, or the developers may notice as the product matures that the desired end result will not be achieved. In these instances corrective actions can be implemented into the subsequent cycles, to either remove the weaknesses in the design or to steer the project at the desired goal.

There is a growing acceptance of agile methods in the software development field, and this had led to an uptake throughout the world of these methods. Organisations such as the Agile Alliance, the Scrum Alliance and assorted Extreme Programming associations have been formed as a result of this uptake. This has given like-minded developers a forum in which they can exchange ideas and practices, allowing the agile movement to gather an even greater momentum. As a result of the acceptance by software development teams for these methods, organisations are now searching for a standardised manner in which to implement agile practices within their teams, rather than adopting an ad hoc manner of implementation of the method. Barring an agile standard, organisations are searching for at least the best practices in regards to this style of development. One of the leading project management standards, the PMBOK, has also formed a review team to investigate agile methods and how they can be integrated into project management in the future.

The PMBOK establishes a complex systems-view of project management, and though the process interactions can be initially overwhelming for an inexperienced project manager, this body of knowledge is a rich project management resource applicable to a broad range of projects. Whilst the PMBOK is a guide that provides details for proper project management processes, it is not a step-by-step guide on how to manage a project. Rather, organisations will often use this guide as a basis to form their own customised project operating procedures (PMI 2008). However, the PMBOK was not always supportive of agile methods, and the PMI was traditionally situated on the opposite side of an ideological divide to advocates of these methods. Agile supporters traditionally viewed the PMBOK as inflexible and bureaucratic, whereas PMBOK supporters viewed agile methods as lacking in processes and discipline (Gerush and West 2009). However this divide has started to disappear in the last few years, and in 2008 PMI and agile leaders formed a special interest group to examine how this divide could be bridged, and what these two styles could offer to the future field of project management. Project leaders are hoping to learn establish new methods of managing projects with a combination of the best of both the agile and PMBOK worlds.
The fourth edition of the PMBOK (PMI 2008) now includes more detail about how projects with iterative phases are becoming more prevalent within organisations. While the need for an improved iterative style of project management is recognised, the focus is still primarily on software development and research projects. This change exemplifies the direction that the agile version of PMBOK method is focussed on, and while this leaner method is still in the discussion phase, the submission of a draft version for approval is the ultimate goal of this partnership (PMI-Agile 2009). The researcher was involved in a founding agile PMBOK group, where project managers were working across international borders to shape this emerging trend in project management. This group was initially established as a standalone group, operating outside of the governing umbrella of the PMI. In the early part of 2010 though it became accepted by PMI as an established interest group, and now operates as the specialised Agile Community of Practice. This acceptance by PMI allows the group to gain exposure to a wider audience, albeit ironically with the addition of a layer of bureaucracy. The group is now endeavouring to expand the influence of this new community with the introduction of a new certification, the PMI Agile Certified Practitioner. The initial exams for this new certification will be available in September 2011, and one of the goals is that this will become an industry recognised certification in this field.

Regardless of the success or failure of this emerging project management certification, this topic warrants detailed investigation, as a melding of the different practices could produce a solid basis for the management of small projects. The goal of this partnership between PMI and the agile developers is to produce a broad guide of best practices, rather than a detailed strategy of how to execute small projects, and this opens up an abundance of research opportunities in the future for this area. The field of agile project management is still in the early developmental stages, and the PMI Agile Certified Practitioner exam is still primarily based on the current version of the PMBOK. Practitioners must demonstrate an understanding of agile concepts, and must establish that they are already involved in this field. Currently there is no Agile PMBOK standard available, though if the goals of the initial agile project management group are any guide, then a real possibility exists that a standard will emerge in the next few years. The field of agile project management is ripe for development, and the next few years should see an influx of academic work, testing and expanding the boundaries on this method.
Since agile project management is a rather general and broad area to focus on with any degree of success, this research will target a specific industry setting and test a customised agile project management method in that setting. The area of interest for this research is graphically depicted in Figure 25, and will focus on the area of IT project management that occurs in SME environments.

Figure 25: A Venn diagram of the area of research interest in relation to the literature
Source: developed for this research
For this special area of IT projects, this research will focus on combining the best features from agile development found in Scrum and Extreme Programming, with the foundation of more traditional project management processes as detailed in the PMBOK. This agile project management model will then be tested in the field to determine if it is possible to increase the success of these projects in an SME environment using such a project management style. The goal of this research is two-fold. The first goal is to investigate an existing problem that SMEs face today, where IT departments are expected to be more responsive, leveraging existing resources to their fullest. This study will investigate the suitability of agile project management in this setting, and test whether it has practical value in a field setting. The second goal is to investigate an emerging trend in project management from an academic viewpoint. This will test the theory and practice from a critical review viewpoint, with the end result adding to the body of knowledge in this field.

With these primary goals in mind the research was initiated, and the development of an improved agile project management style began. The subsequent chapters will describe this progress, starting with the methodology used for this research, then describing the data that was collected, before discussing the results arising from this work.

2.6. Conclusion

This chapter began with a brief introduction of the historical progression of the field of project management, showing how the main tools and methods came to be introduced to business down through the years. This developed into a discussion of the progress of the scientific research in this field, and detailed how the focus of this research has changed over the years as project management matured as a scientific discipline.

Next several popular project management standards were investigated, to determine how applicable they were to the area of interest for this research, namely the SME environment. However, the management style of an SME organisation is often structured in a flat manner, in addition to issues encountered due to a lack of personnel and financial resources. These unique SME problems mean that quite often these standards are viewed as too bureaucratic and resource-heavy to provide real value for these organisations, and as such are not usually implemented by companies in this arena. The PMBOK is unique however, in that is not a how-to for project management, but rather a framework that can
be adapted and modified by the project manager for each situation. It was therefore chosen as the first part of the new framework that would be used in the later research work.

The next area of literature that was investigated dealt with a different sector of IT, that of software development. Two of the large software development standards were investigated, and why these standards are difficult to implement for small software development projects. However, the software development field has found a solution to these unique challenges, with the introduction of several agile software development methods. These agile methods focus primarily on producing software and the requirements of the client above all, and have been designed especially with the ability to respond quickly and successfully to change throughout the whole development cycle. Therefore, due to its success in the software development, it was decided that agile development would form the second part of the new project management framework.

The last area of literature that was investigated involved the SME environment. The unique challenges that are found in these organisations were also discussed, including restrictions brought about by personnel and finance resource limitations. In addition, the discussion also briefly touched on the importance of being able to respond quickly to change as an SME, and how this ability can bring with it a competitive advantage for this type of organisation.

Finally, all these separate topics were put together to establish the parameters of this research. This study will investigate:

To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment?

With this chapter the academic foundation and the parameters for the practical research stage have been established. The next chapter will discuss the research methodology used, and the process by which this research will proceed.
3. Chapter 3 - Methodology

3.1. Introduction

In chapter 2 it was demonstrated that although much research has been undertaken in the field of project management, it is still a relatively young academic field. There are several standards that have been established in this discipline, and the research is continuing strongly, with modified tools and methods being frequently developed. Additionally the literature concerning SME environments was consulted, where the benefit of IT to business was set out and how SMEs can gain a competitive benefit in today’s market with the judicious use of IT.

Finally the literature concerning agile software development methods was investigated, where it was demonstrated that there is current research interest in the area of agile methods. These methods differ from the regular development standards, and are valuable when producing software in projects with changing requirements. It was noted that these development methods could provide a useful addition to the current project manager tools, due to the ability of these methods to embrace requirement changes and the flexibility of their approach.

In this chapter the proposed research methodology will be made explicit. The epistemological and ontological viewpoints of the research will be established, as well as the methods that were used in this particular venture. Action research was used in this research, and therefore the history and process of this particular method will be discussed in sufficient detail. It will be further explained why action research was chosen as the method for this research project, and why it was the desired choice in this particular situation over other available research methods. The goal of this chapter is to explain the research framework and how it will be implemented, and why this particular framework was chosen. This chapter also lays the foundation for the subsequent chapter, where the research data and findings will be discussed. The structure of this chapter is depicted in Figure 26.
Before describing the suitable research approach, the research environment in question will be described to highlight the unique qualities and opportunities that needed be taken into consideration.
3.2. A detailed description of the research environment

The organisational structure of the businesses involved in the research environment is not entirely standard, and will be described in this section to highlight some of the research challenges and customisations that may be needed as the research progresses. Pseudonyms have been used to preserve the privacy and confidentiality of the organisations and people involved in this research.

The research took place in two SME companies in Austria, Publish-Com and Media-Com, where the researcher held the role of IT manager in both organisations. Publish-Com is a publishing company based in Vienna, though the owner of the company has his headquarters situated in Salzburg, approximately 400 kilometres away. The owner has more of a strategic and market placement role, rather than a hands-on management role, and as such is not heavily involved in the daily operations of the company. The owner does however keep abreast of the progress of the business, through regular updates and meetings with the relevant company managers.

Initially a single company, as Publish-Com grew in size it was split into two separate companies. Publish-Com, comprised of 70 employees, remained a stand-alone company, whereas Media-Com, the offshoot company comprised of 40 employees, became a subsidiary of the parent company, Global-Com. A separate London subsidiary that produced similar products was reduced in size to 20 employees, and in turn became a branch office of Media-Com. Publish-Com continued to concentrate its resources on producing a weekly society and style magazine, whereas Media-Com became a media and publishing company, though its publications are focused on sport and lifestyle magazines, in addition to corporate publications. These corporate publications were usually unique publications for other subsidiary companies in the group, and included such items as marketing brochures, coffee-table books, or yearbooks detailing the highlights of sporting clubs belonging to the owner.

Due to the size of Publish-Com and Media-Com, and since both companies were operating from the same building, it was decided that job duplications would be eliminated where possible. Therefore the management, marketing and IT departments began to service both Publish-Com and Media-Com. The relevant part of the organisation chart is depicted in Figure 27, showing the researcher’s role as the IT Manager for both Publish-Com and Media-Com.
The researcher’s line manager and chain of command in Publish-Com is the same as in Media-Com. Additionally, for the researcher there was a task-oriented line of command that needed to be observed, which is comprised of managers from Global-Com’s global IT operations department in the group headquarters. Therefore, though the management approach for the two companies is similar, there are several significant differences in the management approach that is used for the IT department for Publish-Com and Media-Com.
In Publish-Com the researcher had quite broad discretionary powers on how to best achieve the IT goals of the company, and projects were able to be implemented with a relatively small lead time. For the purpose of this research it was possible to modify and refine the project management processes in Publish-Com with relative ease, due in part to the role that the researcher held. However in Media-Com more restrictions were in place, as more preparation for projects was required, more people were usually involved, and project teams possessed geographically dispersed members. Whereas the process style in Publish-Com was quite informal, Media-Com is part of the world-wide group of companies that make up Global-Com, and must therefore adhere to formal processes, procedures and governance practices. This made Media-Com a little less flexible in regards to the research as the major processes were already in place, though it was a relevant, to determine if what functioned in Publish-Com was also able to be implemented within the formal constraints of Media-Com.

3.3. Justification for the paradigm and methodology chosen

In my position as IT Manager in the companies involved in the research, I possessed a first-hand and in-depth knowledge of the internal management structures of these organisations. This facilitated an insight that would not normally be available to an outsider. It also had the added benefit that I was able to influence the implementation of the research, actively bringing it into operation rather than having to rely on others to implement the research on my behalf. This research helped to produce a better understanding of project management in an unstable environment, and of projects with changing requirements. Additionally it produced an improved understanding of project management in small and medium-sized organisations, and the unique challenges they face. It is anticipated that this research will provide future researchers with a good foundation upon which to further investigate this area of project management.
3.3.1. The reasons why action research was the methodology chosen

The research problem and research questions attempted to delve into new ground and uncover a new way of achieving a specific goal. Therefore, due to the very nature of these questions, a research paradigm that was primarily interpretive and qualitative was required.

There are three main reasons that action research as a methodology was the most suitable choice for this research:

1. My research was limited in some aspects by my dual role as both researcher and IT manager. The organisational constraints of carrying out research in the field, rather than in a controlled environment, lent itself more to a qualitative method.

2. A key goal of the research was to encourage people to engage in the research process, and to become participants in the entire process. This would therefore influence change in the organisation, though this would not necessarily produce a quantifiable result.

3. The research was situated in an industry setting that was subjected to extremely frequent restructuring, changing business plans, and a high degree of uncertainty. It was therefore desirable to implement a research approach that included a degree of flexibility, and which would be able to react to these factors.

With these factors in mind, the argument for action research was quite strong, as it is an excellent choice for research in such an environment.

3.3.2. The major research paradigms explained

A commonly held view of research is that there are three major components to a researcher’s scientific approach, namely ontology, epistemology and methodology (McNiff and Whitehead 2002). Ontology forms the basis of a researcher’s approach to scientific enquiry. This is how we view ourselves, and what we believe to be the nature of being. Epistemology is the study of knowledge, and how the researcher comes to possess this knowledge. And lastly, methodology is the approach that a researcher takes to discover answers to their research questions.

Most research processes can be assigned to one of the four major research paradigms: positivism, realism (post positivism), constructivism, and critical theory (Guba and Lincoln 1994). The positivist approach maintains that there are absolute truths, and that these truths can be known and tested in an empirical manner (Guba and Lincoln 1994).
The research in this approach is primarily carried out using quantitative methods, attempting to clarify ‘cause and effect’ relationships. Realism, or post positivism, shares similar attributes with positivism, in that it is alleged that there is an absolute truth which can explain phenomena. The researchers that follow this paradigm quite often believe that the positivist approach is far too simplistic in its viewpoint. This approach states that realities deal with the world in which they are situated, though in most cases the true nature of these relationships is far too complex to be measured, or the instruments and understanding of the researcher are not sufficiently developed to uncover the complete truth (Perry, Riege, and Brown 1999). Therefore several examinations of a reality from different viewpoints may be required, to gain an overall understanding of the relevant relationships or phenomena, in an attempt to uncover all the complexities of a situation.

Constructivism is a paradigm that encompasses the view that truth is a result from a researcher’s belief system, occurring in a specific context (Perry, Riege, and Brown 1999). This gives weight to the participants’ perceptions, as these are considered the most important factor in such an approach, and the researcher is often passionately involved in such an investigation (Guba and Lincoln 1994). Using the critical theory approach, the researcher and the research topic are intrinsically linked. The assumptions that the researcher makes are for the majority subjective, and are historically motivated, as the researcher’s aim is to critique the current situation and bring about change through action.

The final paradigm to be investigated is the interpretive approach to research. This approach is similar to critical theory in many ways, and proponents of both methods believe that the truth of phenomena is based on the participants’ perceptions of reality. Using this paradigm the researcher and the researched become associated, and the thoughts and belief systems of the researcher affect the outcome of the research (McNiff and Whitehead 2002). Whereas critical theory aims to empower the participants to overcome problems in their social setting, interpretivism is aimed more at gaining insight into the complex societal relationships that form a particular environment, and thus gain a better understanding of them. Once the researcher has developed a better understanding of the relationships they will be in a position where it is possible to introduce changes or improvements to the system (Kim 2003).
Although it would make the classification of action research easier if that particular research method fit easily into one of these major paradigms, substantial divergence exists in the different types of action research that have emerged (Cassell and Johnson 2006). Therefore it is not possible to simply classify action research as implementing a critical theory approach, or whether it employs interpretivism or constructivism as the main paradigm. However for this particular implementation of action research, the paradigm used was favouring interpretivism more than any other paradigm.

3.3.3. The clash between positivism and interpretivism

In the scientific community there was initially an ideological divide between advocates of positivism and interpretivism, as illustrated by the conflict between two Nobel prize-winning theoretical physicists, who were researching quantum mechanics in the early 1920s from differing methodological standpoints. Although amicable in their professional life, when it concerned research methods they attacked each other’s ideas with remarkable ferocity. Werner Heisenberg remarked about one of Erwin Schrödinger’s ideas, ‘the more I ponder it, the more disgusting it seems’ (Feldman 2001, p. 158), whilst Schrödinger exclaimed about Heisenberg’s techniques, ‘I was discouraged if not repelled’ (Feldman 2001, p. 158).

Even though interpretive social science can be traced back to German sociologists Max Weber and Wilhelm Dilthey in the 1800s, few positivist advocates consider interpretivism to be truly scientific, and deem it useful at best for exploratory research. Social environments however are fluid, and researchers need to take this into consideration as a static method may have no real relevance if the subject is in a variable state (Neuman 2006). Using an action research approach it is possible to harness the exploratory advantages of the interpretivism approach, whilst scientifically supporting and affirming the results discovered.

3.3.4. Establishing a research theoretical framework

The issues that this research investigated are practical problems experienced by real-world SMEs. For decades scientists have applied positivist methods to the many problems encountered by organisations, and though a wealth of knowledge has been gained using quantitative instruments such as surveys, questionnaires and statistical tests, there are still sizable gaps in available knowledge. Therefore researchers need to modify the toolset that is currently being using in the pursuit of this knowledge, so as to expand the potential for
new information discoveries. One such tool that could provide greater insight into the problems that organisations face is with the use of a narrative approach. As Wilson (2001, p. 1) mentions:

Science, like the rest of culture, is based on the manufacture of narrative... By narrative we take the best stock we can of the world and our predicament in it. What we see and recreate is seldom the blinding literal truth... The stories we tell ourselves and others are our survival manuals.

Narrative investigations of problems reveal another viewpoint, thus providing a tool with which researchers can obtain additional insights into a topic. The research in the area of project management in SMEs is ripe for a paradigm change, and therefore this research will be undertaken using an action research approach, with supporting triangulation supplied by tools such as interviews and surveys. The purpose of action research is concentrated more at problem solving rather than establishing theories, and is a research method that allows the researcher to develop knowledge as an integral part of practice (Dick 1999b). This form of research produces some of the best results in situations where there is a desire to form new insights and to promote investigation in situations where traditional methods would not normally succeed, as it breaks from the traditions of the more customary approaches. To break from tradition is sometimes necessary in research, as Lewin (1949, p. 275), one of the founding fathers of action research, noted:

To proceed beyond the limitations of a given level of knowledge the researcher, as a rule, has to break down methodological taboos which condemn as "unscientific" or "illogical" the very methods or concepts which later on prove to be basic for the next major progress.

The distinct components of this research include the areas of project management, agile development, business IT systems, and the problems and issues unique to an SME environment. Each of these separate components has previously been subjected to extensive research, and if the object of this endeavour was to investigate one of these areas in more depth, then potentially a quantitative approach would be appropriate as the areas are well established. However, as this research is investigating a unique combination of these distinct areas, an approach that takes a more qualitative and narrative approach is necessary. As Lewin remarks, to advance beyond the current limitations of the present knowledge an exploratory method is required. In this situation action research is an optimal choice, as it brings an exploratory aspect to the research.
3.4. The research procedure explained
In this section, the research procedure will be discussed, in addition to the method that was used, and why this method was the most fitting for this situation.

3.4.1. The main goals of action research
The main aspects of action research, as established by Lewin (Argyris, Putnam, and McLain Smith 1985, pp. 8,9) throughout his research work, can be summarised by the following statements:

- Action research is not a purely theoretical exercise. It focuses on solutions for real problems, for real people.
- Action research is based on iterative cycles which consist of problem identification, planning, acting, and evaluating.
- The intended goal of action research is a re-education of people’s established patterns of thinking at a base level, with an emphasis on participation and free choice.
- Action research challenges the accepted status quo, and aims not only to solve problems in social situations, but also to contribute to social science. For this reason high scientific standards must be adhered to.

The next section will introduce a more detailed look at action research, to discover the underlying benefits and issues with this particular methodology.

3.4.2. The argument for using action research as a research methodology
Where a situation is relatively predictable, then it is possible to use a quantitative method with a degree of confidence. The researcher can measure the inputs and then predict how the output will deviate from the norm, depending on how these inputs change. If the relationships of a system can be modelled with confidence, then a theoretical model can be established that can explain the phenomena of the system, and enable insight into how to control the system (Ogunnaike and Ray 1994). This model can then be used to modify the processes and achieve a higher rate of efficiency, allowing the process users to examine and improve the interactions of the system. But an increase in system complexity can bring about an increase in the complexity of the model, and with it the possibility of a reduction in the ability to accurately predict the outcomes of system interactions.
However, in a sociology setting such as a business, the human interactions make the science of predicting and controlling much more difficult. This is due in part to the fact that human relationships are complex and not as predictable as an engineered system, as people within the organisation can hold opposing views or ideas, and these ideas may even change over time (Avison et al. 1999). Additionally, not all problems have straightforward answers, and not all facts may be known if the situation is relatively unique. When a researcher encounters a situation where the underlying are either enormously complex, or if the processes are not clearly predictable, then a theoretical modelling approach may be a more appropriate option is such a case (Ogunnaike and Ray 1994). Empirical modelling, on the other hand, is used when the researcher attempts to discover the relationships in a situation using information that has been obtained experimentally from the system, in addition to experience learned from the system. Such a situation is an excellent candidate for action research, as it is able to take advantage of experience and information gathered from the system. This information is then examined, refined and implemented in further iterations, as the outputs and clarifications that are received per iteration are used as inputs for subsequent iterations, thus shaping and modifying the research as it progresses.

Action research is best suited for solving real-world problems in complex situations, and the very nature of this method is advantageously weighted towards, as the name implies, action. The researcher can put forward a theory, test it, receive feedback, then modify the theory as part of the feedback (Avison et al. 1999). Once an assumption has been made from the data, it can then be tested with the next iteration phase of the research. This allows action research to be responsive to change in the social environment, and to produce flexible and emergent theories as these experiences are put to the test and adapted over time (Sankaran, Tay, and Orr 2009). This produces a situation where as the action becomes more refined and informed, so also the testing methodology becomes more refined (Dick 1999a).

3.4.3. Potential problem sources in action research

The action researcher needs to take care though, that they do not wander too far from the path of the intended research goals, as donning the mantle of action research is not a license to abandon scientific methods. The researcher can easily fall into the trap of consulting rather than conducting action research, or undertaking a case study instead of producing change. The researcher must have an explicit idea that they are working towards, rather than merely ‘beating the bushes’ to see what emerges.
Despite these advantages of action research, one type of research cannot cater for all situations though. This is apparent in the management sciences, where often extended and highly theoretical research projects will have a difficult time being accepted by managers and professionals in the field (Whitley 1988). It has also been noted that often business research is viewed as valueless by senior managers, and that these managers sometimes actively ignore such research (Perry and Gummesson 2004). This is frequently the case where the field is predominantly a practitioner-based field, as is the case with IT. This is not to argue that a statistical style of research has no place in IT studies, but when a researcher views certain research methods as not reliable, then the potential to expand the scientific knowledge in those areas is diminished, and the result can be a loss of insight into problems that cannot be solved or understand with quantitative methods (Banville and Landry 1989). The social and psychological aspects of IT and business are now becoming more pronounced in research topics, as researchers aim to adapt these fields to the human aspect, rather than vice versa. This has thus seen the increase of research into the human aspects of the organisation, and how the social aspects and the IT systems can function better together.

This is not to say that action research is not a valid research method. Indeed, the health and medical field, in addition to the educational field, have for many years implemented action research, solving problems and conducting research into areas that would not have been as well suited to other methods (Reason 1999; Sagor 2000). Action research has enjoyed popularity in certain fields, and the method has branched off in several directions, with marked differences in the application of this style of research. Throughout the literature it is possible to find references to such categories as change-based action research, insider action research, participatory action research, action learning, and action science. The amount of different classifications and directions has confused the situation for the novice action research scientist, and unfortunately prevented a higher uptake of action research in general.

3.4.4. The origins of action research

One of the most significant developers of action research was Kurt Lewin. His research focussed on group-based decision-making, offering people a democratic choice on how to bring about change in their environment. Lewin spent the majority of his scientific life working in the social sciences, and was influenced early in his career by philosophers such as Cassirer. When discussing Cassirer’s work, Lewin reflects back to the time of 1910,
when psychologists were struggling with the problem of whether to include qualitative as well as quantitative data in their research. Within the ranks of psychologists there was a major discussion about whether to include biographical data in the treatment of patients, or whether they should only take empirical evidence into consideration (Lewin 1949). As a result in this change in thinking, psychologists now use a wide variety of qualitative and quantitative data when considering treatment for their patients. As the research environment changes, so must the research methods change and adapt.

However, making changes to an accepted research paradigm is difficult, as a researcher working in an exploratory field faces the possibility of breaking scientific taboos, and being viewed as strange and eccentric as a result of their work. Therefore, when deviating from the norm, a researcher needs to take into consideration that they may encounter some opposition or problems from the scientific community in general. To combat such prejudice the researcher may need to put in extra effort, so that the research work is viewed as scientific and valid.

The model of action research has been developed and modified over the years. However for this research one of the initial styles of action research originating from Lewin will be adopted. This style of action research is relatively simple, and involves iterations of identifying the problem, planning a course of action, performing the course of action, and evaluating the results, as illustrated in Figure 28. These steps repeat in a cycle until the completion of that section of the research. This style of action research was chosen because although it is simple enough to provide the benefits of action research, it does not overly burden the research with the processes of more detailed versions, something that makes it an excellent match for a non-bureaucratic SME environment.
Figure 28: **Action research process depiction**  
Source: developed for this research; data source (Argyris, Putnam, and McLain Smith 1985, p. 9)
Critical reflection plays a vital role throughout the whole action research process. Once the action part of the cycle has occurred, the researcher must investigate the outcome of this action and reflect critically on the findings. With this reflection, the researcher endeavours to retain the scientific aspect to the research, whilst also subjecting the findings to a deeper scrutiny. The researcher can determine which element of the action phase produced the desired results, and which element needs to be adjusted for subsequent cycles. This also assists the researcher to extract lessons learned from the action, and apply them to the research narrative (Dick 1999a). Before each action stage, three primary questions were posed of the planned implementation.

- What is the situation that needs to be addressed by this action cycle?
- What is the desired outcome from this action, and why?
- What action do we need to put into place, to move from the first situation to the second situation?

These questions help the researcher to critically examine the situation being researched, and instigate a valid action plan. After the action cycle, the outcome was assessed against the proposed outcome, to determine if the plan had worked properly, or if not, then what could be adjusted for future cycles. By paying attention to the decisions made before and during an action cycle, it is possible for the researcher to obtain improved results.

3.5. Implementation of the action research

For the implementation of the action research, a generic model for action learning and research as proposed by Zuber-Skerritt (2000) was adapted to this environment. The eight phases that were used in this action research project are depicted in Figure 29. Each of these phases in turn contained the cyclic action research process, consisting of problem identification, planning, acting, and evaluating, as developed by Lewin, one of the founders of action research (Argyris, Putnam, and McLain Smith 1985, p. 9). This cyclic process allows for continual refinement as the research progresses.
Figure 29: The eight main components of the structured action research plan
Source: adapted for this research; source (Zuber-Skerritt 2000, p. 42)
3.5.1. Phase 1 – Initial interviews
The initial phase involved interviewing participants to collect adequate data to be able to define the research problems. The interviews were comprised of open questions, focusing on key topics relating to the research environment. The four key topics for which data was sought regarding IT implementation projects in an SME environment, focused primarily on the following themes:

- The influence that formal project methods have on project success, and how the introduction of agile project management methods might affect the success factor.
- The amount of influence that a project worker’s skill set has upon the success of a project, and whether training can influence that relationship.
- How project success is affected by the level of project risk, and whether the introduction of an agile project management toolkit can improve project success.
- How teamwork can influence project success, and the effect of proper participation and communication by all parties on the team relationship.

As an indicator of the interview structure, sample exploratory questions that were asked during the interview took the following form:

- What are some of the major challenges that IT projects face in a SME environment?
- What importance do you attach to the project worker’s skill set in relation to project success?
- In your opinion, can the introduction of a more agile project management method help mitigate project risk levels?
- What level of team participation is needed for project work, and how does this affect the success of a project?

The complete set of questions that were used as the foundation for each of the interviews can be found in Appendix A.
The interviewees were chosen from the employees of the two companies where the action research took place, with attention paid to their role and knowledge of the company. Semi-structured interviews were used to uncover the participants’ thoughts and opinions about project management currently in use in the company. The interviews were approximately 45 to 90 minutes in length, depending on the role of the interviewee. For example, a manager with extensive experience in interpersonal interactions and leading projects may have a larger amount of insights to offer, then another interviewee who was fairly new to their role, and had limited exposure to project work, or observing team interactions.

The recorded interviews were transcribed and entered into an analysis program, which was used to assist with the coding of the qualitative data. An initial search was conducted through the data for relevant information that was thought to be potentially important for the research (Auerbach and Silverstein 2003). These topics were then examined in detail, with an extended review of applicable research published in academic literature.

This phase began during the data collection stage, uncovering concepts that were grounded in the data. As action research is an iterative process, the analysis was an ongoing process, occurring regularly throughout the research. This enabled the problems and important issues to be better identified before moving to the subsequent action research stages.

During the research project several recurring themes emerged, including such topics as IT projects having to respond quickly to change, minimising risk in IT projects, increasing communication with IT projects, and aligning business objectives with IT projects and spending. It was with the use of these themes that the project management framework was later modified. Once the interviews were complete the research progressed to the next phase.

3.5.2. Phase 2 – Research objectives defined

After identifying the main research topics, the academic literature was once again consulted to determine the current state of research in this field. Informal discussions occurred with participants during this phase, to briefly discuss the issues discovered during the first phase. The participants were comprised of the interviewees from the first phase, plus additional employees in the company who were involved in IT project work. The proposed goals for the research project were discussed, as well as a brief introduction of the action research process, and how participants would be asked to provide their reflections and evaluations during each phase. The main points that were discussed in this
stage were the ‘Who’, ‘What’, ‘When’ and ‘How’ details of the project. During this stage the participants were able to raise concerns about the proposed research plan, as well as suggesting possible changes.

The action research strategy was then finalised and set in motion, setting the foundation for the project work. This included establishing which version of action research would be used for the investigation, which project management standard would be used as the basis for the new framework, and which agile development style offered the most applicable features for this new environment.

3.5.3. Phase 3 – Project work

During the first project work phase the proposed solutions to the research problems were put into action and tested. Data was collected and the results interpreted with confirmation from the participants. This cooperation with the participants helps to recognise their contribution as co-researchers and empowers them to make changes to their environment, which was one of the aims of this research (Argyris, Putnam, and McLain Smith 1985), and additionally the researcher can achieve an extra level of rigour for the research (Dick 1999a). The literature review was also on-going in this phase, so that topics that are uncovered during the research could be examined and compared with what is currently known in an academic light. Informal meetings were conducted weekly with the participants, so that the researcher could receive feedback about the research progress, as well as providing support and help to the participants as the implementation stage progressed.

Collectively the participants and the researcher devised a plan on how to address issues that had been raised, revising the project implementation plan for the next phase. This input and feedback from participants was also valuable as a form of member validation, an important form of validation in field research (Neuman 2006).

3.5.4. Phase 4 – Participant consultation and feedback

In this phase the participants and the researcher discussed the progress of the research up to that point. As part of the overall reflection and evaluating, issues and concerns were discussed, and together the participants and the researcher devised a plan on how to address issues that had become apparent. Extra input was garnered by issuing a survey to all employees of the company, expanded the research sample set to include all employees who had been exposed to the results of the IT project work. This allowed extra insights to
be gathered, from people that were not necessarily actively involved in the project work, but were affected by the processes and procedures that were established through this research. This input was asked using questions along the lines of the interviews, and provided confirmation for the findings discovered, as this data was analysed using quantitative methods.

At the initiation of each test project the objectives were discussed with the relative project participants, a process step where the project objectives were made clear. If the situation was exceptionally unique, then a detailed outcome or result was sometimes not able to be completely defined in this stage. At the very least a goal for the first project cycle needed to be defined, and these objectives were then used as the input for this cycle. The project implementation plan was then revised for the subsequent phases.

3.5.5. Phase 5 – Project work
The revised project plan was once again put into action in this phase. Any plan changes were tested in this practical stage, and differences were noted that arose from implementing the new plan. The literature was consulted to interpret the results, to ensure that the findings were applicable to the academic framework. Additionally, during this phase the project implementation model was built, and the knowledge gathered in the first four phases was made explicit. Further critical reflection on academic learning and how it applied to organisational learning also occurred in this phase.

3.5.6. Phase 6 – Participant consultation and feedback
This phase allowed the participants to provide input on the research, as the preliminary findings were presented in a draft form. This input was in turn used as a form of member validation. This feedback provided a source of triangulation of the results presented by the researcher. A discussion of any residual problems and concerns also revealed any topics that were still unresolved, or that needed to be addressed in the next project work stage.

In this phase the preliminary findings were also presented at an international academic conference in Bad Hofgastein in Austria, and were subsequently published as an academic journal article.
3.5.7. Phase 7 – Project work
Once again the revised project plan was put into action, and notable changes were tested and resulting differences noted. The literature review was also consulted a final time as a part of the results interpretation, with further critical reflection by the researcher about the research results taking place.

3.5.8. Phase 8 – Participant feedback and report preparation
A final consultation with the participants occurred in this stage, to discuss any residual problems and concerns regarding the research. This helped to reveal if there were issues that were still unresolved and had not been adequately addressed by the research, and brought to light potential research questions that could be handled by future researchers. In this phase the research findings were prepared as a part of a Doctor of Business Administration thesis. After approval by the review body, a condensed version will be released to the participants wishing to receive a copy of the findings resulting from this research project.

3.6. Data collection and coding
Data collection in this research involved the use of tools such as semi-structured interviews, surveys, and conversation notes and observations recorded in a research journal. This data was transcribed into a readable format and checked for discrepancies, and then entered into a database that was used to assist with the data classification and coding work. A search was then conducted through the text for relevant ideas that was thought to be potentially important for the research (Auerbach and Silverstein 2003). Once a collection of repeating ideas had been gathered, these were grouped into themes, which were used to consolidate the data. After the data had been organised into themes, it was grouped into the more abstract theoretical constructs. These constructs were the thoughts that have been systematically assembled from ideas, facts and impressions collected throughout the research (Neuman 2006, p. 218). The final step of coding was to produce a theoretical narrative, producing the links between the theoretical problems and the data provided by the participants. This narrative was then applied to the research problems for further clarification. As action research is an iterative process, this coding process did not occur solely at the end of a data collection stage, but rather at intervals throughout the research. Observations from the coding were then tested in each of the action research iterations, and observations from the testing stage were included in the data set for the subsequent stages.
3.6.1.1. Quantitative data description

During the research it was considered beneficial to investigate the environment from more than one methodological viewpoint. To provide an additional insight into the situation, it was decided that the introduction of a quantitative aspect would expand the investigation of the research environment. The data in this paper was collected using a questionnaire that was distributed to all individuals employed by Publish-Com and Media-Com, in addition to freelancers associated with the company on a regular basis.

The questions of the survey were based on the questions used during the initial semi-formal interviews, and were designed to be an instrument to test the feedback received during the interviews. This questionnaire was undertaken with the goal of providing a triangulation of the data provided by the interviews and was a significant part of the study into the research of using agile methods in IT project management in an SME. The questionnaire was prepared first in English and tested initially with three participants who were not a part of the research. This was a pilot test of the questions, and helped to determine the effectiveness of the instrument. One of these initial test participants was a certified psychologist and was able to provide feedback about question wording and other minor improvements.

The questionnaire was designed with 40 questions in total. The initial five questions were demographic questions that could be used to group the respondents into separate response groups. The remaining questions were delivered in six groups that were organised around particular themes relating to the research. This questionnaire was then submitted for approval to the ethics approval committee. On receiving ethics approval, the questionnaire was then translated into German for the Austrian-based participants. The German translation was then subjected to scrutiny by the psychologist as she was a native speaker. The flow and wording of the questions was also adjusted to provide an environment similar to the English-speaking participants. These two language questionnaires were then entered into a web based questionnaire tool provided by Qualtrics (www.qualtrics.com), where the wording and questionnaire design was once again tested for clarity and simplicity.
An invitation to participate in the questionnaire was initially sent out to 125 people, with 23 invitations being sent to participants fluent in English, and 102 invitations being sent to participants fluent in German. Of the 125 invitations sent out, 59 responses were received, giving a response rate of 47.2%. These responses were then reviewed, to ensure that they were complete and contained valid answers, as missing values can distort the results derived from the data (Manning and Munro 2007). Of the 59 responses, 6 were incomplete, as respondents had abandoned the survey partway through. There are several options available to a researcher, when contemplating how to handle missing data. These options can include treating the missing data as data in their own right, deleting the cases or variables with missing data, or inserting an estimate or a mean value where data is missing (Tabachnick and Fidell 1983). The researcher must examine the amount and type of data missing and determine the best course of action. In this instance, a course of action as discussed by Tabachnick and Fidell (1983) was used.

One of the more conservative procedures for handling missing values is simply to drop any cases or variables that contain them. …if missing values are concentrated in a few variables and they are not critical to the analysis… the variables(s) with missing values might profitably be dropped.

There were six responses in the data set that contained missing data. These variables were therefore excluded from any statistical calculations that they were a part of, as this was the most conservative method to handle this issue, and did not adversely affect the results.

3.7. Justification of sample selection

A majority of the earlier IT project management research has been conducted in large organisations, which increases the sample size and reduces to some extent potential problems related to data collection. The issue was also pertinent for this research as well, as the size of an SME results in smaller sample sizes, and can raise issues of research transferability. The research took place in two closely-linked media and publishing companies, where one company consisted of approximately 70 employees, and the second had approximately 60 employees. The research was carried out to the same extent in both companies, which tested the research transferability to a degree, as these companies have distinctly different management and organisation styles.
There were two types of data sampling decisions that needed to be addressed during this research. The first decision involved the choice of the SMEs in which to conduct the research. The environment in which this research was conducted fulfils the criteria for this project. The companies are SMEs of sufficient size, the researcher possesses the ability to effectively introduce an action research process into the organization to derive and test theory, and the SMEs involved have regular IT implementation projects underway so that the theory can be iteratively refined and tested.

The second decision involved the people selected for the initial research problem discovery interviews. A judgment sampling approach was used here, which involved choosing subjects who were most able to provide the desired information (Sekaran 2003). These interviewees were chosen from all employees, with attention paid to their role and specific knowledge of the company. The interviewees were chosen from different roles in the company, and possessed differing levels of expertise. These differing roles and experience enabled the capture of a diverse sample, and provided the research with a rich data set. In situations such as this, where a sub-section of the group possesses the best knowledge, a cross-sampling of the entire population will not produce a better result.

Whilst the final amount of participants contained a fairly even concentration of males and females, participant selections were based primarily on their role, rather than their gender.

After ten interviews had been completed for the initial problem identification stage it was deemed that theoretical saturation had been reached. This point of theoretical saturation occurs when additional cases will only minimally increase the amount of new data, as the researcher encounters the observations repeating (Eisenhardt 1989, p. 545). Lincoln and Guba also comment on this issue of data sampling, when they discuss the qualitative sampling method ‘selection to the point of redundancy’. Whereas in quantitative sampling the sample size is pre-determined by a statistical degree of confidence (Davis 2005), the type of sampling used for this research is based upon the amount of information extracted. Once no fresh information is able to be extracted from new cases, then the sampling is stopped as redundancy has been achieved (Lincoln and Guba 1985, p. 202). It has also been noted that qualitative analyses do not attempt to represent the entire population, and are primarily designed to be impressionistic (Davis 2005). Therefore, as the interview process progressed, the amount of original information that was gathered with each subsequent interview diminished, until it was decided that a point of redundancy had been achieved.
3.7.1. Quantitative sample size

In this section we must deal with a data issue that has been a barrier to most research that occurs in an SME environment. As Hair et al. (2009, p. 176) mention, there are a few rules of thumb that a researcher should keep in mind when considering sample size:

Simple regression can be effective with a sample size of 20, but maintaining power at .80 in multiple regression requires a minimum sample of 50 and preferably 100 observations for most research situations. ...Maximizing the degrees of freedom improves generalizability and addresses both model parsimony and sample size concerns.

Hair et al. (2009, p. 102) also mentions:

When dealing with smaller sample sizes and/or a lower cases-to-variable ratio, the researcher should always interpret any findings cautiously.

Tabachnick and Fidell (1983, p. 379) also comment on this topic of sample size:

The required sample size depends also on magnitude of population correlation and number of factors. If there are strong, reliable correlations and a few, distinct factors, a sample size of 50 may even be adequate, as long as there are notably more cases than factors.

Another issue that Tabachnick and Fidell (1983, p. 92) discuss is that of the issue of the ratio of cases to independent variables in small sample sets. One strategy is to reduce the amount of independent variables by combining several variables into a composite variable, and then deleting extraneous independent variables. In addition, Tabachnick and Fidell (1983) warn that if the case-to-variable ratio is low, then care must be taken to ensure that the residuals are normally distributed.

Using these suggestions and recommendations, and with the aim in mind of experimental investigation, it was determined that the data collected depicted a valid representation of the population in question. It was also decided that the suggestions of the authors would be implemented during the data analysis stage.
3.8. Limitations of the methodology

A main limitation of this study is also an inherent element of the action research method used for this investigation. Action research enables the researcher to interact with participants within a social system, and therefore helps them to focus their energies towards solving problems within that environment. The Hawthorne effect may occur when the participants know that they are being observed, and thus the results of the research are influenced by the very act of observation (Roethlisberger and Dickson 2003). Since action research may contain instances of the Hawthorne effect, it is difficult to determine the potential for the generalisation of the results from this study (Baskerville and Stage 1996).

Scientific rigour is an important factor in research, and one that action researchers need to be mindful of to avoid being labelled as simply consultants rather than researchers. One method of achieving this scientific rigour is with the use of data triangulation. The results collected using the semi-structured interviews were compared with the findings arising from the action research cycles. These in turn were compared with recent articles in the academic literature, to provide another form of validation. Another form of triangulation was to review the findings with the participants, to demonstrate that the researcher understands and is describing the social setting correctly. This is known as member validation where Neuman (2006, p. 405) note:

A study is member valid if members recognize and understand the researcher’s description as reflecting their intimate social world.

Participants were also invested as co-researchers, as a researcher can achieve scientific rigour by involving others in the research process and valuing their input (Dick 1999a). With such participation it was possible to achieve a broader array of input, a factor that not only increased the richness of the data, but also the rigour of the results.

Validity is an issue that needs to be considered with research, and can be achieved by presenting an authentic account of the situation (Neuman 2006). An interpretivist researcher must demonstrate that they have added to the body of knowledge in some way. As Hoshmand and Polkinghorne (1992, p. 58) note:

...the test for knowledge is whether it serves to guide human action to attain goals. In other words, the test is pragmatic, not logical.
With this in mind, it was determined that the test of validity could be satisfied, as it can be shown that the research assists to achieve a specific goal, which in this case is the improvement of IT projects for SMEs.

Action research is predominantly tailored to a unique social situation, and as such is not designed to necessarily be valid or richly meaningful when applied to a different social group. Repeatability, as it pertains to quantitative research, is not within the reach of action research, nor is it a primary goal. However, this research work has been prepared with the aim of ‘recoverability’ in mind. This is a process whereby the researcher provides extra research content, so that an external researcher can follow the progress, and appraise the decisions that were made (Checkland and Holwell 1998). An important goal has been to provide a higher level of validity and rigour, thus providing future researchers with adequate information to subject the research to additional critical scrutiny.

3.9. Ethical considerations and cultural implications

This research investigated new methods of project management in IT projects, and involved no harmful practices or risk to any participant involved. Interviewees were provided with an information sheet in their own language about the research project, and signed an informed consent form if they agreed to participate. Participants were informed that they could withdraw from the research at any time, and that there would be no unnecessary risk or discomfort for any party involved. Interviews normally took place in a private meeting room, unless a participant chose to be interviewed in another setting. No personal data was collected, as this research dealt with non-personal information relating only to the general workplace and the project work. Data recordings and research journals were kept in a secure location that was accessible only to the researcher, and all information supplied by participants was treated with the utmost discretion. All names and identifying details were removed at the time of data analysis, and the role or position of the interviewee was only used for group results in the data analysis stage. Any published findings presented the data as overall data, and contained no identifying names of participants or the organisations, substituting pseudonyms for real names to protect the privacy and confidentiality of those involved in the research.
The action research part of the research was merged with the everyday work life, and therefore observations, suggestions and opinions were gathered unobtrusively as a part of the normal daily interactions. This participation was spread over approximately eighteen months, so that the time involved was neither distracting nor burdensome for the participants.

In regards to potential problems arising due to power-relationship problems, the majority of the research participants were not in a business subordinate position to the researcher, and were free and willing to voice any objections to problems that arose. For the few participants who were subordinate to the researcher, they had the possibility to anonymously approach the researcher’s line manager at any time to report any concerns. The participants could voice their concerns to this manager, and then the line manager would raise any concerns directly with the researcher. This conflict resolution process was discussed with several subordinates and the line manager, and it was seen as an acceptable solution, as the researcher’s line manager is regarded as an approachable and fair manager.

The researcher is married to an Austrian national and lived in Austria for the past eight years. This provided the researcher with an understanding of the cultural and social values of the participants, and also with a conversational fluency in the German language. Local laws and regulations were also taken into consideration at every step in the research project, so that nothing illegal transpired. The contact details of the researcher’s line manager were additionally provided to interviewees, so that participants had a local contact in the event of a complaint or question. Permission to conduct the research on-site was granted by the management of the organisations involved, and individuals involved in the research work were personally consulted for their permission to include their opinions and input.

The main issue that the researcher must take into consideration is the European Charter of Fundamental Rights. Here it states that the integrity of all people involved in the research must be protected, and the privacy of all personal data must be maintained by the researcher (ECC 2007). The research will not encounter any issues in this area as data will be kept anonymous, and participants will be accorded due respect and dignity.

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Supervisor: Dr Jun Xu. Co-Supervisor: Dr Shankar Sankaran
3.10. Conclusion
In this chapter the primary research paradigms were discussed, and how each of them has a different research process associated with it. The difference between these paradigms was clarified, with special focus on the distinction between positivism and interpretivism, and the problems that researchers have encountered in the past when undertaking a non-mainstream research method.

Next the research environment was described in detail. This demonstrated the unique situation where the study was to be undertaken, and how the researcher had more flexibility in the implementation of the project management method in one company then the other. This could be used as an advantage however, as it could be leveraged to test the transferability within two separate companies with their own individual management structures.

The next part of this chapter laid out the basis for the research process, and the phases that the action research would follow. This section also described why action research is the most fitting research method for this situation, and how it would allow the flexibility required for this specific environment, as well as providing a scientifically proven method of inquiry.

The data collection and coding was briefly discussed, and a justification of the sample size provided, to show that the data collected was a valid description of the environment, and the collection method employed scientifically recognised methods.

Next the limitations of action research were discussed, and how this research addressed such important topics as scientific rigour and validity. This is an important topic, as future researchers need to feel that they can trust the scientific basis for the study, to put the findings to use.

Finally, the ethical considerations in regards to this research were discussed, and the safeguards that had been put in place to avoid any potential ethical issues arising. In addition to this, cultural considerations were discussed, and how these would be handled.

The next chapter will present the findings from the data collection, and summarise the research work.
4. Chapter 4 – Data analysis

4.1. Introduction

The previous chapter established the research method that would be utilised in this work. This chapter will now present the research data that was collected, and the findings arising from the data.

This data was collected over a period of 18 months. During this period there were times of high workload and a great influx of data, and periods of relatively little project work and data collection.

Firstly the data arising from the pilot interviews will be discussed, and the findings of this phase shaped the research questions, as well as the progress of the research itself. Next the initial design phase of the project management framework will be described, and the core processes that are involved will be clarified.

The project phases will then be presented in this chapter, to both document the progress of the action research, and highlight the findings that emerged as time progressed. The sections describing the project stages will perform several functions. Firstly the progress of the research will be documented, so that an external reviewer can gain an insight into the research method used for this work, and be able to submit the work to crucial review if they so desire. Secondly, the project management framework was developed and modified over the course of the research, as a product of the action research method involved. These sections will therefore document the progress of the development, and add insight into the decisions and actions that shaped the research outcome. Interspersed with these project phases, the data results of an interim survey of the participants will be analysed and presented, showing how it provided extra insight into the research topic, and how the results were then integrated into the overall outcomes.

The goal of this chapter is to display and explain the collected data in an understandable format, so that an overview can be gained on the results arising from this research. This chapter also lays the foundation for the subsequent chapter, where the conclusions from this research will be discussed. The structure of this chapter is depicted in Figure 30.
Figure 30: A graphical representation of the structure of chapter 4
Source: developed for this research
4.1.1. Qualitative data collection, coding and categorising

Action research presents a challenge in that, while it allows flexibility in the methodology which is able to adapt to a changing environment, there are built-in challenges involved with achieving rigour and validity as perceived from a positivist approach.

Data collection in the research involved the following sources:

- semi-structured interviews
- conversation notes and observations recorded in a research journal
- researcher thoughts recorded in a research journal
- a companywide survey
- feedback from Southern Cross University doctoral workshops
- feedback from my supervisors
- review by a practising psychologist
- review from practising project managers
- presentation and feedback of interim results at an academic conference
- presenting the interim results for review and publishing in a peer-reviewed journal
- presenting the final results for review in a peer-reviewed journal

The research journal recorded thoughts that occurred during the research and each project, with critical reflection as an important component of this process. The data that was collected from interviews or conversations was transcribed into a readable format and then checked for discrepancies. These transcriptions were then entered into a database to assist with the classification and coding analysis of the data. Even though qualitative data consists of words describing social life, it is still possible to achieve a rigorous and systematic data analysis (Neuman 2006). The desired outcome of this data analysis is to produce a theoretical narrative, producing the links between the theoretical problems and the qualitative data provided by the participants. This narrative was then applied to the
research questions to discover the clarification that was obtained. As action research is an iterative process, this coding process occurred not just at the end of a data collection stage, but rather at intervals throughout the research. Observations from the coding were tested in the action research iterations, and observations from the testing stage were included in the data set for the next stage.

4.2. Pilot interviews

<table>
<thead>
<tr>
<th>Details and assumptions</th>
<th>Initial interviews were conducted across the companies to uncover issues regarding the research ideas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary findings</td>
<td>There is a general lack of understanding about project management, though agile concepts are viewed favourably by most interviewees.</td>
</tr>
<tr>
<td>Research adjustments</td>
<td>Extra data than was strictly necessary was collected, allowing a richer data set to be compiled from the research.</td>
</tr>
</tbody>
</table>

Table 2: The summarised details and results from the pilot interviews

Source: Developed for this research

4.2.1. Details and researcher assumptions

The preliminary step in the research process involved interviewing several people to gather information about project management in the organisations, and to establish the goals of the research. Action research has a dual-focus purpose, where the researcher’s goal is to add to scientific knowledge, whilst also working with the participants to solve a real-world problem. Therefore the initial consultation with the participants is a necessary step to a structured research process, ensuring that the researcher addresses the correct issues from the outset.

Interviews were conducted with a cross-section of the population, using a judgment sampling approach which involved choosing subjects who were most able to provide the information required (Sekaran 2003). The initial problem identification consisted of a set of ten interviews. It was determined towards the end of this set that the point of theoretical saturation had been reached, as each addition case was only minimally increasing the richness of the data set (Eisenhardt 1989). The interview protocol that was used as the basis for these semi-formal interviews can be found in Appendix A.
The participants were selected from a variety of roles in the company. These roles included several line managers from departments such as production and online media, an employee from the IT department, a project manager, a member of the upper management team, and a typical employee. This enabled a wide range of feedback to be gathered, as the interviewees were spread out across the company, though each possessed a wealth of information about their specific area of the company, whilst still containing portions of overlap in knowledge with other departments. This also assisted with the corroboration of information received, as the researcher was able to ask interviewees for confirmation about facts that were gathered from other participants.

There was a broad range in their level of education that the interviewees possessed, including a mixture of high school level education, business school, and those who had completed a master’s degree at a university level. This range of education levels also helped to enable a depth of understanding from a wider range of people in the interviews.

As a researcher conducting field research in an environment that I was familiar with, I wanted to discover in great detail the opinions of the interviewees without influencing their answers to a great extent. I initially thought it would be difficult to gain a proper understanding of the issues in the company, as interviewees would be hesitant to mention anything negative, for fear of repercussions from upper management if these comments were made public. However, by using open-ended questions and asking for clarification about topics that arose during the conversations, I was able to elicit a collection of answers and problems that was more frank than I had hoped for. Once interviewees had been assured of the confidentiality of the process and were at ease with the situation, the answers and comments became in some instances quite candid. The formality of the informed consent form lent itself to supporting this situation as well, as people felt at ease and knew that they would not be identified, or suffer consequences as a result of their participation in the research.
4.2.2. Primary findings from this phase

Though many themes arose during the interviews, there were several recurring themes that emerged across a majority of the interviews.

Relatively few (4) of the interviewees fully understood what a project was, and even fewer (2) understood the role of project management in its entirety. The following excerpt was a typical response from interviewees.

*Interview excerpt:*

> The term project manager is quite a vague term. I don’t really know where to start with it...

The only interviewee who fully understood the role and what it entailed was a contractor, who had been brought in to manage the launch of a unique media product. When the other interviewees were questioned about what they believed his job to be, the majority were not really sure, or they viewed the role of the project manager as more of a supervisory position.

A majority (9) of the interviewees associated everything relating to IT as residing within one category. Therefore IT change management, problem resolution, project management and processes were all bundled together into one category by most participants. As a researcher it sometimes required extra effort to separate an opinion or comment about process management or project management, as an interviewee would often stray to a tangential issue during the course of the discussion.

When asked about the concepts of agile project management, all interviewees responded favourably, and most thought that these concepts would work extremely well within Media-Com and Publish-Com. This was due primarily to the size of the companies and the company culture, which interviewees felt was particularly aligned with the principles of agile development.

4.2.3. Research adjustments

Due to the difficulty in separating participant opinions of generalised IT management and IT project management, additional questions were posed for clarification during conversations, to draw out the desired information in regards to project management. Whilst the data collected formed a rich set of information, a portion of this information was interesting and useful predominantly from an IT management perspective, though not
as fully pertinent to the research goals. However, by allowing the participants to discuss a wider range of IT-related topics it was possible to include data on subjects that was useful to the research, but that may not have naturally arisen if there had been an attempt at drastically reducing the scope of the data collection. This rich data set also meant that changes were able to be made during the action stages that encompassed more than pure project management topics, thus providing enhancements to the overall IT project environment.

4.3. The project management framework design process
Once the interviews were completed the data was transcribed and analysed to identify reoccurring concepts, which were used to guide the design of the research. A preliminary project management framework was then assembled with this guidance, to be used as a framework to test the combination of agile development techniques and traditional project management processes and concepts. The PMBOK was used as the foundation for the project management processes used in this research, and the agile concepts were adopted primarily from Scrum, a prevalent agile development method. The action research processes were also investigated to determine if these processes could be implemented into the framework. This is due to the fact that action research would be employed as the research method for this investigation, and it is able to adjust to change and uncertainty in a situation, similar to the agile development methods. The aim of this amalgamation, as mentioned previously in this work, was to produce a project management style that could respond quickly to requirement changes, and provide project management assistance in an unstable environment.

4.3.1. The core processes of the project management framework
At the commencement of the design process the literature was consulted, which revealed a wide variety of action research processes. The basic structure of the model was adopted from the description of action research as presented by Argyris, Putnam and McLain Smith (1985, p. 9), where they mention: ‘Action research, like social management more generally, involves iterative cycles of identifying a problem, planning, acting, and evaluating.’ As this was one of the original action research configurations, and has been tested over time, this description of the processes involved in an action research cycle was chosen, and is depicted in Figure 31.
These base iteration processes form the core of the agile project management framework, and as depicted in Figure 31, these four processes form a continuous cycle of adjustment and improvement.

4.3.1.1. Identify
In this first process stage the project manager will identify the issues or tasks to address in this cycle, and what the concluding results should be. As mentioned in chapter 2, the project scope sets out in detail the purpose of the project, and what it has been assembled to achieve. This stage of the cycle could be likened to an abridged version of the project scope, as the goal is to deliver a small useable chunk of the overall end result with each cycle. The size of the goals for a cycle is invariably smaller than the overall project scope. If the project manager needs to deliver the product in one cycle then they are using a linear project delivery method, which is not a focus of an agile project management style.
4.3.1.2. Plan
In the second stage, the project manager has identified the goal of this cycle and thus needs to establish a plan of action. As with the previous section, the plan for this cycle needs to align with the overall project implementation plan. Not only is the plan stage an organisational tool for work that will occur in this particular cycle, but it is the means by which the project can remain on course despite changes in the requirements or the environment. The plan stage can be likened to piloting a ship at sea, where the captain sets sails for a specific port. However as conditions arise, such as needing to make an additional port of call or reacting to adverse weather, the captain must continually make adjustments that take into consideration the current issue, though with the eventual goal always in mind. So the project manager needs to steer the project around and through issues that arise, always with the goal of attaining the desired project results.

4.3.1.3. Act
The third stage of the cycle is where the project plan for the cycle is put into action. In an SME environment the project manager may also be the implementer of the project, as this is quite often the case in a smaller sized company, where key employees must perform several roles. Whether the project manager is involved with the implementation of the project in a hands-on capacity or takes more of a supervisory role, the plan should be followed to ensure that the goal can be achieved. If the plan is ignored then there is a possibility that the actions will not achieve the goals of the cycle, and the efforts of the cycle will be wasted.

4.3.1.4. Evaluate
The last stage of the cycle occurs once the action stage has taken place. Now the project manager and the project team take a critical look at what has ensued, as opposed to what had been planned. The results of the cycle are inspected, and problems that arose in the previous stage are noted. If the cycle was successful, then the cycle goals and the cycle results will match. If there is a discrepancy between these two, then the project processes will need to be examined to determine the reason behind the failure to achieve the goals. The results of the evaluation are then used as an input for the next cycle, where the cyclic process begins once again. An important function of the evaluate stage is to make adjustments in future project cycles, so that mistakes are not repeated, and processes are continuously being improved.
These four stages of the core cycle were then used as the foundation for the project management framework, which combined components from the PMBOK, agile software development, and action research. This framework is depicted with a model in Figure 32.

![Figure 32: A preliminary model of the project management framework](image)

Source: Developed for this research

### 4.3.2. Description of the project management framework

The goal of the design process was to produce a project management framework, rather than a cook book approach to project delivery. This would give future project managers the freedom to adapt the framework to specific projects, whilst still upholding the principles of the concept.

#### 4.3.2.1. Project objectives

At the initiation of each project the objectives that need to be achieved are discussed and established in conjunction with the relative project stakeholders. If the situation is very unique, then it may not be possible to completely define a detailed end-product in this stage. At the very least a project goal needs to be established so that the initial project cycles can commence, though embarking on a project without a firm project goal should only be used in extreme circumstances. Once established, the objectives are then used as the input for the project cycles.
4.3.2.2. Iterative project cycles

This iterative cycle has already been discussed to some extent in a previous section of this chapter. The goals for the cycle are defined in the first stage, and a clear purpose for the cycle is established by the project manager and the team. Another aspect that they need to be mindful of is whether this cycle contributes to the overall project goal. If the cycle does not contribute to the project goal, then it should either be adjusted, or re-examined to determine whether it is assigned incorrectly to the wrong project.

In the second stage of the cycle, a plan is developed to achieve the project goals of the current cycle. This stage is also where the work is disassembled into smaller parcels and assigned to the respective project workers. The third stage is where the project cycle planned work is then undertaken. The final stage is the evaluate stage, where the project objectives are examined and it is determined whether they were actually achieved or not. Each of the iterations should ideally produce a useable portion of the total end-product. This allows the deliverables to be placed into operation and tested, thus allowing end-users to provide feedback to the project manager, so that corrections can be used as an input for the next iteration. These cycles are able to be implemented in a flexible manner, and are not restricted to a certain length of time. A cycle may take place over several weeks when used in a project of long duration, or it may occupy mere days for shorter projects. The time needed is dependent on the overall complexity of the project.
4.4. Action research: the initial test and design cycles

<table>
<thead>
<tr>
<th>Details and assumptions</th>
<th>The initial project management framework is tested on three smaller projects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary findings</td>
<td>Feedback iterations are required for the act stage, to enable an increase in the reaction speed. The concept of project success is sometimes subjective. Old tools can still have value today.</td>
</tr>
<tr>
<td>Research adjustments</td>
<td>The Gantt chart is reintroduced. Feedback iterations are added to the framework. Success definitions will be discussed with project participants before each project starts.</td>
</tr>
</tbody>
</table>

Table 3: The summarised primary findings from the initial test and design cycles
Source: Developed for this research

4.4.1. Details and researcher assumptions

Once the initial interviews were completed and the preliminary project management framework was designed, it was then tested in a series of small scale projects. This phase was used to test the usability and functionality of the framework, and to discover whether any major adjustments needed to occur. These initial projects were relatively small, though they were adequate to test the usefulness of the framework.

The initial test phase included the following projects:

- A network configuration change project in Publish-Com
- A internet provider change-over project in Media-Com
- A software rollout and introduction of an enterprise standard project in Media-Com

The network configuration change project involved reconfiguring the Publish-Com network so that it would be ready to join the Global-Com network at a later date. This would then enable business software and solutions to be used seamlessly within the Publish-Com network, though it required each single network device to be reconfigured, so that they were using a new numbering range. During this reconfiguration process servers and workstations would not function correctly, so this project needed to be conducted out of normal working hours. The main challenge for a project that introduced so many changes was endeavouring to minimise the effects of the change for end-users.
The internet change-over project for Media-Com involved replacing the existing internet access with a faster connection. This would entail a loss of internet access for a short period as technicians reconfigured the firewall, and incoming mail and files would also need to be redirected, so that they would enter via the new internet connection in the future. The main challenge here was that mail and other systems could only be unavailable for a very brief period, and then only outside of normal business hours.

The final project involved a rollout of software in the London branch of Media-Com, which would involve installing the Global-Com standard operating environment onto the computers. The biggest challenge here though was not a technical one. This branch was initially a very small company in its own right, which was used to working in a relatively unrestricted manner, with very little guidelines on how to achieve success. The new enterprise environment would mean a reduction in the control of their work computers, and on what they could install on these machines.

The preparation for this stage involved much discussion with the end-users of the two organisations, and much research into the composite parts to the new framework. As a research, I felt prepared and assured that the new project management framework was the best choice for the environment where the projects were underway. I also felt that this framework would be able to cope with any changes that occurred during the project, enabling the implementation to happen more smoothly and with fewer issues.

4.4.2. Primary findings from this phase
The following paragraphs highlight in detail the primary findings that arose during this research phase.

4.4.2.1. Framework changes were needed
The three projects were successful in their application, though it was determined that an adjustment was required for the framework model. It was noticed that during the act stage of the core processes, that requirements could appear that were not addressed in the preceding plan stage. An example of the likelihood of new requirements suddenly appearing became apparent during the Media-Com software rollout project in London. As part of the identify stage all users of this branch office were contacted a minimum of three times via email, requesting feedback and confirmation in regards to their business software requirements. A list of software to be installed was included in these emails, and several
end-users contacted the project team with extra requests. These requirements were then assembled into a prototype environment and tested, as preparation for the act stage.

During the implementation one department had additional software requirements, as they had not responded to the initial investigation emails. To minimise the rework caused by this delayed request, it was decided to briefly pause the rollout, include the addition software in the standard, test the standard, and only then continue with the software rollout. This reduced the additional work that would be necessary if the software had to be installed separately afterwards. This incident however led to the introduction of feedback iterations to the framework, as depicted in the model in Figure 33.

The feedback iterations have been added to the act stage, in order to improve the responsiveness of the framework to requirement changes. During this stage the project workers take a moment to pause and assess if the work is still heading in the right direction or to determine if new requirements have arisen, and what needs to be adjusted to achieve the goals that were set for this cycle. If the cycles are one or two days in duration, then the feedback iterations may need to occur every few hours to ensure that the project stays on course. If the project starts to deviate then resources can be reassigned at short notice or the priority of tasks reassigned, thus bringing the project back on track. The more complexity or risk associated with a project, the more frequently these feedback loops will need to occur to ensure that the original goals can be achieved.

Figure 33: Version 2 of the agile project management framework model
Source: Developed for the research
4.4.2.2. Findings associated to the project tools

For the test and design cycles there was an initial attempt to radically change the tools used to denote the project time line. The initial adaptations attempted to portray tasks associated with a project, though in a different format than was used with past projects. This format endeavoured to imitate a task board, a common tool used in agile programming which involves the use of index cards to represent tasks. The tasks are written on the index cards and placed on a board where developers can see which tasks are unfinished, and which tasks need to be completed in order to bring the project to the next stage of development. Developers choose tasks from the index cards, and once these are finished they are marked as complete on the board.

However on implementing a variation of this type of system, it was noted that project participants had difficulty understanding the format and the message being delivered. Even after it was explained and demonstrated the participants were still hesitant in their acceptance, and did not find it particularly informative or intuitive. Indeed one participant after examining this manner of task assignment work remarked that he felt it was too hectic and lacked priority, and was not professional enough.

*Interview excerpt:*

Everything is in there... OK, everything has to be done, but it’s lacking organisation.

He went on to remark that this method had no sense of when tasks needed to be accomplished, and which tasks were more important than other tasks. Also the sequence of the tasks needed to be more explicit, so that a non-technical person could quickly obtain an overview of the project. The interviewee then proceeded to explain a chart that he would find helpful, unwittingly describing a Gantt chart. Indeed, after showing him the project timeline in the Gantt format, he remarked that it was clearer and understandable.

This is one topic that reoccurred often during the research, as this acceptance of Gantt charts by participants was evident throughout the whole research project. This is partially due to the fact that integration and technical line managers from Global-Com use Microsoft Project as their main project management tool. A case in point involves the project manager for Mobile-Com, a sister company of Publish-Com and Media-Com occupying office space in the same building. The project manager for this mobile media company also used Microsoft Project for tracking and managing all projects that he was
responsible for. In fact the term project management and Microsoft Project were synonymous throughout the company, and it was assumed by project participants that this software would naturally be used for medium and large projects. Therefore, to provide the desired information to managers outside of the project Gantt charts from Microsoft Project were implemented, though internally within the project team a task board system derived from Scrum was implemented.

4.4.2.3. The definition of success can differ from person to person

It was noted that there was a marked difference in the definition of project success, depending on the person’s role in the company. As the project manager and IT manager, a project that introduced a large amount of change was successful if users could afterwards continue to work productively, and also take advantage of the changes that were introduced to the environment. However, some end-users could view the same project as unsuccessful, regardless of the technical outcome. This variance in definitions became apparent in the software rollout project for Media-Com in London.

Several end-users felt that the software changes introduced in this project were forced upon them without their input. This was a valid opinion to some extent, due to the circumstances surrounding the integration of this branch. Before this project was started over a half of the original employees of this branch had been made redundant, as the headquarters for Media-Com was moved from London to Vienna. There was a lot of in-fighting within the upper management teams, as each manager battled for control of their own segment of the new organisation structure. Due to these initial political manoeuvrings, a substantial portion of the end-users in London felt abandoned and betrayed by the managers in the new Austrian headquarters. This led to a reduction in the level of communication between the management teams in Vienna and London, which only exacerbated the situation further. As a result, the end-users were unhappy about the project even before it began, though whether any outcome could have been hailed as a success in this situation is difficult to ascertain. This situation demonstrates however that success in relation to a project means different things to different people, and is something that needs to be cultivated with personal relationships. Not only is the technical outcome of a project important, but it is also important to manage the stakeholders expectations, even in difficult situations.
4.4.3. Research adjustments
Several adjustments were made to the research after critically reviewing the results from this work phase.

4.4.3.1. The Gantt chart is reintroduced as a project tool
Gantt charts were reintegrated into the project management framework, due to stakeholder expectations of how a project reporting tool should appear, and what form displayed information should take. This brought about its own problems however. In its original form a Gantt chart is a lineal depiction of a project. This tool can show dependencies and interdependencies quite easily, though the project manager needs to create the timeline, with estimated start and finish dates for each particular task. Under normal circumstances this would not be a major issue, as by using such tools such as CPM and PERT, the project manager can make either educated decisions based on historical experience or use predictive calculations, based on data supplied from contractors and specialists. The Gantt chart was therefore used more as a reporting tool than a planning tool, due to its limitations in describing a non-linear environment. This inability to display non-linear tasks therefore meant that the charts had to be updated on a regular basis, and were more of a guideline than an accurate depiction of work in progress.

4.4.3.2. Agreeing on the definition of success
It became apparent that just as the scope of the project needed to be agreed upon, so a definition of success had to be arrived at. Without this, the expectations of the different stakeholders cannot be aligned, and the project will not be deemed successful by all parties. Unfortunately, as mentioned earlier in this chapter, it is not always possible to cater to all stakeholders wishes. This type of situation can arise when changes are being implemented against stakeholders’ wishes, or in a politically charged environment. Although the ideal situation would be to have a project win-win situation and full stakeholder cooperation, unfortunately this is outside the area of this particular research, and a topic for another paper.
4.5. Action research cycle 1

<table>
<thead>
<tr>
<th>Details and assumptions</th>
<th>The modified project management framework was further tested with a more complex project.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary findings</td>
<td>Tracking progress and communication become an issue for larger projects when using an agile method.</td>
</tr>
<tr>
<td>Research adjustments</td>
<td>Processes for improved communication are added to the framework, and the concepts of a backlog and a burn down chart would be tested in future cycles, to improve task assignment and progress tracking.</td>
</tr>
</tbody>
</table>

Table 4: The summarised primary findings from action research cycle 1
Source: Developed for this research

4.5.1. Details and assumptions

The project that was tested in the first full action research cycle involved a complete office move for the London branch of Media-Com. As a part of this the IT infrastructure needed to be moved from Soho in London to an office in the Global-Com building near the Tower Bridge. This meant that all the workstations, servers, telephones and video conferencing equipment needed to be moved in a very short period, to enable users to continue working in the new office with minimum disruption. To consolidate resources and reduce costs, it was also decided by the IT management team in Global-Com that the arrangements for first and second-level IT support for Media-Com in London would be altered in the future. Since Media-Com would be sharing office space in the Global-Com building after the move, it was decided that the local Global-Com IT staff would handle these support issues in future. The support had been handled up to this point by an external contractor, who had been supporting the London Media-Com team since the formation of the company, and was viewed as part of the team. This change in the support model meant that the backend servers and systems would need to be converted to the Global-Com enterprise standard, and the support would need to transition smoothly from the contractor to the local Global-Com IT staff.

There were therefore several subprojects to this project. The back-end server would need a hardware upgrade, before the software could be upgraded. The internet connection would need to be relocated to the new office with as little disturbance as possible. Data from several obsolete servers would need to be copied to the new infrastructure before these...
servers were shipped to Austria. The users’ workstations would need to be prepared for the removalists, so that they could be relocated in one move. And the remaining servers and network equipment would need to be disconnected and prepared for shipping, before being shipped to the new office where they would be reinstalled. These were the main tasks, and since they could be broken into smaller chunks of the complete project, they were separated into several tasks. These tasks then made up the backlog of work, which was then used as the input for the project cycles.

The backlog tool simplifies the input step of each cycle, as the tasks have been deconstructed to a usable size for a cycle. Additionally, the tasks are prioritised and arranged with dependencies. For example, in this project the hardware upgrade of the backend server would need to occur before the software could be upgraded. Once this stage had been concluded, then the data could be transferred to the new server from the obsolete servers. As this project occurred over two months the backlog concept was tested in several formats, in order to determine which variation offered the best potential. This included displaying the backlog on a whiteboard, representing the tasks with post-it notes on a cork board, and using mind-mapping tools to create printouts that could be given to the project team.

A basis definition for a successful project was also established. This definition was slightly different for each stakeholder, with the Global-Com IT integration manager, business unit managers, and system end-users having varying expectations and requirements. Consulting with the varied parties allowed the project team to tailor the delivery of the project to best meet the expectations of the key stakeholders.

4.5.2. Primary findings from this phase
The following paragraphs highlight in detail the primary findings that arose during this research phase.

4.5.2.1. Tracking the progress of the project when requirements change
One of the issues that became apparent with this framework is tracking the progress of the tasks. As this framework has been designed to be flexible in regards to the style of deployment used, the tasks can occur either in a linear manner or simultaneously, or a combination of the two. The tracking was aided in part with the use of Microsoft Project. This software enabled the project to be displayed as the separate tasks that were defined in the backlog, with additional detail describing the dependencies between the tasks.
However, if requirement changes were introduced, then the chart would need to be immediately updated to ensure that the project manager and sponsors could monitor the overall progress. Tracking can become an issue when there are many tasks simultaneously in progress, and when requirement changes occur to multiple tasks in a compressed time period.

4.5.2.2. Communication issues that arose

In an attempt to keep the project participants informed, regular emails were dispatched to inform the end-users of potential issues arising from the project work, and when systems would be unavailable. It was noticed that as they were quite detailed the end-users were not reading the emails, and were therefore surprised by the eventual system outages. The project team therefore drastically reduced the detail of the emails, communicating just the bare minimum of information, so that the message would not overwhelm the recipients with detail.

This project also highlighted another communication issue that can arise when dealing with more complex projects. In this action cycle, the project was taking place in Media-Com, which is under the IT governance of the Global-Com IT team. There the integrations manager needed regular updates in regards to the project’s progress. This manager had a supervisory role, acting as an intermediary between the Media-Com IT project team and the Global-Com IT management. The majority of communication in traditional agile methods consists of face-to-face conversations, as the aim is to decrease the possibility of miscommunication by reducing the ambiguity of the communication style. Therefore the IT integration manager was less informed as to the progress of the project, as he was not in the psychical location where the project was taking place. To improve this situation, a change would need to occur in the framework to enable better communication between geographically dispersed team members.

One of the main attributes of using an agile method is that it is designed to respond quickly to changes in the project requirements. This is in stark contrast to more traditional methods of project management, and project participants quickly noticed that changes were able to be introduced with relatively short notice. This led to a more lax approach from the end-users, as they felt no pressure to be specific with project requirements, as they believed that requirements could change easily when needed. The consequences of such actions would therefore need to be communicated to the end-users for future projects.
4.5.3. Research adjustments
The project was successfully completed though a few minor issues arose during the implementation stage, as mentioned in the previous findings section. The framework therefore needed a few adjustments before the next action cycle began.

4.5.3.1. Communication process changes introduced
Whereas the original agile methods value in-person communication, in a project situation where the team is dispersed over a wide geographical area there needs to be an established method of communication. This will ensure that the relevant stakeholders receive the information they require to remain informed as to the project’s progress.

For the integration manager it was necessary to provide additional information, as he was located in another country, and could not easily determine the progress of the project. Therefore a daily or twice daily update was required, to ensure that this manager was informed correctly. This communication would be added to the processes where necessary, though each business manager varied in the amount of feedback they required. Some managers wished to be regularly informed, whereas others were busy with other tasks, and preferred to be informed only when the project encountered problems. Therefore, for each manager future communication would be tailored, taking the form of update emails, telephone conversations, or brief video chat sessions, depending on the required situation.

4.5.3.2. Tracking project progress and assigning tasks
As the size of projects increase, generally the management complexity increases as well. A tool was required to track the progress of projects in conjunction with Microsoft Project, to depict the completion and progress of tasks. To aid with this tracking, the concept of a burn down chart would be added to the next action cycle, to test if this improved the progress tracking for the project.

It was also decided to test the concept of a product backlog, derived from the Scrum development method. Using this tool tasks can be packaged into small parcels, which can then be assigned to one or two IT project workers to work on as part of the overall project. This concept fits neatly into the traditional project management method, by working with the concept of a WBS (Work Breakdown Structure). The project manager deconstructs the overall project into components or functional areas, thus producing basis for the WBS. The WBS is then deconstructed further to tasks that deliver a usable chunk of the end-product.
These tasks are prioritised and dependencies noted, and this forms the backlog. This backlog is then used as an input for the project cycles.

4.6. Interim survey

<table>
<thead>
<tr>
<th>Details and assumptions</th>
<th>A company-wide survey was conducted to uncover extra information concerning the research topic.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings</td>
<td>Research findings relating to training, company culture and reacting to change were challenged, and a different aspect presented.</td>
</tr>
<tr>
<td>Research adjustments</td>
<td>Minor aspects of the theory supporting the framework were challenged, and would therefore need to be critically reviewed and adjusted in subsequent cycles.</td>
</tr>
</tbody>
</table>

Table 5: The summarised primary findings from the interim survey
Source: Developed for this research

4.6.1. Details and assumptions

The research was conducted in an experimental area, testing the combination of two established management systems to a new situation. Therefore, it was considered beneficial to investigate the environment from more than one methodological viewpoint. To provide an additional insight into the situation it was decided during the research to introduce a quantitative aspect. This quantitative method took the form of a survey, and the questions used in the English version can be found in appendix C. In a thesis length quantitative analysis, this section would be expanded and discussed over a complete chapter. However, as this data forms a supporting rather than a primary role, the analysis and findings have been compressed, with only the features relevant to this research being presented here. The detailed process that was used for the test of the quantitative data has been presented in appendix D, to support the validity and integrity of the results presented here.
4.6.2. Testing the hypotheses

During the previous action research stages several hypotheses emerged as a result of the research. These were compared against the findings from the survey data, to gain a deeper understanding of the results that had been gathered to this point in time in the action research work. The hypotheses investigated the correlations between different variables, to establish if any significant relationships existed. A positive correlation exists if the values of the variables being examined vary in the same direction (Ho 2006). The test is then taken a step further to determine the coefficient of determination, which explains how much of the variance between the variables is shared (Urdan 2005). Due to limitations of available space, not all relationships will be discussed in this section. Rather, only the seven relationships which provided extra insight into the research will be presented and investigated, due to the secondary nature of this data.

4.6.2.1. Hypothesis 1

\(H_a: \) Correctly implementing the fundamental practices of project management will affect the level of risk in a project.

The variables involved in this hypothesis were all interval scales, and therefore a Pearson product-moment correlation (Pearson \(r\)) was used. A significant positive correlation was found between risk and project fundamentals, \(r = .40, p < .01\), with 16.0% of the variance in risk being explained by project fundamentals. A moderate relationship was found to exist between risk and project fundamentals, and as a result sufficient evidence has been found to reject the null hypothesis.

This correlation supports the view that participants felt that project management was important, and that by using project management it was possible to affect the level of risk associated with a project to a certain extent. This confirmed concepts that emerged from interviews with participants.

*Interview excerpt:*
Every company needs project management, whether it is small or large. Project management is about having someone in charge. It means having someone who is responsible and accountable for making sure the project occurs.

*Interview excerpt:*

…any scheme which brings in improvements, and improves the workflow and the ability to control the situation, everything that is done in the area of project management, improves the quality of the service, and the quality of the problem solutions.

The feeling that project management only produces moderate benefits could stem from two observed reactions from participants. Firstly, as a social group, the journalists were wary of having a restrictive influence imposed on their work by the management of Media-Com. Secondly, participants voiced the opinion that the management from Global-Com was trying to assert managerial control over them, without first gaining an understanding or appreciating the uniqueness of the business.

*Journal excerpt:*

Participants come from a journalism background, where they have a free hand to engage in their work as they see fit. The company is in transition, and the move from a flat-structured organisation to a highly structured and hierarchical corporate organisation is a cause for some consternation among the journalists. I believe they feel that everything will become more bureaucratic.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Pearson $r$</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>risk – project fundamentals</em></td>
<td>48</td>
<td>.400</td>
<td>.005</td>
</tr>
</tbody>
</table>

Table 6: The correlation between risk and project fundamentals
Source: Developed for this research.
### 4.6.2.2. Hypothesis 2

**Hypothesis 2**

*Hₐ: Reacting quickly to change in a project will affect the level of risk in a project.*

The variables involved in this hypothesis were both interval scales, and therefore a Pearson product-moment correlation (Pearson r) was used. A significant positive correlation was found between *risk* and *change reaction*, \( r = .552, p < .01 \), with 30.4% of the variance in *risk* being explained by *change reaction*. A strong relationship was found to exist between *risk* and *change reaction*. Sufficient evidence was therefore found to reject the null hypothesis.

Participants were in agreement that a project that reacts quicker to change in the project will help with the risk factor of the project. When the project team reacts slowly to changes, then the risk of project failure increases. The project team was quick to react to changes, and the other participants noticed this, in comparison to the average IT project team.

*Interview excerpt:*

I have been very surprised that in IT projects, especially the IT itself, the operation of IT is actually very good, above all, very spontaneous in how it reacts.

One of the key principles of the agile project management framework is to respond quickly to requirement changes, thus allowing the project to be steered back to a stable course, rather than deviating too widely from the project goal.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Pearson r</th>
<th>Sig. (2-tailed)</th>
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</thead>
<tbody>
<tr>
<td><strong>risk – change reaction</strong></td>
<td>48</td>
<td>.552</td>
<td>.000</td>
</tr>
</tbody>
</table>

*Table 7: The correlation between risk and change reaction*

Source: Developed for this research.
4.6.2.3. Hypothesis 3

**Hₐ**: Providing project workers with training in agile project management techniques will affect the importance of handling risk in projects.

The variables involved in this hypothesis were interval scales, and therefore a Pearson product-moment correlation (Pearson \( r \)) was used. A significant positive correlation was found between risk and training, \( r = .503, p < .01 \), with 25.3\% of the variance in risk being explained by training. A strong relationship was found to exist between risk and training, and sufficient evidence was therefore found to reject the null hypothesis.

This correlation investigates the point that project workers need training to be successful in their job, and that training affects the level of risk in projects. This aspect of training was especially evident when introducing new concepts into the work environment. The project workers needed to understand why a tool was being introduced or it would not be implemented correctly, if at all. This on-site training is an important aspect that cannot be ignored, to ensure that the uptake of tools and procedures is effective. This step cannot be ignored if the project manager wishes to reduce the level of risk with these improved processes and procedures.

*Journal excerpt:*

With the introduction of each tool, the tool in question needs to be explained to the project team in detail. This explanation needs to be in-depth, and they need to not only understand the use of the tool, but also what benefits it will bring either to them or the project.

<table>
<thead>
<tr>
<th></th>
<th>( n )</th>
<th>Pearson ( r )</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>risk - training</td>
<td>46</td>
<td>.503</td>
<td>.000</td>
</tr>
</tbody>
</table>

Table 8: The correlation between risk and training
Source: Developed for this research.
4.6.2.4. Hypothesis 4

\[ H_a: \text{Providing project workers with training in agile project management techniques will affect the importance of the fundamental practices of project management.} \]

The variables involved in this hypothesis were interval scales, and therefore a Pearson product-moment correlation (Pearson \( r \)) was used. A significant positive correlation was found between project fundamentals and training, \( r = .340, p < .05 \), with 11.5% of the variance in project fundamentals being explained by training. A moderate relationship was found to exist between training and project fundamentals, and sufficient evidence was therefore found to reject the null hypothesis.

In the previous hypothesis, the relationship between training and project risk showed a strong correlation, and that generally the participants agreed that project management would help to reduce the risk involved with a project. This correlation investigates the connection between training and the perceived importance of the fundamentals of project management. There was a reduction in the overall amount of participants who were in agreement that training in this method was important, when it came to understanding the basics of project management.

Interview extract:

"The formal training is not necessary, as long as the person in charge can do the job. This person also needs to have... common sense. This common sense helps with the implementation of the project. Also the project manager needs an understanding of the business, so that he can see how the project fits into the whole scheme. In regards to the formal training, for example, a housewife must do many different jobs in her daily life, but she doesn’t receive formal training in those things.

Project management is therefore viewed by a portion of the participants as just plain common sense, and not a role that requires special training and knowledge to understand the underlying concepts."

<table>
<thead>
<tr>
<th></th>
<th>( n )</th>
<th>Pearson ( r )</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>training – project fundamentals</td>
<td>48</td>
<td>.340</td>
<td>.018</td>
</tr>
</tbody>
</table>

Table 9: The correlation between training and project fundamentals

Source: Developed for this research.
4.6.2.5. Hypothesis 5

\[ H_a: \text{The importance of reacting quickly to change in a project affects the impact of change in a project.} \]

The variables involved in this hypothesis were all interval scales, and therefore a Pearson product-moment correlation (Pearson \( r \)) was used. A significant positive correlation was found between \( \text{change} \) and \( \text{change reaction} \), \( r = .442, p < .01 \), with 19.5\% of the variance in \( \text{change} \) being explained by \( \text{change reaction} \). A moderate relationship was found to exist between \( \text{change} \) and \( \text{change reaction} \), and sufficient evidence was therefore found to reject the null hypothesis.

By responding rapidly to project requirement changes, the project team can help to control the negative effects caused by these alterations. This is an important method of dealing with change, as a portion of the interviewees felt that project change is an inevitable part of project work.

*Interview extract:*

Each project is always about changes, always being forced to adapt. For example, the economic crisis, hardly anyone knew what companies should expect, and there you just have to react, you cannot proceed along the planned track, otherwise you’ll be stuck along the way.

Another interviewee showed that reacting to change can mean delaying the schedule, as sometimes the best option is not to rush, but to be sure about the results.

*Interview extract:*

If the implementation plan is delayed, then for me it is important that everything can continue to operate... it is simpler to say, OK, then let’s move the implementation a week to work around a problem. In this respect, the security (of the production) has more priority then to keep the appointments. And that is a part of successful projects...

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<th></th>
<th>( n )</th>
<th>Pearson ( r )</th>
<th>Sig. (2-tailed)</th>
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</thead>
<tbody>
<tr>
<td>change – change reaction</td>
<td>50</td>
<td>.442</td>
<td>.001</td>
</tr>
</tbody>
</table>

Table 10: *The correlation between change and change reaction*

Source: Developed for this research.
4.6.2.6. Hypothesis 6

**Hₐ: The company culture will have an effect upon the teamwork in a project.**

The variables involved in this hypothesis were interval scales, and therefore a Pearson product-moment correlation (Pearson \( r \)) was used. A positive correlation was not found to exist between *company culture* and *teamwork*, \( r = .097, p > .05 \). A relationship was not found to exist between *company culture* and *teamwork*, and therefore insufficient evidence was found to reject the null hypothesis.

Initially a strong correlation between the company culture and teamwork was expected by the researcher. This expectation was due to the continual theme promoted within the organisation, that there was a company culture in existence that valued and promoted teamwork. However, upon further investigation, it seems that the participants do not fully agree with this sentiment. After further investigation, two common themes in regards to teamwork emerged in the organisation. The first revealed a perceived lack of interest by a portion of the employees, for anything that transpired outside of their immediate role.

*Interview excerpt:*

> However, the problem in the company at the moment is... people don’t care about anything other than their own job.

There were also differing views on what constituted teamwork, which led to some friction within the company.

*Interview excerpt:*

> It is very important... that there should be collaboration, and not just a one-sided information exchange, as many think that working together means just passing on information. But when I just pass on information without waiting for a response... then it does not work. There are some people; they just send emails and say, OK, this is the story, and then it doesn’t matter to them anymore.

<table>
<thead>
<tr>
<th></th>
<th>( n )</th>
<th>Pearson ( r )</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>company culture - teamwork</em></td>
<td>45</td>
<td>.097</td>
<td>.527</td>
</tr>
</tbody>
</table>

Table 11: **The correlation between company culture and teamwork**

Source: Developed for this research.
4.6.2.7. Hypothesis 7

H₇: The company culture will have an effect upon the importance of reacting quickly to change in a project.

The variables involved in this hypothesis were interval scales, and therefore a Pearson product-moment correlation (Pearson r) was used. A positive correlation was not found to exist between company culture and change reaction, \( r = -0.126, p > .05 \). A relationship was not found to exist between company culture and change reaction, and therefore insufficient evidence was found to reject the null hypothesis.

As with the previous correlation, it was initially assumed that as the company portrayed a dynamic profile in its marketing material that adopting an agile project management approach would come naturally to the organisation. And if it didn’t come naturally, at the very least it would assist in implementing such a style of project management. However, the participants did not believe that there was a connection between the company culture and the ability to react quickly to project changes. Whereas some viewed the company culture as closed and slow to react, there was conflicting feedback about using an agile method in a portion of the interviews.

*Interview excerpt:*

> Above all, I think this approach works here, because here, especially in the upper management... all of them are open-minded. More so than in other companies, and I believe that what happens in the upper levels is also reflected in the lower departments, and we’re an office that is not closed to new opportunities...

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Pearson r</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>company culture - change reaction</td>
<td>45</td>
<td>-.126</td>
<td>.408</td>
</tr>
</tbody>
</table>

Table 12: The *correlation* between company culture and change reaction
Source: Developed for this research.
4.6.3. Research adjustments

The reply rate for this survey was lower than expected. As a researcher, I had assumed that I would receive a higher rate of survey completion, as I work closely with many of the employees, and felt that we had a good working relationship. As the IT manager my job was to provide a stable and progressive IT environment and to gain a greater insight into the company and what drives the business, I required input from the actual users of the IT services and products. Some of the professional questions I had going into this research were: Am I providing the correct service to the users? Could this service be improved in any manner?

Approximately 50% of the employees completed the survey, providing adequate data for a view of approximately one half of the company. It is not possible to know the other employee’s opinions, but in combination with the qualitative data there was sufficient overlap between the two sets of participants, and it was possible to investigate a majority of the company population. This was one of the driving forces to introducing the survey tool into this research.

The survey findings were a useful tool in the research process, in that they either confirmed views that had emerged during the work, or challenged assumptions that were held. For example, mixed viewpoints emerged in regards to the importance of the company culture and whether this affects the success of project management in the organisation, and whether agile project management was a good match for this style of company. Other observations demonstrated that the participants understood about the need for change in projects, as one interviewee demonstrated.

Interview excerpt:

If you fixed on the rails of a plan, this is one of the best ways to fail.

Project management training was not viewed as an important investment, though it is difficult to know whether this is due to a lack of comprehension of the function that project management plays, or a lack of understanding of the complexities involved with project management. The subject of the survey may have also produced a negative effect on the amount of participants. As mentioned earlier, many participants didn’t fully understand the concept of project management, and therefore it is possible that some employees did not
participate as they did not feel that they could contribute to the topic. This was actually mentioned by several employees.

Conversation excerpt:

Oh, I don’t know anything about project management. What can I say that’s of any value?

As stand-alone statistical information this survey would have reduced value, as the population for the data set is relatively small, and statistical difficulties arise when working with a small sample. However, the insights that it enabled as a secondary tool were invaluable, and helped in two main aspects. The results from the data helped to confirm some of the emerging concepts that assisted with the creation of the agile project management framework. Additionally, the results helped to focus attention on aspects of the research when used as a critical reflection tool, highlighting characteristics that had not been fully contemplated. In this vein the survey was exceedingly valuable, as it helped to not only increase the richness of the data, but also allowed a greater portion of the participants to provide feedback about the research topic. The findings from the survey were used to refine the research in the next action research cycle.
4.7. Action research cycle 2

<table>
<thead>
<tr>
<th>Details and assumptions</th>
<th>The findings from the survey were used to refine the action cycle. The project backlog concept was added to the project management framework.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings</td>
<td>The project backlog proved to be a useful tool, providing a good level task allocation. Stakeholder expectation management is critical to ensure project success.</td>
</tr>
<tr>
<td>Research adjustments</td>
<td>The framework will be left as it is, and tested in a second company for transferability and stability.</td>
</tr>
</tbody>
</table>

Table 13: The summarised primary findings from action research cycle 2
Source: Developed for this research

4.7.1. Details and assumptions

The project in this action cycle involved a software standardisation project for Media-Com in Vienna. The software environment was in a semi-standardised state already, though this update would bring Media-Com closer into line with the enterprise standard as defined by Global-Com. The enterprise standard would also introduce several new software applications which were part of the enterprise suite of software that was employed by Global-Com. This would bring major benefits for the users in Media-Com, as they would then be fully integrated into the global group of companies, with improved access to the systems in place. However, the major concern for all users involved loss of control and personal choices.

The end-users were not keen to be migrated to the Global-Com mail server, as it would mean that they would have to use the corporate standard email client, rather than an email client of their choosing. They would also no longer be able to receive email on their private iPhones, as the corporate systems only supported Blackberry devices for mobile email. Additionally, the majority of the users were able to administer their own computer, installing software when and as they needed it. This ability would also be removed, to ensure that software licensing was adhered to. This was particularly troublesome for the producers, as they were accustomed to having administrative control of the client machines, enabling them to make changes relatively quickly without the need to wait for IT support.
The concept of implementing a software image was a relatively new concept in Global-Com, endeavouring to introduce a standard operating environment for the Macintosh computers. As the concept and the system were both extremely new and not field-tested, this system would need to be extremely flexible, to include changes that arose during the implementation of the image.

4.7.2. Primary findings from this phase
The following paragraphs highlight in detail the primary findings that arose during this research phase.

4.7.2.1. Project tools are improved and hybrid solutions emerge
During this cycle a cross between a Gantt chart and calendar was experimented with, to determine its effectiveness. The IT office had a glass wall between the office and the rest of that level, and it was on this wall that the large Gantt calendar was depicted using whiteboard markers. In this manner, it was possible to portray the necessary tasks for up to two months ahead. These tasks were able to be prioritised, moved and reorganised with minimal effort. This tool provided several advantages. It was very visible for the project team due to its location, and summarised the key project milestones simply and clearly. It also possessed a ‘wow’ factor due to its uniqueness. The drawback to this tool was the relative instability of the text, which was one evening partially erased by the cleaning staff, before we explained the situation to them. The popularity of this simple tool was apparent though, and it was implemented with success for the remainder of the subsequent projects.

In this action cycle the backlog tool was added to the framework and tested. As mentioned in an earlier section of this chapter, the backlog is a list of tasks that need to be completed in the project, with priorities and dependencies noted. As a project member completed a task, it would be removed from the backlog and from the glass wall Gantt calendar as well. The backlog drove the cycles, and provided the content for the Gantt calendar. Additionally, in the evaluation part of each project cycle, it would be determined if new tasks needed to be added to the backlog, in the event that a new requirement had arisen. With the addition of the project task backlog, the agile project management framework took the form of the model depicted in Figure 34.
4.7.2.2. Stakeholder expectations are managed during a time of change

During this project there was a noticeable shift in the company culture. The organisations were being integrated into Global-Com, and therefore the underlying mood in Media-Com and Publish-Com was quite tense. This project was also a visible sign of this integration, and one that was not very well accepted by many of the employees. These employees felt that the organisation was transitioning from a team-based medium-sized company to a large faceless enterprise, with all the accompanying bureaucracy and issues associated with such a large organisation.

This nervousness about the future of the IT environment produced abundant requests for special consideration in regards to software installations and configurations. Although these requests were processed and handled where possible, the IT project team was sometimes unable to comply with the requests, especially in circumstances where there were conflicts with the IT policies of Global-Com. This meant that stakeholder expectations need to be handled diligently, and ensuring that where requests could not be met, the reason was explained in detail. This helped to improve the chances that the project would still be viewed as a success, even if it could not deliver the extra requirements that were presented during the planning and implementation stages. Even though an agile project management style can help the project team to cope with requirement changes, sometimes the project manager has to say no to a request, due to a lack of resources or because the request contravenes policy.
4.7.3. Research adjustments

At this stage, the framework was working well and it was successfully used for the project implementation, in a very dynamic situation. Several changes were introduced throughout the implementation stage of this project, and several of the technologies implemented were being rolled out for the very first time in this project. Therefore it was also a testing ground for these technologies, and as improvements were suggested these were included in subsequent project cycles, so that by the final project cycle the improvements were included in the base solution.

By this stage it was felt that the framework had been sufficiently tested and refined, and would now be put through a final action research cycle to test it, without any major changes being applied to it. This would test the framework once again, and since it would be tested in a different company, would also test if the tool could work across company boundaries, or whether it was specific to this unique environment.
4.8. Action research cycle 3

<table>
<thead>
<tr>
<th>Details and assumptions</th>
<th>The project management framework was tested for a final time, in another company, in a very complex setting.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Findings</td>
<td>The framework worked well in an unstable environment that was politically charged, and contained many requirement changes.</td>
</tr>
<tr>
<td>Research adjustments</td>
<td>Lessons learned included helping users to deal with the stress of changing requirements, and dealing with the burden of forced requirement changes.</td>
</tr>
</tbody>
</table>

Table 14: The summarised primary findings from action research cycle 3
Source: Developed for this research

4.8.1. Details and assumptions

As mentioned in chapter 2, the research took place in two closely-linked media and publishing companies. This tested the research transferability to a degree, as these companies have distinctly different management and organisation styles. During the last few months of the research Publish-Com was acquired by Global-Com, and was merged with Media-Com. This produced a major change in company environment, and once again it was possible to test the project management model in a new style of environment.

This cycle involved a company integration project for Publish-Com, merging this company with Media-Com. Standard enterprise software was rolled out, and an enterprise standard operating environment was introduced. Additionally a change-over of the phone system, back-end servers and email systems was also completed in this project.

4.8.2. Primary findings from this phase

The software standardisation project detailed in action research cycle 2 for Media-Com, although possessing much the same goal as the integration project in this cycle, was handling in a different manner. This was due in part that Media-Com was already partially integrated with Global-Com, and the update would cause less disruption to the users than the project involving Publish-Com. One of the major issues was a noticeable disconnect between employees during this transition period. This was a major time of stress for many employees, and resulted in some substantial teamwork and workflow issues.
Interview excerpt:

The problem is that people don’t care about anything other than their own job, and the process has problems. People say ‘it’s not my problem’. Other areas have no real process at all.

Journal excerpt:

The work process seems to be a problem here. On one hand the work process is very close to an agile method. The problem seems to arise however, as people don’t care about other parts of the process. Teamwork seems to be lacking, and people have a ‘don’t care’ attitude.

Due to the impact this project would have on the business, the project team comprised of technical experts from Publish-Com and Global-Com decided that it would be wiser to reduce the speed of the implementation, and deliver the project with a series of mini-projects. These stages would introduce the changes in a staggered approach, allowing for changes to be integrated properly, whilst allowing the business to continue production work relatively unimpeded. This method of progressive implementation was viewed by both IT and key production employees as one of the better methods of approaching the IT project.

Interview excerpt:

The progressive method is better. This way we can use the product earlier and play with it bit by bit. It helps with learning the new product as well. Also in this situation, if the whole system is changed at once and it doesn’t work, then there are production problems.

However, the new managing director of Media-Com had a different view to IT, and overruled the project team’s plan, deciding that the company change should occur with a ‘big bang’, over one weekend. Although the risks were explained in detail, he was unmoved when it came to discussing the impact of this plan, and therefore it was up to the project team to implement his plan, regardless of the business implications. This was more than a minor change of plans, and was the biggest test of the flexibility of the project management framework. Fortunately the project team had received prior warning of this decision, and were able to do extra preparations and testing in the weeks leading up to the project implementation weekend. Multiple scenarios were tested, with many variations of potential problems being tested and planned for. This extra planning allowed the project
team to prepare for potential problems that could arise, though at a considerable financial cost.

4.8.2.1. Miniature emergency project is inserted with short notice

During this last action research cycle another small project was inserted at short notice, which further demonstrated the ability of the agile framework to cope with unforeseen circumstances. A small production team was working on a secret in-house project, which was endeavouring to create a functional mock-up of a new magazine. The goal was to produce the magazine in four weeks from scratch, and then present it to the business owner for approval. If the owner felt that the magazine was a good fit for the product palette, then it would be approved and go into production in the following months. Therefore, the scope of this production project was to produce a mock-up of a high-end lifestyle magazine. The budget for this project was small, as it was a speculative project, and the time-frame was a definitive four weeks, as it had already attracted the attention of the business owner, who was keen to see the results.

However, implementing the IT component of this project was quite difficult, as there was no real plan of action, and decisions were being made and changed on a daily basis. Initially it started in one direction, though it changed tack to take into consideration other ideas as it matured. To plan for this, initially the project plan was created with minimal details for the four weeks, producing a bare-bones framework for the project plan. Once changes were made and details received, then the project plan was modified and details added. Due to the compressed time-frame of the project, changes were made daily or twice daily.

This became a standard tactic that was used in situations where uncertainty and indecision were the governing factors. Daily changes were made to the project plan, and then moving tasks and compressing the timeline to make tasks occur in the correct sequence and time-frame. In this circumstance, the extreme uniqueness of the product and the indecision of the producers of the magazine formed an environment where the project staff needed to work in a more reactionary manner than would be normal.
4.8.2.2. Reactionary work in a time of change

As the date for the merger of Publish-Com with Media-Com drew near, the amount of last minute requirement changes to the project increased rapidly. The difficulty in executing the project also increased, due to an apparent shift in company culture during this time. One factor that increased the uncertainty of the project environment was the increase in projects that were kept relatively secret. The details of these projects were kept within the marketing or management department, and only once the details had been finalised were other departments involved. Often times this meant that scope decisions had been decided with a lack of technical input, producing instances of substandard decisions. The IT segment of the project would be handed to the IT department with the instruction ‘This must happen now, as it is of highest priority.’ This in turn created issues with resource scheduling and the time-flow of other projects, as a highly political and high priority project could encroach on the smooth implementation of other projects.

To cope with these issues, projects resource scheduling was given greater attention. In instances where there were enough resources to complete one or two projects simultaneously, then more resources were required for these extra projects. External project labour was often called upon, with technicians being made available at short notice, though at a higher cost. As mentioned in chapter two, when one of the project constraints is changed, then another will need to also change. In this instance, since the amount of work increased, then more project workers were needed and the costs increased.

4.8.2.3. User stress and power struggles arising from excessive change

The company transition period was difficult for the average employee during this integration project. Large organisational changes were introduced, and department managers who were previously involved in business decisions suddenly found themselves relegated to secondary positions, as these decision processes were taken over by managers in Global-Com.

Several employees with relatively little positional power had an established personal relationship with higher managers in Media-Com, and would leverage these relationships for their personal wishes. In several instances, to advance their agenda they would present the problem as ‘damaging for the business’, which would escalate the issue from something that would be resolved in the normal course of action, to a critical event. These issues were often over-rated, and due to the success of this tactic it became an oft deployed
strategy by a select few employees, becoming a tactic to bypass standard procedures during the project phase. Unfortunately this drew resources away from issues that were critical, and increased the stress of users affected by real problems.

However, it was noted that after integration into Global-Com this relationship power was diminished to a degree. Before the company merger the employees had free reign with the choice of mobile device they could use for telephoning and receiving mobile email, and some employees became rather fond of their particular mobile brand. As a result of the merger, and the move to a different mail system, the users were informed that they would have to use an enterprise standard device. A few employees replied to this news by stating, “Ok... I guess I won’t be contactable then!” However, this type of reaction was met with disinterest and a shrug of the shoulders in Global-Com. The employees realised that as part of a global company, the dispensability of the individual was more apparent, along with the realisation that no one is irreplaceable when the system is operated by processes and procedures. This was therefore a period of adjustment for many employees, and a time of increased stress in the workplace.

4.8.3. Research adjustments

This project was one of the most hectic situations that could have been used to test the resilience and adaptability of the project management framework. Despite the many changes that were introduced with short notice to projects, high levels of internal secrecy, decisions made without expert consultation by upper management, and the Global-Com backend servers crashing over the ‘big bang’ weekend, the projects were still delivered successfully. The integration manager had been extremely nervous about this project, and had feared that the project would be unsuccessful, thus affecting his credibility. However, despite these issues the project was successfully implemented, and business was able to continue production after the weekend with the new systems in place. The prototype magazine was also a success, and is now also in production, adding to the stable of products that the company produces.
4.8.3.1. Closing the project is an important step

Closing the project off completely always required a bit of patience and persistence, however this step needs to be followed through relentlessly. Some employees would not make their computers available for the change-over, due to some last-minute production work that had not been completed on their part. This may have been an attempt at exerting control in a situation where they felt they had no control, thus allowing them to dictate on their own terms when the changes on their workstation would happen. This was a common reaction amongst the journalists:

Conversation excerpt:

I can’t let you do the change right now, as I need to complete this article first. Otherwise there will be no magazine!

However by managing the fears of these employees, and allowing them a small amount of autonomy, it was possible to complete the project without resorting to demands. A point to note is that the project team does not need to resolve all issues that may arise during the project. One of the major changes introduced with the merger involved a language change of a few key computer programs. The local spoken language is German, though the company-wide language of Global-Com is English. Therefore, in keeping with the company policy and to make future IT support smoother, these key programs were changed from German to English. This became a source of stress for several employees, to the point that they were verbally abusive to the project team. However, this type of response was expected by the project manager, and the IT team had been prepared for such reactions. Therefore without taking the attack personally, or attaching too much importance to the emotional content, the project team dealt with the issues as they arose. However, even though it was a problem arising from the project, it was part of the project scope that had been agreed upon by key stakeholders, and therefore the problem was assigned to the IT support team for resolution.

This project produced some especially large changes in the company. To assist the employees through the adjustment period caused by this project, the project team established a project centre in an open central area of the office. This concept was tested over several projects, and it was noticed that if the project team left the project site immediately after a project, then the feelings of unease were higher than if the project team was visible for a day or two after the project, during the project close phase. Even though
the project team was contactable and in the same building, it was noted that the employees needed a visible body to feel more secure when working through project issues. Additionally, by working in an open area the project team was seen to be working, and not somewhere unseen, ignoring the project issues. This had the effect that employees had direct contact to the project team, which also assisted the team to discover extra lessons learned in the evaluation of a project.

4.9. Conclusion

The project management framework was developed over several months, and was designed from a stable foundation. The framework foundation was built from the basic concepts of action research, and was supported with the literature review and information discovered by initial interviews with key participants in the associated research organisations.

The initial framework structure was then expanded with the addition of basic project management concepts, taken from the PMBOK. This expanded framework was then able to be tested over several months, initially with several small projects. This verified the concepts that comprised the framework, and allowed for adjustments to be made. The concept of feedback iterations in the act phase of the project cycle was introduced, to improve and correct the project during the implementation stage. This framework was then tested in Media-Com in London, with a slightly more complicated project. The concepts of project progress tracking were gradually introduced in several formats, with burn down charts and a hybrid Gantt chart solution being implemented with good results.

After these initial testing and design stages a company-wide survey was sent out. This allowed extra insight into the research concepts to be gathered, and expanded and clarified views that the research had uncovered. It also allowed all of the company employees to be involved in the research if they so desired, and gave them the opportunity to provide feedback to the research.
The research then continued into the second action stage, where the concept of the project backlog was tested in a project for Media-Com. This deconstructed the project objectives into smaller chunks, which were used as inputs for the project cycles, thus providing granularity in the planning and implementation. The framework was functioning well at this point, so it was decided to avoid making any further major changes, and test it in another environment.

The final action cycle was a large and complicated project involving a company merger. This project was conducted in Publish-Com, and tested to an extent the transferability of the framework in a complex and variable situation. The company was experiencing a state of change, and the human factor of this project was quite significant, due to an undercurrent of political struggles within the organisation. Many significant changes were introduced during this project, with some occurring with little warning or preparation. Due to the highly secretive nature of the decisions during this period, some technical decisions were arrived at without the input of the technical specialists, resulting in suboptimal solutions. This added an extra stress to the project management framework, though it was still able to be implemented for successful project delivery. This was the ultimate test of the framework, testing it in a unique and changeable situation.

The next and final chapter will present the results from this research, and the conclusions that have arisen from this work. Suggestions and recommendations will be made, and opportunities for potential future research will be clarified.
5. Chapter 5 – Conclusion

5.1. Introduction

Chapter 4 presented the research data that was collected in this work, and the progression of the development of the project management framework. This concluding chapter will present the findings arising from the research data, and the implications of those findings. Additionally, recommendations that are grounded in this research will be proffered, and the possibilities for future research to expand on the results of this work will also be discussed.

The first section of this chapter will briefly discuss the research questions, summarising the main findings that were directly related to these questions. These findings will be subsequently expanded upon and presented in more detail in sections 5.3 and 5.4, where the distinct implications for theory and practice are presented.

Section 5.3 of this chapter will present the research findings that have implications in regards to the theory of this field. This section will present the benefits of using a flexible agile project management framework, and also explain how this framework cannot solve all problems that may arise, and why this is so. Then this section will briefly summarise some of the issues that can arise when introducing a new project management system to an organisation, plus the difficulties that may arise when people need to deal with change. Finally in this section, the function of the project manager will be discussed, demonstrating the central role that this person needs to take, especially with the implementation of an agile project management style.

Section 5.4 will then present the research findings that have implications for the policy and practice of project management. These findings are more related to the daily operation of project management, and whilst based in theory, are of a more practical nature than the preceding section. In this section the practical benefits of agile project management will be presented, showing how this style assists project teams to adapt to change, and also how being responsive to change is improved by using a method such as this. Additionally, the benefits of using a compact team will be discussed, as well as the amount of time required for a person to become an expert in a field, such a project management for example.
After discussing the implications for theory and practice, a summary of these main points will presented, in order to present the salient conclusions and recommendations in one area.

Finally, the possibilities for future research will be discussed. These opportunities have arisen in connection with this research, but are outside of the scope of this work. Being outside of the scope of this research they were not investigated, and this affords an opportunity to future researchers wishing to pursue further investigation of these areas. Some of the topics that offer research potential involve determining the best organisational culture fit for agile project management, and determining if this style of project management has potential in a larger organisation. Additionally, the recent emergence of the draft version of a handbook and certification for a formalised ‘Agile PMBOK’ warrants investigation, to determine if it is indeed possible to formalise a style, where excessive formalisation has historically been one of the determining factors in the decision to move to a more agile style.

The goal of this chapter is to present the findings in a concise and understandable format, so that a straightforward overview can be gained of the results arising from this work. This will allow researchers and practitioners to gather the salient points, and apply them to either further research, or implement them into their project management toolkit.

The structure of this chapter is depicted in Figure 35.
Figure 35: A graphical representation of the structure of chapter 5
Source: developed for this research
5.2. Conclusions about the research questions

The principle aim of this study was to investigate the topic of agile project management, which combined the foundations of traditional project management with modern agile development tools and techniques. The goal of this investigation was to discover if the concepts already in use in software development could be used in a different field, that of project management. The PMBOK was chosen as the foundation of the project management processes and procedures, and agile components primarily from Scrum and Extreme Programming were blended into a style that was applied to the research questions. The modified agile project management framework was then tested in the field, in an IT setting of two SME organisations.

At the commencement of the research, the primary research question was introduced, asking:

\[ \text{To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment?} \]

As this question would need to be tested, it gave rise to the secondary research questions:

\[ \text{What tools and procedures will need to be included in a toolkit, combining methods to assess the primary research question?} \]

\[ \text{What are the results of implementing such a toolkit in an SME environment?} \]

As the testing procedure needs to occur before the results are seen, starting with the secondary questions each of these questions will be briefly discussed, and the results from this research summarised. This section is a preliminary summary of the results, and will highlight the primary findings that arose with direct connection to the research questions. The research findings will then be discussed in greater detail in the next two sections of this chapter. The implications that arose in regards to project management theory will be discussed in section 5.3, and implications that are related to project management policy and practice will be discussed in greater detail in section 5.4. The first step therefore is to give a summary of the testing environment, the tools that were adapted for this research, and the way in which the review of the results occurred.
5.2.1. What tools and procedures will need to be included in a toolkit, combining methods to assess the primary research question?

To test whether a combination of traditional project management methods and agile development methods could improve IT project success, a framework needed to be assembled that could provide the basis for the testing process. As described in previous chapters, the PMBOK framework was established as the basis for the adapted project management framework. As noted in the PMBOK (PMI 2008), the separate parts of this body of knowledge are implemented as required, depending on the project size and other project-related circumstances. For an SME environment, this can mean a set of project management processes that is reduced in size, compared to the set that may be required for the control of large projects, or projects occurring in large organisations.

The agile components were introduced progressively to enable the investigation of each component in turn. This allowed each component to be either accepted or discarded as part of the overall solution. The testing took place using multiple action research cycles, where the output of a cycle was subjected to critical reflection and used as an input for the subsequent cycle, enabling the researcher to improve and refine the framework as the study progressed.

The initial design of the framework included the basic structure as found in action research. This cyclical process comprised the four components of one of the original action research methods, which consists of initiate, plan, act, and evaluate. This last stage in the cycle enabled the concept of critical reflection to be included into the project management framework, with the concept of evaluate. This is crucial to the total process, as the project team can deconstruct the project objectives into deliverable pieces, and then reflect after each minor project cycle has been completed. This also allows for adjustments to the subsequent cycles.

As the testing progressed, feedback iterations were added to increase the responsiveness of the framework during the implementation stage. In the final research stage the concept of an agile backlog was added, to process tasks into the project cycles more efficiently. These tools and processes formed the basis of the framework that was used to test the concept of agile project management.
5.2.2. What are the results of implementing this toolkit in an SME environment?
With the establishment of a set of tools to test the framework, the next secondary question came into focus. This would determine the effects of implementing the agile project management framework in the field. As described in the previous chapter, this framework was tested over a period of several months by using it for the management of multiple projects. During this time, it was shown that the framework proved beneficial for the management of IT projects. One of the benefits was that it helped to ease the introduction of project requirement changes, even in advanced stages of implementation. It also provided a set of processes for managing projects in an SME environment that was flexible and non-bureaucratic, whilst still providing adequate processes to guide and control the projects.

5.2.3. To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment?
Returning the focus to the primary research question, as previously mentioned, the agile project management framework was tested over several months in several projects. These projects were successfully completed, and the framework helped the project team to respond quickly to changes as they arose, a feature for which the framework was designed. A selection of the projects involved very unique situations, where customised products and solutions were being developed for niche markets. Therefore project lead times were often very brief, and it was common for major changes to be introduced at short notice. The agile project management framework helped improve the flow and the management of projects, especially in situations where there was a high degree of uncertainty and not all factors were initially known.

The framework presented here should not be considered a step-by-step process manual, prescribing a ‘correct’ path to manage projects. Rather, it should be viewed as a flexible project management system, which is adaptable and responsive to environment changes. The framework is still in the developmental stages, and further research needs to be undertaken into the model itself. This will determine if this tool can be used in a wider range of situations and produce favourable results, and whether it is also a scalable solution, with potential uses outside of an SME environment. Additionally, extra study needs to be focused on whether it is possible to design a toolkit so that benefits can be reaped, not only by trained and professional project managers, but also by the average
project worker. This is particularly relevant, as the current framework requires advanced training or knowledge on the part of the project manager.

5.3. Implications for theory
This section of chapter 5 will discuss some of the implications of this research in respects to academic theory that has already been established in this field. Agile project management is an emerging section of the field of project management, which highlights a developing way of thinking in this area of management. There is ongoing research currently being conducted in this field, and hopefully this study will help to advance the field of project management.

There were several main topics that arose during this research that pertain to project management theory. These established findings were either confirmed in this unique setting, or when assembled in new combinations, enabled fresh insights to be derived. These topics have been depicted in Table 15 to provide a visual summary of this chapter section.

<table>
<thead>
<tr>
<th>The benefits of a flexible agile project management framework</th>
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<td>Agile project management is flexible, but cannot solve all problems</td>
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Table 15: A summary of the implications for theory sections
Source: developed for this research

5.3.1. The benefits of a flexible agile project management framework
A common theme that reoccurred throughout the research was that several participants felt that Media-Com and Publish-Com employed a ‘ready, fire, aim’ policy when implementing projects. These participants felt that projects were often rushed through without proper planning, due in part to the nature of the products being developed. As the projects were being championed by creative rather than business-oriented people, it was felt that these creative-oriented managers were not overly concerned about the details, and
that someone would manage the technical details as the project progressed. The processes in the agile project management framework were greatly simplified for these projects, which enabled the use of project management as a tool without introducing the bureaucracy of the larger methods.

With their results of their investigation into project management requirements for SMEs, Turner, Ledwith and Kelly (2008) noted that these organisations predominantly work best where there is a simplification of project management processes. They show that using a non-bureaucratic method can enable an organisation to respond to client needs in a faster and more flexible manner, allowing them in turn to gain a competitive advantage with this flexibility. The positive benefits of this flexibility were also witnessed during this research, thus confirming these findings in a new environment. Turner, Ledwith and Kelly also noted that decision-making is conducted on a more idealistic level in an SME, and therefore the actions noted in these Media-Com and Publish-Com were not uncommon, due to the size and management style typical for this type of business. Owens (2007) also confirmed that SMEs can experience a lower level of strategic thinking in the management team, and that an inattention to detail has been observed with SME managers, an observation that was also noted in the research environment.

5.3.2. Agile project management is flexible, but cannot solve all problems

Several issues encountered during this research were exacerbated by the global financial crisis. The effects from this crisis were experienced in the research organisations approximately halfway through the study and as a result project budgetary and personnel resources were greatly reduced. The workload was higher than normal during this period, and there were decreased levels of engagement by participants, as over-worked team members concentrated their efforts more on their everyday work, and less on project work. It took a concerted effort on the part of the project team to engage participants in project work during this period, especially when decreased budgets limited the range of solutions to project problems. This is a problem that project managers face when they must source project team members from functional departments, especially in times when these departments are overworked and starved of resources themselves. This confirmed the findings of Grenny, Maxfield and Shimberg (2007), where they mention that functional managers have many priorities, and unless the project manager is communicating successfully, then project resource requirements can easily be ignored or relegated to a secondary position. Projects were still completed successfully during the financial crisis.
period, though as one participant wondered, maybe this is more due to the driving determination of the more active team members to complete the project, rather than any specific style of project delivery.

Whether agile project management will be accepted by businesses in general remains to be seen, irrespective of the amount of interest being shown in agile methods by project practitioners at the moment. As Porter and McKibbin (1988) mention, the business world in general has historically shown little interest in business research. However, there is still a real possibility that the demand for improved methods will come from the project management practitioners who are on the front line, rather than being implemented from the management down through the organisation.

This research demonstrates that an agile project management framework can work well for small and medium projects in an SME environment, though it was noticed that as projects became larger the framework began to demonstrate a few weaknesses. This makes a reference to the aspect of scalability in regards to this style of project management, where the more complex a project becomes the more issues arise when project changes are introduced. This is a factor that other authors note when investigating agile development methods. This is confirmed by Reifer, Maurer and Erdogmus (2003), who show that whilst most proponents of agile methods agree that this style is best suited to a smaller environment, it is possible to use portions of an agile method in a larger setting. They note however, that larger teams are more adverse to change, and that agile methods may need to be introduced to these environments with more conservative goals at first. Boehm and Turner (2005) have researched the issue of introducing agile methods to traditional environments, and also note that larger organisations contain some unique management challenges. Larman and Vodde (2010, p. 10) demonstrate that it is possible to use an agile approach on a large scale though, and that it is more a style of working than a prescribed set of procedures.

Large-scale Scrum, as regular Scrum, is a framework for development in which the concrete details need to be filled in by the teams and evolved iteration by iteration, team by team. It reflects the lean thinking pillar of continuous improvement. It is a framework for inspecting and adapting the product and process when there are many teams.
Whilst Larmen and Vodde state that it is possible to scale an agile project management method to a larger environment, this is not the focus of this research and was not tested in this setting. It is a potential issue for future researchers though, to investigate how this management style could apply to larger environments and where the potential for improvement in those organisations exist.

**5.3.3. Issues that can occur when introducing a new project management style**

A major hurdle to introducing project management practices into an organisation is the desire of the company owner or manager to see those practices implemented. During this study the company managers were generally in favour of project management as a concept, though they were often too busy with other matters to assist with advocating for these types of processes. As a result these processes were not seen as compulsory, as there had been no directive from management for the organisation to implement such practices. Therefore for the project team to bring these practices into operation involved convincing the participants by demonstrating the benefits that could be gained from using such processes. If the owner does not support the introduction of project management processes, then there will be acceptance problems within the organisation, as employees will not perceive the benefit or the need for using such a system. This was confirmed by Turner, Ledwith and Kelly (2008) as well, where they noted that even though a business owner may not actively oppose a system, if they do not fully support it then it can fail due to a lack of support. Crawford et al. (2008) also mention this issue, when they discuss their findings in relation to project sponsorship. They show the importance of the sponsor role, as a parent company may not be providing the necessary resources, or parts of the company may be actively opposing the introduction of new processes, and that only with the support and assistance from senior management can the project manager hope to introduce the proper procedures and processes.

Towards the end of the research the companies were in a transitional phase in regards to the company culture and mindset, when Publish-Com and Media-Com were being integrated into the Global-Com group of companies. This merger brought about a need for readjustment, as the employees were moving from a company culture involving low discipline and a high entrepreneurial spirit, to a company culture with high discipline and a high entrepreneurial spirit, as depicted in Figure 36.
There was also a notable change in the management style during this period as well. Morgan (1998) discusses these different management styles, where he mentions that whilst companies generally follow a masculine structure, there are distinct characteristics with a company that displays a ‘female mindset’. It is important to note that the classification of organisations as male and female has more in common with the concept of yin and yang, rather than a sexuality-based description. Morgan (1998) notes that the female influence in a company will usually distinguish itself in the form of a flatter company structure with less bureaucracy, and where leaders often making more intuitive decisions. The agile project management style works well in a company that displays the characteristic ‘female mindset’, due to the lack of rigid rules and bureaucracy that is detrimental to this style of management. However, since the company is merging with Global-Com, where there is a greater tendency towards a ‘male mindset’, the agile project management framework would need to be re-examined in this context, to determine if it a viable project management tool in such an environment.
5.3.4. Coping with change, when change is a requirement

One of the important design elements of agile project management is that it is able to cope with requirement changes, even when they occur quite late in the project timeline. However, not all project participants are involved in change decisions, and may have little or no influence when the project requirements or product changes. Changes in a project may be received by a project team from upper management, though the end-users of the product or system may have no input into the process, and may feel overwhelmed with the amount of changes that they need to adapt to.

This can result in differing reactions, as the end-users attempt to deal with changes in their environment. The most prevalent coping method experienced during these stressful periods was an emotion-based style, with frequent displays of anger, annoyance and frustration by the end-users. It was noted that this coping method would produce feelings of negativity amongst the end-users, which would escalate if not handled promptly to assuage the concerns. The project team became the focus of this emotion, as often times the relevant decision makers were either inaccessible to these people or located in a different city. Carver, Scheier and Weintraub (1989) note that there are generally two main methods of coping with organisational change. People using the problem-focussed method endeavour to solve the problem at hand, whereas those that employ an emotion-focussed coping method aim to reduce and manage the emotional stress caused by the issue. O’Brien-Wood (2001) expanded on this work, demonstrating that an emotion-oriented coping method can increase the feelings of negativity and stress arising from organisational change, a situation that was noted within the research environment. The project team endeavoured to reduce these feelings of negativity and stress of the end-users with the use of listening and communication skills, working with the end-users to resolve their issues.

During the research it became evident that there were different views of project success when dealing with different people in the organisation. As the IT manager, a project is viewed as successful if the end-users can continue to work productively, and they are able to continue production and the impact on the business is low. From the IT integration manager’s viewpoint, a project is successful if there are relatively few complaints from the business departments triggered by projects. Business department managers appreciate when a project has low impact on the production, and when business can continue as usual. Additionally, if end-user complaints are numerous, then the project can be viewed by management as unsuccessful, regardless of whether it achieved the project goals or not.
The end-users were most affected by IT projects and often the ones least consulted for their opinion. They quite often did not understand the purpose of the change, as it was being imposed on them without consultation. They were accustomed to the systems and programmes in place, and saw little need to change, and the new systems often required training and a period of adjustment, something that was uncomfortable for a sizeable portion of the end-users. To successfully deal with these issues, the project team brought not only the managers into the decision-making process, but also representatives of the end-users. Only in this manner were the end-users able to voice their concerns and have their issues dealt with before they became problems. As Thomas and Fernández (2008) note, the very act of defining project success can contribute to that success, and that once a project team knows how success should appear, they can then steer the project to those goals with less effort.

5.3.5. The project manager holds a central role in the success of projects

One of the main components that contribute to project success is the role that the project manager plays. Other researchers have discussed this, recognising the importance of a strong project leader (Petter and Randolph 2009; Geoghegan and Dulewicz 2008). Whilst it is recognised that the project manager needs experience in project management, there is some disagreement between researchers whether the project manager needs domain knowledge or not. However, in an SME environment, as the central focus for the implementation of agile projects, the project manager needs to be trained and proficient in the use of several project management styles, in addition to possessing a wide range of domain knowledge.

This was confirmed by the findings of Leybourne and Sadler-Smith (2006), who note that domain experts were better equipped to make decisions in environments that were less structured, a common occurrence when implementing agile methods. Turner and Müller (2006) also confirm this, noting that a project manager should have at least a good understanding of the fundamentals to ensure that they can plan for scenarios, a talent that only comes with experience in a certain field. An SME organisation needs technical people who are flexible in their approach (Simon et al. 2007), as without this flexibility or willingness to cross areas of expertise, these organisations will not have the skills required to fulfil their goals.
Even the project manager’s personality and management style need to be carefully matched to the project to ensure a high level of success, as much of the success hinges on the project manager (Dvir, Sadeh, and Malach-Pines 2006). If the project manager does not possess the proper project management training, or has a personality or management style that is mismatched to the project, then the success rate will undoubtedly be affected when implementing an agile style of project management. In addition, the project manager needs the skills and personality that will enable them to investigate the traditional project management tools, and combine them in a balanced manner with the agile development tools (Amason et al. 2007). With this investigation they are able to determine the best course of action for that particular project, and deliver a customised project management strategy.

And finally, the project manager needs to match the style of project management to the company type. Media-Com and Publish-Com were different companies, though working in similar market segments. Due to differences in management styles used for these companies, the project management style needed to be slightly customised for each company. This matches the results of Turner, Ledwith and Kelly (2010), who showed that different management styles are required across different countries and industries. It is becoming common for project managers to adapt their management style to the situation, rather than using one standard approach across all projects. It is becoming increasingly apparent that the project manager needs to be flexible and adaptable in their approach, selecting the correct tool for the current situation. Additionally, adopting an approach to project management that can be adapted and implemented in a modular manner can provide noticeable benefits to the organisation.
5.4. Implications for project management policy and practice

This section of the chapter will discuss some of the implications of the research with respect to project management policy and practice. Agile project management is challenging the processes and policies that are currently in place for managing projects. Increased research into this area has the potential to influence the application of the techniques in this field, as it moves from the purely theoretical to the practical.

There were several noteworthy topics that arose during this research that pertain to project management policy and practice. These topics were based in theory and then confirmed in this unique setting, or when assembled in new combinations enabled fresh insights to be derived. These topics have been depicted in Table 16 to provide a visual summary of this section of the chapter.

| An agile project management framework allows project teams to adapt |
| Responsiveness to requirement changes improves when using agile methods |
| Practice, practice, practice: 10,000 hours |
| A compact team structure produces the best results |
| Findings about the agile project management framework |

Table 16: A summary of the implications for project management policy and practice
Source: developed for this research

5.4.1. An agile project management framework allows project teams to adapt

Each project was unique in the style and amount of processes required for proper management. The project management for the separate companies also required different levels of detail and processes, conditional on the requirements of upper management. Agile works best, not when it is used in its pure form, but when it is adapted to the organisation (Smith and Sidky 2009). For Publish-Com an informal task-based style of management was able to be implemented, although for Media-Com a more formal style of project management was required. As Media-Com is a subsidiary of Global-Com, a multinational group of companies, there were well established company-wide IT governance processes and standards in place for the management of projects.
The project management style in use by Global-Com is structured along the lines of a traditional waterfall model, where project phases are planned and implemented in a structured and linear manner. Despite the different styles of project management involved, it was possible however for the project team in Media-Com to deploy the agile project management framework locally, inserting it into the overall project management structure required by Global-Com. This situation is dependent on the local project manager for implementation, as they need to have an understanding of both the traditional and agile project management approaches. The project manager will need to understand the requirements of each approach, and how it can be associated with the overall project management scheme. For each project, the project manager was required to adapt the exact style and approach, as ‘one size does not fit all’ (Shenhar 2001, p. 413) when managing projects, especially when the environment or requirements are changing.

The level of details required for the project management processes depends on the level of complexity within a project. A relatively simple project will not need the same controls and processes that are required by a complex or difficult project (Turner, Ledwith, and Kelly 2008). When the project is small enough, it is possible that the whole project is managed in the heads of a few people. However, this situation will change as the company grows and projects become more complex. The number of projects stakeholders increase, and interpersonal communications also increases in complexity in such a circumstance. Though, just because SMEs are small does not mean that the projects are always small and not complex. Indeed, if an SME is trying to break into a niche market, the very uniqueness of the situation and the need to react swiftly to changing situations can produce a very complex environment. These situations show that each project needs to have a different level of processes applied to it, a situation that is ideal for an agile project management method. As the agile project management framework is adaptable, the level of processes that are applied to the project can be easily adapted. The adaptability and versatility of this framework was a valuable factor in the management of projects during this research.

5.4.2. Responsiveness to requirement changes improves when using agile methods

The research involved a series of projects that were extremely unique in the situations that they dealt with and the products that they delivered. Quite often the products and solutions involved in the projects were focussed on niche media markets. Projects had very brief lead times, and it was common for changes to be introduced at several stages of the project implementation, even when the project progress was quite advanced. This is one of the
principles of agile development, where changes are welcomed even at an advanced stage, especially if the change will improve the product for the end-users. The agile project management framework was used to improve the flow of the projects and improved the management of the projects, particularly in situations that contained a high degree of uncertainty or where project requirements were changing.

As the requirements arise from user needs, the project manager needs to regularly consult with the stakeholders. Without the proper consultation, the product will not be produced correctly, as it is being designed on assumptions and conjecture (Pan 2008). Agile project management is based on listening to the user, and providing the best solution to the user. Therefore, there is a need to build the design in conjunction with the user, and not make assumptions.

5.4.3. Practice, practice, practice: 10,000 hours

One finding that became apparent during this research was the pivotal role that project manager experience plays in the successful implementation of a project. One of the draft research questions proposed for this research asked the question ‘Is it possible to produce a project toolkit that project workers will be able to use, to enable more successful project work?’ Although it was removed from the formal research questions, this question was always in the back of the researcher’s mind as the study progressed. Popular literature authors cater to the desire for project success with such titles as ‘Teach yourself Project Management in 24 hours’ and ‘Project Management: 24 Steps to Help you Master any Project’ promising to encapsulate and impart the wisdom of a seasoned project manager to the novice. Organisations have come to realise that project management is necessary, and people who find themselves in charge of projects, either by choice or accident, are reaching for such titles to provide them with some insight into this field of management.

The reality however, is that just as with any other highly specialised field, the one thing that sets a seasoned project manager apart from the junior project coordinator is experience gained over years of practice. This is a known phenomenon, and has been researched in some detail. Ericsson, Krampe and Tech-Römer (1993) showed that for someone to gain mastery in a field, they need many hours of practice. To reach an average level of experience will require approximately 4,000 hours of practice, and at this level the practitioner has a grasp of the basics, and can follow formulated instructions. Rules and procedures should usually be followed in this stage. To achieve a good level of mastery in
a subject requires around 8,000 hours of experience. At this level the practitioner is able to assemble information from many styles, and is able to formulate their own method to an extent. The rules are seen more as suggestions in this stage, and the practitioner knows that sometimes the rules are made to be broken.

To reach the level of truly expert mastery, the practitioner will need in excess of 10,000 hours of experience. They can now make decisions based on many hours of practise, often so that these decisions may appear spontaneous and arrives seemingly from ‘gut feeling’. However, this should not be mistaken for pure intuition, as it is a result of intense training, where decisions become ingrained and a part of their everyday actions. This expert knowledge in a field is gained with a mixture of hands on experience and formal learning, as Turner & Huemann (2000) noted. This finding has also been confirmed in other fields by Ericsson et al. (2006), and demonstrates that there is more to becoming experienced in project management than just reading the manual.

The idea that intuition is associated with subject mastery is not a novel idea though, and was demonstrated in an ancient Chinese proverb, The Daoist Butcher (Tzû c. 369-286 BC, p. 249):

Prince Huei's cook was cutting up a bullock… Every blow of his hand, every heave of his shoulders, every tread of his foot, every thrust of his knee, every whshhh of rent flesh, every chhk of the chopper, was in perfect rhythm.

“Well done!” cried the Prince. “Yours is skill indeed!”

“Sire,” replied the cook laying down his chopper, “I have always devoted myself to Dao, which is higher than mere skill. When I first began to cut up bullocks, I saw before me whole bullocks. After three years' practice, I saw no more whole animals. And now I work with my mind and not with my eye. My mind works along without the control of the senses. Falling back upon eternal principles, I glide through such great joints or cavities as there may be, according to the natural constitution of the animal. I do not even touch the convolutions of muscle and tendon, still less attempt to cut through large bones.”

“A good cook changes his chopper once a year - because he cuts. An ordinary cook, one a month - because he hacks. But I have had this chopper nineteen years, and although I have cut up many thousand bullocks, its edge is as if fresh from the whetstone. For at the joints there are always interstices, and the edge of a chopper being without thickness, it remains only to insert that which is without thickness into such an interstice. Indeed there is plenty
of room for the blade to move about. It is thus that I have kept my chopper for nineteen years as though fresh from the whetstone.”

“Nevertheless, when I come upon a knotty part which is difficult to tackle, I am all caution. Fixing my eye on it, I stay my hand, and gently apply my blade, until with a hwah the part yields like earth crumbling to the ground. Then I take out my chopper and stand up, and look around, and pause with an air of triumph. Then wiping my chopper, I put it carefully away.”

The butcher depicted in this proverb was a master in his profession, and after many hours of practice the correct solution to the problem would appear before him, as his skill had transcended that of the average cook. At this point the skill becomes embedded in the practitioner, and intuition takes over. Although, it should be realised that intuition is often mistaken for skill that is ingrained. When discussing the issue of the required skill level for a project manager, one of the interviewees commented on this topic.

*Interview extract:*

…the project manager needs an understanding of the business, so that he can see how the project fits into the whole scheme. In regards to the formal training, for example, a housewife must do many different jobs in her daily life, but she doesn’t receive formal training in those things.

Although the housewife has learnt somehow to do multiple tasks without a lot of formal training, these could have been learnt from her mother, or she may have learnt them by trial and error. On the other hand though, maybe the housewife does many different jobs, though not well. Additionally, common sense can also be confused by an observer with a higher skill level, as noted by Dreyfus & Dreyfus (1980). The person that is an expert in a subject will have an intuitive grasp of a subject matter. Therefore, what may seem to be easy and common sense from the outside could be the result of many hours of practice. In the end, there is no substitute for practice and training, and a mixture of both will enable the project manager to gain a better understanding of the field, and raise their skill level over time.
5.4.4. A compact team structure produces the best results

Project delivery in an SME environment primarily occurs in small teams, as small organisations usually undertake small projects. Since the project teams are predominantly smaller, the team members may be required to conduct the tasks of more than one role. In a large organisation the project manager will often hold a supervisory role, whereas in a small team the project manager is frequently hands-on, providing both technical and managerial skills. The concept of a four man team was adopted from the Australian army, where it has been proven in adverse conditions that this number is an ideal configuration for a small team, providing both flexibility and adaptability (Colton 2008). These concepts were adapted to the project environment, where small teams of approximately four team members were selected. This enabled the project team to remain adaptable and flexible, whilst still able to scale for larger projects, by adding extra teams as required. In the final project conducted for Publish-Com, the roll out weekend required a larger than normal project work force. The project manager and the second-in-charge therefore each supervised a team of three or four. This knowledge gained from using the framework was applied to the management of each team, and the two teams worked in close contact with one another.

During this research a method of teamwork was noted that worked exceptionally well in this environment. The project team initially required a common language, necessitating basic training and sharing of concepts about project tools, in addition to domain knowledge gained through many years of experience. This allowed the team members to discuss project issues in the same terms, though at different levels of detail depending on their formal training and amount of experience. The basic project tasks were treated as processes, so that the underlying structure became standardised and could be undertaken without excessive discussion or team consultation. These basic tasks might involve deconstructing the project into tasks, depicting the project timeline, or updating the progress of the project.

In the implementation stage of the projects however, when the challenging tasks arose it was occasionally necessary that the project manager refrain from intervening, thus allowing the project team the freedom to apply their experience and knowledge to the problem in a creative manner. This freedom to implement creative approaches to problem solving is a key component to an agile approach. An agile project generally diverges from the world of standardisation and process driven work, and therefore team creativity is a
key to providing the answers. Godé-Sanchez (2010) notes that military teams establish their teamwork in a similar manner. There is an underlying shared language in the team, the underlying tasks are automated and process driven, the team can adapt to the situation as it changes, and creativity plays a role in bridging the last gap between mundane and unique tasks.

Over the course of this research the IT team developed to work as a tight-knit team. In the beginning the team dynamic was relatively unformed and individualistic, though as the research progressed, the team became tight-knit and worked together as a unit. This is an important characteristic when using an agile method, as the teams and projects are frequently smaller in size. If the team is not harmonised, then difficulties will emerge with the project implementation. Tuckman (2001) commented on the development sequence of small groups, noting that most teams go through four stages, forming, storming, norming, and performing. In the beginning the team forms, and is focussed on the task at hand. Then the team will most often go through a period of adjustment, where there are occasions of internal conflict between team members. In the next stage, the team bond begins to form, and there is the beginning of a team atmosphere where the members start to really work with one another. And in the last stage, the team members form a whole that is more than a sum of the parts. The team works together as a unit, and the structure also enables results to be achieved that would not be possible for the individual. Interpersonal skills and team energy are two key factors for success here.

In an earlier section of this chapter the importance of having a strong project leader was highlighted. If the project leader lacks the proper training and experience, the project can experience major implementation issues. However, although the project manager fills an important role in the equation, the project team is a crucial component in the equation. A project is not successfully completed through the efforts of one or two people alone, but on the skills and efforts of the whole team, and with a high quality project team an improved level of project success is able to be achieved. Field Marshall The Viscount Slim (Colton 2008, p. 51) also commented on the benefits of improving the overall quality of a team.

Armies do not win wars by means of a few bodies of super-soldiers but by the average quality of their standard units… Any well trained infantry battalion should be able to do what a commando can do…
This also holds true in a project team situation. If the average level of the team can be raised, then the opportunity for success will be greatly improved.

5.4.5. Findings about the agile project management framework

The goal of this research was not to reinvent the wheel and produce new project management tools. This type of research has already been covered in great detail by other researchers (Klastorin 2003; Dhillon 2002; Forsberg 2005), and is not the focus or purpose of this study. Rather, as stated before, the goal is to modify traditional project management methods and tools, and adapt them to be more responsive in their application. As such, the tools used in this study were adapted from classic tools that had already been developed, and were proven in the field. Often times the classic version of a tool was refined and adapted to fit the project, and for each further project refined or adapted once again. This provided the team with the best tool for the job, as each project was unique in the product or environment it addressed. Even projects with similar goals were handled on a case-by-case basis.

It should be noted that agile project management does not equate to a lack of paperwork or few controls. Rather it deals more with the management of a project in a flexible and reactive manner, providing the best solution to problems in a changing environment or where project goals are not completely defined. Depending on the complexity of the project and the size of the team, the project manager may need to use different project tools for each situation. For a small team, a task-based board system such as found in Scrum software development may be sufficient (Schwaber 2004), whereas for more complex projects, work breakdown structures and work schedules for resource planning or other similarly traditional tools may be necessary. The project manager is a key element when using this framework, and they must possess the skill to understand which tool is appropriate for each stage and in which project setting, as issues arise in regards to each particular tool.

Highlighting the type of tool-related issues that may arise, there are two main concerns with implementing a Gantt chart, and how the project management team will establish an estimate of the project timeline. The first of the issues is when either no historical data exists, due to a lack of organisational experience in regards to such a project, or when the project is creating such a unique product or attempting a unique goal, that there is difficulty in estimating the duration of such a project. The second concern is when a
business goal exists for the project, but the method of achieving the goal has not been clarified. This can occur when the project stakeholders are still deciding the details of the project, and no solid decisions have been made. In these situations, the project manager will need to adapt the tool, seek further information, or choose a different tool, depending on the exact situation of that particular project. Without adequate project experience they may be unable to provide the correct decisions in such a case.

Another consideration to keep in mind regarding this framework is that although it can be implemented without properly defined project goals being established for the complete project from the outset, it should only be implemented in such a manner in extreme circumstances. One example of such extreme circumstances could involve producing an extremely unique product, which is urgently required by the organisation. In this case, the project goal may be quite broad, with the goal listed as producing the required product. The budget may also be quite broad in the range, depending on the critical nature of the product, or the time to implement the product may be flexible. In all of these circumstances, there is a desired end-result that has been established, even if the exact path to achieving this goal is undefined at the current time. This goal drives the action cycles during the project life span, and as the path and exact goal becomes clearer, the project path is refined and clarified as a result of the outcomes of the cycles. One of the main criticisms of agile methods in general, is that project teams can begin work towards a goal without a plan. However, possessing the ability to cope with uncertainty in a project environment does not mean that the project team can start implementing without a plan. Such a course of action will only result in waste or suboptimal user of resources.

The implementation phase of each project cycle is an important section of the framework, and is the section where the project goals defined in the planning stages are achieved. Although the framework aims to be adaptable and flexible, with the ability to cope with changing requirements, the overall project goal always needs to be kept foremost in mind. If the project team realises that the action process is implementing a deliverable that does not add to the overall project goal, then this cycle should immediately be investigated to ensure that the project is not diverging from the project goals.
Additionally, if the project requirements undergo a radical change, then the cycle progress may need to be stopped and reset back to the identify stage once again. Having multiple feedback iterations in the act stage can help to ensure that what is being implemented during the act stage is the ideal solution to help achieve the project goals.

Incremental implementation of the end-product is one of the key strengths to this style of project management. It allows a gradual introduction of a new product, whilst allowing for input from the end-users about improvements that can be included in future cycles. This style of project delivery was appreciated by several of the research participants.

*Interview excerpt:*

I find it a good idea… because for nearly everyone these are not noticeable changes… When you make changes in small steps, and people don’t notice or realise it, then it is a perfect solution.

*Interview excerpt:*

When you have the possibility to go step-by-step, then you can try to avoid obstacles or to optimise (the product)… or when new information is added, you can incorporate that.

The incremental style also introduced a few issues in regards to requirement changes. As mentioned in the action research cycles, the project participants quickly noticed that the project team was able to successfully deal with changes to the project requirements. This in turn raised the level of expectations. The project stakeholders were accustomed to introducing changes at the last minute, and as the project team could always deliver those changes, albeit it with extra resources and exertions, this became a common trend in project work. This can cause problems for project managers however, who are involved in such a situation. Agile methods are designed to allow requirement changes, and the developers of these methods had this in mind when setting out this style of working. The founders of the Agile Manifesto (Beck et al. 2001b) even mention this in their core principles:

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
However, changes in requirements are not able to be implemented without a resource cost, regardless of the intentions of the people implementing such a style of work. As mentioned in chapter 2 in regards to the fundamentals of project management, if one aspect of a project is changed then other project constraints will need to be adjusted. Therefore if the scope of a project is changed, then it is very probable that either the project will require more time, or more resources, thus incurring greater expense. Consequently the project manager needs to be aware of the project constraints when discussing requirement changes with stakeholders. They can then ensure that this topic is discussed, and an agreement reached on which constraint may be affected.

A combination of agile development practices and the PMBOK framework can bring benefits to IT projects in an SME environment in such an environment. This is primarily because the project team can react quicker to requirement changes, and reassign resources to the most valuable position in the business structure. This is extremely important in a situation where resources are in short supply, a situation that is prevalent for the majority of SME environments. An SME that implements an agile project management framework successfully may gain increased performance and better reaction times to project change, resulting in a higher success rate to the project team.

5.5. Conclusions and recommendations arising from the research

There are several findings that have arisen from this research. These findings, conclusions and recommendations have already been discussed in detail in sections 5.3 and 5.4. In this section of the chapter the research contributions have been summarised in Table 17 and Table 18. Following these graphs the research findings will summarised, providing a compact review of the salient points of this study.
Research questions | Research topics in the current literature | Contributions arising from this research
---|---|---
RQ1: To what extent can a mixture of traditional project management methods and agile development methods improve IT project success in an SME environment? | 1. Project Management (PM) tools and standards.  
2. Common causes of project and software development failure.  
3. The development of PM methods and tools throughout history.  
4. PM and business-related literature reviewed from a range of industries and countries.  
5. Skilled project managers require many hours of practice. | 1. Reviewed PM and agile literature to develop a solid basis for the research.  
2. In context of improved project success, contributed insight into challenges that arise for IT projects.  
3. The project management framework was customised, incorporating both PM & agile processes.  
4. Confirmed that a skilled agile project manager requires experience in both agile and traditional methods.  
5. Confirmed that the project manager must have the proper management style to successfully implement agile methods.  
6. Ascertained that agile project management can help organisations react quickly to changing requirements, but is not applicable to all situations.

Table 17: A summary of the research contributions – part 1  
Source: developed for this research
<table>
<thead>
<tr>
<th>Research questions</th>
<th>Research topics in the current literature</th>
<th>Contributions arising from this research</th>
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| **RQ2:** What tools and procedures will need to be included in a toolkit, combining methods to assess the primary research question? | 1. Agile software development methods and tools.  
2. PM tools and procedures.  
3. Further development of existing tools. | 1. Designed and refined processes and procedures for an agile project management toolkit.  
2. Contributed to the development of an agile project management framework.  
3. Critically examined agile methods, demonstrating it is a collection of useful tools. |
| **RQ3:** What are the results of implementing such a toolkit in an SME environment? | 1. The importance of SMEs.  
2. The unique challenges faced by SMEs.  
3. Decision making and leadership styles in an SME.  
4. The importance of the SME-sized organisation to the economy. | 1. Critically examined the effectiveness of agile and PM processes in an SME environment.  
2. Demonstrated that an SME can benefit from implementing agile project management.  
3. Confirmed that agile project management needs the support of the SME owners.  
4. Confirmed that agile project management is ideally suited to a small environment.  
5. Verified that agile methods must be adapted to the company culture to be most effective.  
6. Further research into further application has been recommended. |

Table 18: A summary of the research contributions – part 2  
Source: developed for this research
5.5.1. There are real benefits to be gained from implementing an agile project management style.

The agile project management framework designed during the course of this research was proven to be successful in an SME environment. Different levels of processes can be applied to a project when implementing an agile project management method. It is possible to change the level of processes that are applied to a project, as the agile project management framework is very adaptable. Therefore for small and non-complex projects, the processes can be reduced in the amount and complexity, whereas for more complex projects, the full weight of more advanced PMBOK and agile processes can be applied to. The adaptability and versatility of this framework was a valuable factor in the management of projects during this research, and assisted in the successful completion of these projects.

5.5.2. Agile project management needs the support of the business owners, especially in an SME environment.

Agile project management diverges from the standard methods of project management in several areas. Due to the innovative nature of agile project management, if the business owner does not fully support the introduction of project management processes, then there is a higher potential for acceptance problems within the organisation. The acceptance problems usually arise because employees may not perceive the benefit or the need for using such a system.

Even though a business owner may not actively oppose a system, if they do not fully support it then it can fail due to a lack of support. Additionally, as project management will often require additional resources to implement, if senior management in a parent company do not provide these necessary resources, or if some parts of the company actively oppose the introduction of new processes, then the project manager will encounter difficulties in introducing the proper procedures and processes to implement such a management style.

5.5.3. Agile project management is better suited to smaller environments

In this study it was noted that an agile project management framework works best for small and medium projects in an SME environment. It was also noted that as projects grew in complexity the framework began to demonstrate several deficiencies. For example, tracking large and complicated projects can be more difficult for agile project management, as well as coordinating work schedules when there are a large number of project workers
involved. This is a demonstration of the scalability concerns of this style of project management, and the more complex a project becomes the more issues arise when project changes are introduced. It has also been noted that traditionally larger teams are more adverse to change, and agile methods may need to be introduced to these environments with more conservative goals at first.

5.5.4. Agile is not a panacea, and needs to be used as a tool in a suitable setting

Although agile project management is a useful tool, it cannot solve all problems, and is not suitable for every situation. One problem that project managers encounter is that functional managers have many priorities that compete for their attention. Unless the project manager is a skilled communicator, then requests for project resources can easily be ignored or relegated to a secondary position by these functional managers.

It has also been noted that historically managers and business leaders have generally shown little interest in business research, and that these managers will not necessarily adopt method that have been proven in research studies. However, there is still a real avenue open that the demand for improved methods will come from the project management practitioners themselves, rather than being implemented as a strategic management choice for the organisation.

5.5.5. The agile project management framework must be adjusted to the company structure and culture to work most efficiently

The agile project management framework is by design flexible and adaptable. However, this framework should not be applied in the same form to each organisation in the same manner. Rather, it should be adjusted to the structure and the culture of the organisation, to gain the biggest impact. For example, an organisation with a ‘female mindset’ will usually distinguish itself in the form of a flatter company structure with less bureaucracy, where leaders often making more intuitive decisions. The agile project management style works well in the type of a company which displays this characteristic female mindset. This is primarily due to a reduction in the amount of rigid rules and bureaucracy in this style of company, which are detrimental to agile project management. If the company culture is rigid and bureaucratic, then this style of project management will usually be more difficult to introduce.
5.5.6. The framework must be customised, incorporating elements of both agile and PMBOK

As a component of the agile framework, the PMBOK is also a valuable project management framework, but there is a need for the framework to be customised, including ‘enough’ of them for successful project management. The level of detail required for the project management processes depends on the level of complexity within a project. A project that is simple in its scope and execution will not need the same controls and processes that are required for a project that is more complex or difficult to execute. As the agile project management framework is adaptable, the level of processes that are applied to the project can be readily adapted. Therefore, for small and non-complex projects the controlling processes can be simple and limited. For more complex and difficult projects however, a wider range of PMBOK and agile process may need to be applied to the management tasks.

5.5.7. Small teams work best in an agile environment, though teams can scale for larger projects by adding extra teams

The delivery of projects in an SME environment primarily occurs through the efforts of small teams. It has been noted that small organisations predominantly undertake small projects, due to the amount of resources available to them. Since the project teams are smaller, the team members may be required to perform the tasks of more than a single role. For example, the project manager may also be in charge of implementation, and a project team member may be involved in the implementation of several stages of the project. A team of four members was found to be a useful size, as this enabled the project team to remain adaptable and flexible, though still allowing room to scale for slightly larger projects, with the addition of extra teams as required. The importance of coherence in the team is also noted, as the project is not successfully completed through the efforts of one or two people alone, but on the skills and efforts of the whole team. If the project team has an average of high quality in its team members, then it is most likely possible to achieve a greater level of project success than with just one or two highly trained project team members.
5.5.8. To become a skilled project manager requires many hours of experience and training

Project management is a specialized field, where not all managers are equal in their abilities. One thing that differentiates between a seasoned project manager and a junior project coordinator is experience, which is gained over years of practice. It has been demonstrated that to reach the level of an expert in their field, a practitioner will need in excess of 10,000 hours of practice and experience. They are then able to make decisions based on these many hours of practice, often so that these decisions may appear spontaneous and arrive seemingly from what can appear to be a ‘gut feeling’. However, this demonstration of an expert level of knowledge should not be mistaken for pure intuition, as it is a result of prolonged training, where decisions become ingrained and a part of their everyday actions. Additionally, this expert knowledge is gained through a combination of hands-on experience and formal learning.

5.5.9. The project manager’s management style needs to be matched to the project, and they need to be trained in this role

The project manager needs to possess the proper project management training for the best possibility of project success. Additionally, though, the personality and management style of the project manager need to match with the style of project, otherwise the success rate will undoubtedly be affected when implementing an agile style of project management. In addition, the project manager needs the skills and personality that enable them to investigate the traditional project management tools, and put them into practice in a balanced manner with the agile development processes. Through these processes they are able to determine the best course of action for that particular project, and are able to deliver a customised project management strategy for each unique project environment. In addition to possessing broad experience in project management, the project manager will need domain knowledge as well, as domain experts are better equipped to make decisions in environments that are less structured, which is a common situation when implementing agile methods.
5.6. Researcher’s thoughts about personal development

Throughout this work I have attempted to remain as objective and critical as possible. This is primarily due to the value that I believe this work can bring to the project management field. A significant portion of project managers in this field come from an engineering or technical background, due primarily to the fact that project management was established in those areas. This research was conducted using an action research methodology, as it was determined that this was the most suitable research method to introduce and test the agile project management framework. However, some of the more traditional project managers focus strongly on quantitative methods. In order to reach as wide an audience as possible, I therefore implemented action research primarily as a qualitative approach, but balanced this with the introduction of a quantitative aspect, and ensuring that the scientific rigour on this work was strictly upheld. In this section though, I will step back from the objective style, and attempt to describe the subjective results. This is not too large a leap though, as scientific objectivity and personal subjectivity both play an important role in action research, where the researcher must continual look for meaning in actions and results, both internally and externally. There were several major personal benefits that arose that I would like to discuss briefly, as well as a few limitations that I noticed.

The first major personal benefit that I noticed during this research was the improved ability to leverage resources in a small IT team. I found it easier to arrange resources due to the modular delivery method. Rather than working on a project of several weeks, these monolithic tasks became a series of easy tasks, coming together like a series of Lego blocks to achieve the ultimate goal. This also improved my project management skills, as I found it improved my skill to lead difficult and nebulous projects to a successful result.

A direct result of the action research component was that I gained a better understanding of the project stakeholders. There is often a divide between technically skilled workers, such as IT staff and engineers, and those who are non-technical, such as administrative staff, creative staff and management. By spending a major amount of my time working with these non-technical people, asking for their feedback, and taking the time to really listen to their comments, I was able to gain an insight into a different aspect of the workplace. This has helped me to make better decisions in my work, and helped me to take into consideration more viewpoints than the purely technical or business related one.
Perhaps one of the most valuable outcomes from this research for me personally was the level of personal and career progression that I was able to attain. I find that I am more able to remain calm in stressful situations, or when variables are unknown or uncertain. Being agile has become an integral part of my personality, and I am able to adjust my decisions and actions as my environment calls for it. This has also helped in my most recent position, where I am responsible for an extremely variable IT environment. Although I have now moved on from the organisation where the research was conducted, I am able to apply the principles and concepts to problems in my new position as the Group IT Manager. The new organisation is a multi-national entity, comprised of about 2,000 full-time employees and 3,500 part-time employees world-wide. Although the new organisation is definitely outside of the bounds of an SME organisation, the group is comprised of many SME-sized organisations. Thus the concepts can be used on the branch and organisational level, and are able to be incorporated into the overall IT structure. This research also emphasised the benefits of a team-based approach to IT, and I have embraced this style of management in my work.

Even though the personal benefits outweigh the negative aspects, I have found that there are a few issues that have arisen as result of my research. I conducted this research in Austria, and during the final stages of thesis writing I needed to relocate back to Australia due to family reasons. I relocated to Sydney, and during my search for a new position I was involved in discussions for several opportunities, with one or two for a position as a project manager. I was keen to bring my newly acquired skills to the work arena, but encountered a small amount of resistance and puzzlement along the way. I found that recruiters and project management supervisors were often unable to align the agile development concepts in combination with a traditional project management skillset. Due to my knowledge being quite unique when compared to a traditional project manager, and the expanded skillset fairly untraditional, the conventional recruiters found it difficult to ‘tick the box’ in regards to my skillset.

I have also noticed a comprehension gap when discussing project management techniques with project managers and IT managers from typically traditional backgrounds. Although they had achieved mastery in their own fields, they were often unable to see the value of combining the concepts of agile development with traditional methods. A typical response that I have encountered is ‘Out project management team does not manage projects like that’. I think this is more a problem with learning and experience though, and believe that
in time agile project management will emerge as a natural choice in the field of IT project management, especially for SME organisations. Until this new framework is accepted by practitioners, researchers and agile advocates will need to become evangelists of these methods. This will help to spread the information about the benefits and opportunities available when using such a method in project work. By helping others in the industry to understand and accept this method, researchers will be able to assist in the further progression of the project management industry.

5.7. Limitations of the research
As with all research studies, there were several limitations. This study occurred in a media and publishing industry, with projects situated around digital and print-based media ideas. The results have not been tested in other industries, or in larger companies. However, this framework was designed specifically for an SME environment.

One of the main limitations of this research is also a limitation of action research, the method that was employed for this research. Action research is a method that enables researchers to investigate a social system, and work with the people involved in that social environment to examine problems together. One of the main shortcomings to this type of interaction is that it is possible that instances of the Hawthorne effect (Roethlisberger and Dickson 2003) may occur. This effect is apparent when research participants are mindful that they are active members of a research study, and realise that they are being observed, and as a result their behaviour is influenced. Since action research data may contain instances of the Hawthorne effect (Baskerville and Stage 1996) the possibility to generalise the results from this study is difficult to determine.

Action research as a method is tailored predominantly to each unique social situation. Additionally, the combination of an SME environment, the artistic nature of the employees working in a media and publishing organisation, and the occurrence of a global financial crisis during the research process, created an uncommon situation. Due to this tailored approach, the results are not designed to be necessarily valid or meaningful when applied to another social environment. And whereas quantitative research aims to provide repeatability with the results, enabling future researchers to repeat and test research outcomes, action research is not designed with this goal in mind. Rather, it is designed with the goal of recoverability, so that interested researchers can critically review the study.
and recover the processes involved (Checkland and Holwell 1998). With these aims established, the research was conducted in a manner that would provide a high level of scientific rigour and validity, aiming for a result that was more than merely scientifically plausible. This was aided by implementing a constant review of associated literature, participant feedback, data triangulation, and critical self-reflection as constant reinforcements of the research. These reinforcements should provide future researchers with adequate information to enable them to subject the research to critical scrutiny.

The framework resulting from this research is not a cookbook for novices, and does not proclaim to be. The project manager is the leading force in the project implementation, and as such he needs to have a broad understanding of the relevant procedures and underlying principles. Therefore for this situation, the project manager will need experience in both traditional project management and also agile development. At the moment such a combination of experience is difficult to obtain, though project management training centres are starting to offer training in agile development concepts for people without experience of agile development.

Some of the issues that arose during this research may have been exacerbated by the worldwide financial crisis that occurred during the data collection stage, as this reduced the amount of budget and personnel resources available to many projects. The workload was extremely high at times, and it was noticed that at times there was an increased level of disengagement by certain participants during this period, as some team members concentrated solely on work directly related to their own area of expertise and less on team-based projects. During this time it required a determined effort to involve people in projects outside of their immediate area of responsibility, especially when limited resources affected the range of solutions available to project problems. The unique impact of a worldwide financial crisis on the organisations is difficult to determine, and it is unknown to what extent this affected the research environment.
5.8. Further research potential in this field

There are several areas of scientific research that were either referenced by this research, or were a secondary concern that arose as a result of this study. Though there were several issues that arose that could not be addressed, as they were outside the scope of this research, three main areas of future interest are noted here. These points could provide researchers with a path to further the work undertaken here, and add to the overall knowledge in the field of project management.

5.8.1. Further investigation of agile project management

The framework presented in this research should be viewed as still in the developmental stage, and further research will need to be conducted into this style of project management. Further research is needed to determine if this project management style can be used in other industry sectors. This study was focussed on the media and publishing sector, though other sectors could also potentially gain benefits from implementing the same style of project management. Multiple industry sectors have adapted traditional project management to their particular industry, and achieved the rewards of improved project success. The potential also exists that agile project management can be adapted to a wide range of industry sectors in the future, with the goal of introducing an more adaptive project delivery style to these industries. Further research could determine if an agile project style can be used in a wider range of situations and produce favourable results, and whether it is a scalable solution, with potential uses outside of an SME environment.

Currently the project manager needs extensive training in project management and agile development methods, in addition to extensive domain knowledge. These separate segments of knowledge allow the project manager to make the necessary decisions when contemplating the correct course of action to take in an agile project environment. However, there is a growing need for project management skills in organisations today. Project team members with exposure to project management methods are sought after, and project management is becoming a standard component in university degrees. Therefore, extra study needs to focus on whether it is possible to design a toolkit so that there are benefits not only for trained and professional participants, but also for members of the project team. This extra research is needed, as the current framework requires advanced training on the part of the project manager. If the average knowledge of project management in the team can be increased, then potential for improved project success exists.
5.8.2. Determining the best organisational culture fit for agile project management

When discussing the mindset of an organisation, there are typically two distinct types mentioned. These are the ‘masculine mindset’, and the ‘feminine mindset’. This is not a reference to the gender of the organisation managers, but more a descriptive category along the lines of the classical yin and yang. For example, an organisation that follows a typical masculine mindset structure will be more rigid in the application of procedures and processes, and will typically have a more bureaucratic arrangement.

This was an aspect that arose during the study, as Hostede (2001) notes that Austria as a society possesses a high masculinity aspect to their culture. This is usually displayed by a potential gap between the masculine and the feminine mindsets that is larger than in a country with a lower masculinity dimension. Though typically an Austrian company will possess a masculine mindset, in this study the SME companies involved possessed primarily a feminine mindset. This could be attributed to the artistic nature of the industry that the organisations were involved in, and the working style of the people involved. However, it was noted that the global parent company displayed a typical masculine mindset, with a higher degree of rigidity and bureaucracy. During the integration projects, where the SME organisations were being integrated into the global systems of Global-Com, conflicts arose between the different management styles, as the cultures of the SMEs often clashed with those of Global-Com.

There are therefore two areas of future investigation available here. The first area deals with how agile project management would function in a different style of SME, or one which was located in a disparate industry. For example, an SME that is engaged in an engineering field will most likely possess a more masculine mindset. Could an agile project management style also bring benefits to an SME in such an industry, or is the culture and the style of management dependant on one another? This framework should therefore be tested in such an environment, to see whether it is also as applicable in such an environment.

Secondly, the framework could be tested in a larger organisation. This would also provide a different culture environment for testing the framework. Whereas the first area of investigation focuses on SMEs with a different mind-set, this area of investigation would investigate whether a larger organisation with a similar mind-set could also benefit from such a project management style.
5.8.3. The development of a PMBOK Lite

The promoters of the PMBOK method of project management hold that an agile method is necessary in certain situations, especially where research and development is being conducted. However it has also been proposed that a ‘Lite’ version of the PMBOK may also produce benefits for small projects, and this is a current area of interest for researchers in this field. Research will need to be conducted into this area, to determine if there are benefits that could be gained from such a move. Businesses and project management organisations are in agreement that more research needs to occur in this field, and it is hoped that this study will provide an element of support for this future study, as research continues into modified and agile project management methods.

The PMI is currently in the final draft stage of releasing a certification in ‘Agile Project Management’. The training required for such a certification may be the catalyst that is needed for the uptake of agile methods from project managers in other industry sectors. Introducing a certification in agile project management also requires a certain amount of ‘correct’ answers and methods of conducting an agile project, so that people can be assessed as to their ability in this style. It may be worthwhile conducting a study to investigate whether a standardised agile project management method is possible, or whether in fact the concept of formalising agile processes and procedures is an anathema to the original principles of agile development.

Conversely, this future standardisation and certification may be the stimulus needed to educate more project team members in agile concepts. This may in turn help to increase the overall education level or project team members. It has claimed that if you increase the average ability of a team you can greatly increase the potential for the success of that team. This topic could also be included in future research, to determine the amount of education and certification needed by project team members. Does increasing the overall level of education of the team increase the potential for success? Or is certification an industry in itself, which promises a return on investment which is difficult to substantiate?
5.9. Conclusion

In large organisations project management methods have been developed from industry practices and international standards to ensure a higher rate of success for Information Technology projects. However, when IT projects are implemented in an SME environment these organisations often lack an established method of project management or skilled project implementers. As project workers find themselves pressured to become more responsive, reacting ever more quickly to business demands, it is becoming commonplace for smaller organisations to forgo formal project management practices. This is often due to the fact that small projects are viewed as simple to deploy, suffer from a lack of resources, or are given low prioritisation by the organisation. Even the PMBOK, the current de facto project management standard, can been perceived by SMEs as complicated and overly bureaucratic, something undesirable in regards to time-constrained or low-budget projects. Agile development is one solution to the problem of overly complex methods that has been developed in a separate IT field, that of software development, and has gained considerable popularity with smaller software development teams.

IT implementation projects occurring in the SME environment is an area that has not received a lot of research attention, mainly due to research problems stemming from sample sizes, lack of organisation resources to support such research, and the inherent uniqueness of SMEs. However this section should not be ignored, as nearly 99% of all businesses are categorised as an SME (CEC 2005), forming an essential segment of the economy. This research investigated the current state of formalised project management and how these methods could be modified for an SME environment, especially in relation to IT implementation projects. A mixture of traditional project management methods and newer agile development methods were utilised, with the goal of establishing that an amalgamation of the two methods can assist with project success, particularly in the case of resource-poor SMEs. The acceptance of this method by the SME IT workers involved was also investigated.

Projects occurring in an SME face some rather unique challenges. They are usually carried out in changing environments, and not all projects can be planned to the same extent. Project roles are often assigned to a minimum amount of people, and frequently the project manager is charged with the management as well as the physically execution of the project. SMEs generally adopt a non-bureaucratic method of conducting business, and therefore
more formal methods can lead to problems. In light of these factors, an agile method with a foundation in a proven method, such as a combination of the PMBOK and agile methods, was found to be beneficial in such a situation, and is a worthwhile topic for further investigation.

It is becoming common practice for project managers to adapt their project management style to the specific situation, rather than applying one approach across all projects, choosing the correct tools and processes required for each unique project. When taking such an approach the project manager needs to be flexible and adaptable with their management style. Adopting an approach to project management that can be implemented in a flexible manner can also provide noticeable benefits, and allows an agile project management framework to be used even in situations where another style of management is already in place.

The agile project management framework was a useful tool for the project team, and improved the project implementation work. This style was also favoured by research participants, who were partial to the incremental implementation style used. The project management framework presented here should not be implemented simply in a step-by-step manner, or used as a process manual for beginners. This is not a description of the ‘right’ way to manage projects, but rather it presents a flexible and adaptable project management style, which can be used for projects with in-built uncertainty or where the requirements are likely to change.

The organisations and specific environments where this research was conducted formed an extremely unique situation, from a combination of the SME organisation structure, the artistic nature of the employees working in a media and publishing industry, and the external influence of the global finance crisis during the research process. Whilst this created an extremely distinctive environment, the validity and rigour of the results were always of prime importance to ensure that the research results would form an acceptable contribution to scientific literature. This was achieved with consistent review of associated academic literature, feedback from research participants, triangulation of data, and with the use of critical review by the researcher, as a strategy to ensure the scientific nature of the findings.
The agile project management framework is still in early stages of development and research, and further research needs to occur into the model itself to investigate whether it can produce favourable results in a wider range of environments and organisations. Potential further research could investigate whether it can be scaled to environments that are larger than the SME-sized organisations researched here, and whether it is possible to design a toolkit that can provide benefits for typical project members. This could increase the success of projects by providing team members with tools that could be implemented, without requiring the education and training level of the project manager.

Quite often in an SME environment, the project manager is not only performing a project supervisory role, but is also charged with the physical implementation as well. As SMEs are generally operating with a less bureaucratic style of management, the more formalised methods of project management are ill-suited, and can even introduce problems due to the lack of flexibility. After taking these factors into consideration, a project management style that combined a proven project management method with tools and concepts from agile development was found to provide benefits in such a situation, and provides a foundation for future investigation. In an economic age where businesses are required to achieve greater results with fewer resources, a project management method that can assist with the reduction of project failure could prove beneficial to many SMEs. As the IT industry is increasingly required to react to business demands in a flexible manner, the topic of agile project management is growing ever more important, and this study endeavours to assist IT project teams in the journey to investigate this valuable tool.
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Appendix A

This appendix contains the base interview questions that were used in the initial interview phase.

Interview with Interviewee __________

Date:

Question: What comes to mind when you think of project management?

Question: What comes to mind when you think of IT projects?

Question: What do you feel are some of the challenges that IT projects face in a small business?

Question: How do you think these problems can be avoided?

Question: What problems can arise if projects are not planned properly?

Question: What does good planning involve?

Question: Do you think that project management is necessary or optional for smaller IT projects?

Question: Do you think formal project management techniques would be a benefit in such a situation?

Question: Do you think this agile style would be suitable for our company?

Question: Do you see any benefits in designing a project style specifically for this company?

Question: If a resource if unavailable for a project, or is less available, how do you think this can affect the success of a project?

Question: Is it important if projects can react to unplanned resource problems quickly?
Question: Which of the following has more value for you: A project that delivers everything all at once but may be delayed until it is totally ready, or, a project that delivers a partial product quite early, and then extra items can be added later?

Question: If we use employees or contractors for a project, how important do you think their technical and project skills are?

Question: Does a project worker’s skill level help with project success?

Question: Would training project workers give them extra skills to help improve project success?

Question: Does a skilled project worker make the company money, or help to avoid losses?

Question: In your opinion, can the introduction of project style that can react faster to changes help reduce project risks?

Question: In what way do you think these risks can be reduced?

Question: Do you think that teamwork affects the success of a project?

Question: What is needed for good teamwork in project work?

Question: How can we create better teamwork in the company?

Question: And finally, do you have any further thoughts or ideas on how our IT projects can be improved?
Appendix B

This appendix contains the principles behind the Agile Manifesto, which expands on the core values of agile software development.

Principles behind the Agile Manifesto

We follow these principles:

Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.

Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.

Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.

Business people and developers must work together daily throughout the project.

Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.

The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.

Working software is the primary measure of progress.

Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.

Continuous attention to technical excellence and good design enhances agility.

Simplicity - the art of maximizing the amount of work not done - is essential.

The best architectures, requirements, and designs emerge from self-organizing teams.

At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behaviour accordingly.

Source: (Beck et al. 2001b)
Appendix C

This appendix lists the questions that were used in the survey.

These initial questions will only be used to group similar answers together.

Please select your Gender:
- Male
- Female

Please select your age (years):
- Under 20
- 20 to 30
- 31 to 40
- 41 to 50
- 51 to 60
- Over 60

How would you best describe your role:
- Management
- Production
- Graphic Artist
- Lithography
- Journalist
- Administration
- Sales
- IT
- Other (Please specify): [ ]

How many years have you worked for the company?
- Less than 1
- 1 to 3
- 4 to 6
- 7 to 10
- Over 10

How many years have you worked in your field?
- Less than 1
- 1 to 3
- 4 to 6
- 7 to 10
- Over 10
Please signify your agreement level with the following questions about project management:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project management is important for successful projects in the company.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Project management is important for successful IT projects in the company.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Project management is important for small IT projects.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>It is important that IT projects stay within the allotted budget.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>It is important that IT projects should be delivered on time.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>It is important that IT projects should deliver the correct product.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>If the project goals change during the project, the project may take longer.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>If the project goals change during the project, the project may cost more.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>A reduction of resources, such as budget, software or manpower, can reduce the success of a project.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

Further Comments:
Please signify your agreement level with the following questions about agile projects:
(Agile projects react quickly to unforeseen changes in circumstances.)

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>In a new or unique situation, not all facts of an IT project may be known before the project starts.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>It is important that IT projects can react quickly to unforeseen problems.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>If changes occur in an IT project, then people involved need to be informed quickly.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A project method that can help IT projects react more quickly to change would be useful in our company.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A project method needs to be less formalised to be able to react more quickly to change.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT projects that introduce minor incremental changes spread out over time are less disruptive to the company.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT users may require a longer time to become adapted if IT projects produce major changes.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further Comments:

Please signify your agreement level with the following questions about risk in projects:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Don't Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT projects should include a plan of action for risks that are most likely to occur.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT projects with a higher risk level need more planning time to ensure success.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT projects that contain higher risk need more resources, such as time, money or planning. Proper planning for IT projects can help reduce the amount of problems that may occur.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT projects that react slowly to changes have a higher level of risk.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further Comments:
Please signify your agreement level with the following questions about project training and skills:

| The technical skills and know-how of project participants can affect the success of IT projects. | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree | Don’t Know |
| Project participants should receive training in project techniques. | ○ | ○ | ○ | ○ | ○ | ○ |
| Project participants who receive training in project techniques can help improve the success of a project. | ○ | ○ | ○ | ○ | ○ | ○ |
| The project leader should be trained and have experience in project techniques. | ○ | ○ | ○ | ○ | ○ | ○ |
| It is only necessary that the project leader be trained in project techniques. | ○ | ○ | ○ | ○ | ○ | ○ |

**Further Comments:**

Please signify your agreement level with the following questions about project teamwork:

| A team that works well together may improve the success of an IT project. | Strongly Agree | Agree | Neither Agree nor Disagree | Disagree | Strongly Disagree | Don’t Know |
| There should be open communication between team members. | ○ | ○ | ○ | ○ | ○ | ○ |
| Face-to-face communications are more effective than digital communication, such as email and telephone conversations. | ○ | ○ | ○ | ○ | ○ | ○ |
| There needs to be full agreement in a team about the project goals before a project can start. | ○ | ○ | ○ | ○ | ○ | ○ |
| There is a good team environment in the company. | ○ | ○ | ○ | ○ | ○ | ○ |

**Further Comments:**
Please signify your agreement level with the following questions about the company environment:

<table>
<thead>
<tr>
<th></th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither Agree nor Disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>The company as a whole is good at setting and achieving business goals.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The company is able to react quickly to changes that affect the business.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The level of enthusiasm in the company for customers and products is high.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The ideas and products produced by employees are innovative.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further Comments:
Appendix D

This appendix details the steps that were used to test the quantitative data for validity and integrity.

Testing the data for validity

Excluding the demographic items, the questionnaire was comprised of 35 items grouped into 6 thematic sections. These items were used to determine certain concepts relating to project management as it pertained to each participant’s organisation. Before the results could be applied they needed to be tested for integrity and validity. The following section shows how the composite variables were produced, and how these composites and the items that comprised them were tested for validity.

The tests involve several steps for each variable, to determine if the integrity and validity is of a high enough level, to be useful. This process will be demonstrated here in a graphical format for the variable change reaction, to demonstrate the process that was used for each of the variables. The results will then be presented for each subsequent variable in a text format.

Face Validity

The very first step was to examine the items closely to determine if they possessed face validity (Oppenheim 1998, p. 161). This means that the items are determined to reflect the general concept that is trying to be measured. For example, to measure the construct of the reaction to project change, the following items are included in the questionnaire:

1. In a new or unique situation, not all facts of an IT project may be known before the project starts.
2. It is important that IT projects can react quickly to unforeseen problems.
3. If changes occur in an IT project, then people involved need to be informed quickly.
4. A project method that can help IT projects react more quickly to change would be useful in our company.
5. A project method needs to be less formalised to be able to react more quickly to change.
At face value, these items appear to measure the same concept.

**Composite Variable**

A single numerical value representing each particular concept was produced by combining the separate items into a new composite variable, using an arithmetic mean, as noted in Manning & Munro (2007, p. 28). For the composite variable *change reaction*, the following equation was used:

\[
\text{change reaction} = \frac{(11_1 + 11_2 + 11_3 + 11_4 + 11_5)}{5}
\]

This process was repeated for each composite variable in turn, and the results produced from the separate items are listed in Table 19 where the variable and the concept that is being measured are set out.

<table>
<thead>
<tr>
<th>Composite variable</th>
<th>Concept</th>
</tr>
</thead>
<tbody>
<tr>
<td>importance</td>
<td>The importance of project management.</td>
</tr>
<tr>
<td>project fundamentals</td>
<td>The importance of the fundamentals of project management, namely: time, cost &amp; scope.</td>
</tr>
<tr>
<td>change</td>
<td>Outcomes when project goals change.</td>
</tr>
<tr>
<td>change reaction</td>
<td>How projects react to change.</td>
</tr>
<tr>
<td>incremental change</td>
<td>Introducing incremental changes with a project.</td>
</tr>
<tr>
<td>risk</td>
<td>Risk in projects.</td>
</tr>
<tr>
<td>training</td>
<td>Project participants receiving project management training.</td>
</tr>
<tr>
<td>teamwork</td>
<td>Working as a project team.</td>
</tr>
<tr>
<td>culture</td>
<td>The company culture</td>
</tr>
</tbody>
</table>

Table 19: *Composite variables and their corresponding concept*
Source: Developed for this research

These composite variables have been tested for face validity, and now the next step was to thoroughly test each composite variable for internal reliability and integrity.
**Inter-item and item-to-total**

The first test that each composite variable is subjected to is to test the item-to-total correlations and the inter-item correlations. These correlations will test if the composite variables have adequate homogeneity and if there is a relationship between the variables being tested (Urdan 2005). Manning and Munro (2007) note that an acceptable item-to-total correlation is greater than .50 and an acceptable inter-item correlation is a result greater than .30. Urdan explains the relationships in a bit more detail, showing that a correlation coefficient below .20 indicates a weak relationship between the variables, a result between .20 and .50 represents a moderate relationship, and a result greater than .50 (either positive or negative) represents a strong relationship (Urdan 2005, p. 76).

Table 20 shows the correlations for the variable *change reaction*. Using the guidelines as set out by Urdan, it is possible to state that the item-to-total correlations form a strong relationship, with the exception of item 11_1 (highlighted in Table 20). The inter-item relationships for 11_1 were also shown to be weak, and therefore item 11_1 was removed from the composite variable, and it was recreated without this item. The new equation for the composite variable change reaction therefore is:

\[
\text{change reaction} = \frac{(11_2 + 11_3 + 11_4 + 11_5)}{4}
\]
<table>
<thead>
<tr>
<th>change reaction</th>
<th>Pearson Correlation</th>
<th>11_1</th>
<th>11_2</th>
<th>11_3</th>
<th>11_4</th>
<th>11_5</th>
</tr>
</thead>
<tbody>
<tr>
<td>change reaction</td>
<td>Sig. (2-tailed)</td>
<td>.003</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>11_1</td>
<td>Pearson Correlation</td>
<td>.414**</td>
<td>1</td>
<td>.198</td>
<td>.209</td>
<td>.088</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.003</td>
<td>.168</td>
<td>.144</td>
<td>.542</td>
<td>.695</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>11_2</td>
<td>Pearson Correlation</td>
<td>.755**</td>
<td>.198</td>
<td>1</td>
<td>.543**</td>
<td>.416**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.168</td>
<td>.000</td>
<td>.002</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>50</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>11_3</td>
<td>Pearson Correlation</td>
<td>.713**</td>
<td>.209</td>
<td>.543**</td>
<td>1</td>
<td>.395**</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.144</td>
<td>.000</td>
<td>.004</td>
<td>.006</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>50</td>
<td>52</td>
<td>50</td>
<td>52</td>
</tr>
<tr>
<td>11_4</td>
<td>Pearson Correlation</td>
<td>.679**</td>
<td>.088</td>
<td>.416**</td>
<td>.395**</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.542</td>
<td>.002</td>
<td>.004</td>
<td>.010</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>50</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>11_5</td>
<td>Pearson Correlation</td>
<td>.739**</td>
<td>.057</td>
<td>.478**</td>
<td>.379**</td>
<td>.354*</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.695</td>
<td>.000</td>
<td>.006</td>
<td>.010</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>50</td>
<td>50</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 20: **Inter-item and item-total correlations of the composite variable change reaction**
Table 21 shows the correlations for the new variable *change reaction*. With the inconsistent item removed, it is now possible to state that the item-to-total correlations form strong relationships (as highlighted in Table 21). Additionally, the inter-item correlation of 11_2 and 11_3 form a strong relationship, and the remainder of the inter-item correlations form moderate relationships.

<table>
<thead>
<tr>
<th>change reaction</th>
<th>Pearson Correlation</th>
<th>11_2</th>
<th>11_3</th>
<th>11_4</th>
<th>11_5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Correlation</td>
<td>.780**</td>
<td>.718**</td>
<td>.722**</td>
<td>.787**</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>11_2</td>
<td>Pearson Correlation</td>
<td>.780**</td>
<td>.543**</td>
<td>.416**</td>
<td>.478**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.002</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>11_3</td>
<td>Pearson Correlation</td>
<td>.718**</td>
<td>.543**</td>
<td>1</td>
<td>.395**</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.004</td>
<td>.006</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>11_4</td>
<td>Pearson Correlation</td>
<td>.722**</td>
<td>.416**</td>
<td>.395**</td>
<td>1</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.002</td>
<td>.004</td>
<td>.010</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>11_5</td>
<td>Pearson Correlation</td>
<td>.787**</td>
<td>.478**</td>
<td>.379**</td>
<td>.354*</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.000</td>
<td>.006</td>
<td>.010</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 21: **Inter-item and item-total correlations of the composite variable change reaction (redone)**
Source: Developed for this research
**Principal Components Analysis (PCA)**

To further determine if the separate items of each composite variable was homogenous, a PCA (Principal Components Analysis) of the data was undertaken to highlight similarities and differences (Smith 2002). Using a PCA, it is possible to determine the eigenvalue of each component that is a part of a composite variable. When discussing the eigenvalue, Ho (2006, p. 205) remarks:

> An eigenvalue is a *ratio* between the common (shared) variance and the specific (unique) variance explained by a specific factor extracted. The rationale for using the eigenvalue criterion is that the amount of common variance explained by an extracted factor should be at least equal to the variance explained by a single variable (unique variance) if that factor is to be retained for interpretation.

The PCA of the items combined in the composite variable *change reaction* can be seen in, and the value that of interest, the eigenvalue, has been highlighted in Table 22. As Manning and Munro (2007) explain, if the three items are homogenous, then there will be a single component with an eigenvalue greater than one. If multiple components have an eigenvalue greater than one, then the items are not homogenous and cannot be combined, as they are in fact measuring multiple concepts.

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
</tr>
<tr>
<td>1</td>
<td>2.288</td>
<td>57.206</td>
</tr>
<tr>
<td>2</td>
<td>.655</td>
<td>16.373</td>
</tr>
<tr>
<td>3</td>
<td>.620</td>
<td>15.512</td>
</tr>
<tr>
<td>4</td>
<td>.436</td>
<td>10.909</td>
</tr>
</tbody>
</table>

Table 22: **PCA of the components of change reaction**
Source: Developed for this research
The component matrix shown in Table 23 details the factor loadings, which indicate how closely the items are aligned with the concept being tested (Ho 2006). Each of the correlations between the items and the underlying concept was greater than .50 (Manning and Munro 2007, p. 33), with the lowest correlation having a value of .70 (highlighted in Table 23), confirming once again the internal consistency of the composite variable. Therefore, in this case the PCA results show that the composite variable is consistent.

<table>
<thead>
<tr>
<th>Component</th>
<th>Factor Loading</th>
</tr>
</thead>
<tbody>
<tr>
<td>11_2</td>
<td>.821</td>
</tr>
<tr>
<td>11_3</td>
<td>.774</td>
</tr>
<tr>
<td>11_4</td>
<td>.701</td>
</tr>
<tr>
<td>11_5</td>
<td>.725</td>
</tr>
</tbody>
</table>

Table 23: PCA component matrix of components of importance
Source: Developed for this research

Hair et al. (2009) expand upon the role that the factor loading plays. These loadings are the correlation of each variable and the factor. The higher the degree of loading, the greater the role that variable plays in the representation.

**Scree Plot**

A useful tool to graphically depict the eigenvalue is the scree plot shown in Figure 37, which graphs the eigenvalue against the component number. From the second component the line is flatter, indicating that each successive component accounts for a smaller portion of the total variance. This is useful for composite variables containing many items, as once the curve begins to straighten out, this is considered the maximum number of factors to extract (Ho 2006). However, even though this test was included as part of the testing process, since the composite variables were not large conglomerations it proved to be of little value.
Cronbach’s Alpha

The next step was to use Cronbach’s alpha to determine the reliability coefficient of each set of items. Bland and Altman (1997, p. 572) mention that while clinical research demands $\alpha$ values greater than .90, research involving groups can be viewed as satisfactory with $\alpha$ values of .70 to .80. Manning and Munro (2007, p. 26) also concur with this viewpoint, that a coefficient alpha of .70 is to be considered of acceptable reliability. Hair et al. (2009, p. 125) expand on this further, remarking that while the lower limit generally accepted for Cronbach’s alpha is .70, this can be decreased to .60 in situations involving exploratory research.

Cronbach’s alpha was used to determine the reliability of the four change reaction variables, where it was found that $\alpha = .72$ (as highlighted in Table 24). Therefore the composite variable change reaction can be considered reliable for this application.

<table>
<thead>
<tr>
<th>Cronbach's Alpha</th>
<th>N of Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>.727</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 24: Cronbach's Alpha of the change reaction variables
Source: Developed for this research
The results from testing the remainder of the composite variables have been presented in a text format, and follow the same procedure as used for the variable change reaction.

**Testing the variable ‘importance’**

For each participant the mean across items 9_1, 9_2 and 9_3 was calculated to form the new composite variable *importance*, which represents the importance of project management in the organisation. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005, p. 76) items 9_1, 9_2 and 9_3 were all found to possess an item-to-total correlation greater than .50 and formed a strong relationship. In addition, the inter-item correlations were all greater than .20, where the inter-item relationship between item 9_1 and 9_2 formed a strong relationship and the remaining inter-item correlations formed moderate relationships. A principal components analysis was performed on the three items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007, p. 33). Cronbach’s alpha for the three items was found to be good (α = .78). Therefore the composite variable *importance* was found to be consistent and reliable.

**Testing the variable ‘project fundamentals’**

For each participant the mean across items 9_4, 9_5 and 9_6 was calculated to form the new composite variable *project fundamentals*, which represents the main concepts of project management. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) items 9_4, 9_5 and 9_6 were all found to possess an item-to-total correlation greater than .50 and formed strong relationship. In addition, the inter-item correlations were greater than .20 and all inter-item correlations formed moderate relationships. A principal components analysis was performed on the three items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the three items was
found to be comparatively low ($\alpha = .62$), however it was decided to retain these variables, as Hair et al. (2009, p. 125) explain that the acceptable level can be decreased to .60 in situations involving exploratory research. Therefore the composite variable project fundamentals was found to be consistent and reliable.

**Testing the variable ‘change’**

For each participant the mean across items 9_7, 9_8 and 9_9 was calculated to form the new composite variable change, which represents the concept of how change affects a project. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) items 9_7, 9_8 and 9_9 were all found to possess an item-to-total correlation greater than .50 and formed strong relationships. In addition, the inter-item correlations were all greater than .20, where the inter-item relationships between items 9_8 and 9_7, and items 9_8 and 9_9 showed strong relationships and the remaining inter-item correlations formed moderate relationships. A principal components analysis was performed on the three items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the three items was found to be good ($\alpha = .78$). Therefore the composite variable change was found to be consistent and reliable.

**Testing the variable ‘incremental change’**

For each participant the mean across items 11_6 and 11_7 was calculated to form the new composite variable incremental change, which represents the concept of how incremental change brought about by a project is perceived. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) the items were found to possess an item-to-total correlation greater than .50 and formed strong relationships. In addition, the inter-item correlations were all greater than .20, and the inter-item relationships were also strong relationships. A principal components analysis was performed on the two items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and
therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the two items was found to be good (α = .71). Therefore the composite variable *incremental change* was found to be consistent and reliable.

**Testing the variable ‘risk’**

For each participant the mean across items 13_1, 13_2, 13_3, 13_4 and 13_5 was calculated to form the new composite variable *risk*, which represents the concept of how risk can affect a project. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) items 13_1, 13_2, 13_3, 13_4 and 13_5 were all found to possess an item-to-total correlation greater than .50 and formed strong relationships. In addition, the inter-item correlations were all greater than .20, where the inter-item relationship between items 13_3 and 13_2, as well as between items 13_3 and 13_5 showed strong relationships and the remaining inter-item correlations formed moderate relationships. A principal components analysis was performed on the five items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the five items was found to be good (α = .79). Therefore the composite variable *risk* was found to be consistent and reliable.

**Testing the variable ‘training’**

For each participant the mean across items 15_1, 15_2, 15_3, 15_4 and 15_5 was calculated to form the new composite variable *training*, which represents the concept of how training plays a role in a project. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) items 15_1, 15_2, 15_3 and 15_4 were all found to possess an item-to-total correlation greater than .50 and formed strong relationships. In addition, the inter-item correlations were all greater than .20, where the inter-item relationship between items 15_2 and 15_3 showed strong relationships and the remaining inter-item correlations except for item 15_5 formed moderate relationships.
Item 15_5 displayed an item-to-total correlation \( r = .40 \) lower than the criterion of .50, and inter-item correlations (including correlations of \( r = .05 \) and \( r = -.01 \)) where the majority were lower than the criterion of .20. A new composite variable was therefore reconstructed without the item 15_5, as it was not determined to be homogenous with the other items. A principal components analysis was performed on the remaining four items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the four items was found to be good \((\alpha = .71)\). Therefore the new composite variable \textit{training} was found to be consistent and reliable.

**Testing the variable ‘teamwork’**

For each participant the mean across items 17_1, 17_2, 17_3, and 17_4 was calculated to form the new composite variable \textit{teamwork}, which represents the concept of how teamwork plays a role in a project. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) all items were found to possess an item-to-total correlation greater than .50 and formed strong relationships. In addition, the inter-item correlations were for the majority greater than .20, where the inter-item relationship between items 17_1 and 17_3, and items 17_2 and 17_4 showed some weak relationships (including correlations of \( r = .13 \) and \( r = -.16 \)) for the inter-item correlations, which were lower than the criterion of .20. A new composite variable was therefore reconstructed without the items 17_3 and 17_4, as they were not determined to be homogenous. Once the variable had been recombined it is possible to state that the item-to-total correlations and the inter-item relationships all now form strong relationships. A principal components analysis was performed on the remaining two items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the two items was found to be adequate \((\alpha = .69)\). Therefore the new composite variable \textit{teamwork} was found to be consistent and reliable.
Testing the variable ‘culture’

For each participant the mean across items 19_1, 19_2, 19_3, and 19_4 was calculated to form the new composite variable culture which represents the concept of how the participants view the culture of the organisation. Item-to-total and inter-item correlations were calculated, and using the guidelines set out by Urdan (2005) all items were found to possess an item-to-total correlation greater than .50 and formed strong relationships. In addition, the inter-item correlations were all greater than .20, where the majority of the inter-item relationships showed strong relationships and the relationships between items 19_1 and 19_3, as well as between items 19_2 and 19_4 formed moderate relationships. A principal components analysis was performed on the four items, to determine if they could be considered to measure a single construct. Only one component was extracted with an eigenvalue greater than one, and therefore a single construct dimension was assumed. All loadings were greater than the minimum criterion of .50 as specified by Manning and Munro (2007). Cronbach’s alpha for the four items was found to be good (α = .83). Therefore the composite variable culture was found to be consistent and reliable.
Univariate outliers

The next step was to check the composite variables for univariate outliers, as outliers may affect the outcome of multivariate analysis. A histogram is a useful tool for visualising trends and data distributions (Davis 2005), where the general shape of the distribution, the symmetry, the modality and the skew of the distribution are able to be graphically represented (Bortz 1999). The histogram for the variable change reaction is presented in Figure 38, where it can be seen to possess a minor variance from a normal distribution.

![Histogram for the variable change reaction](image)

Figure 38: Histogram for the variable change reaction
Source: Developed for this research

A histogram was created for each of the remaining composite variables, and it was noticed that variables importance, project fundamentals, change, risk, teamwork, culture and training all possessed minor variances from normal. The histogram for the variable incremental change was close to a normal distribution however.
A boxplot is used to graphically depict the distribution and the skew of the data before proceeding with more in-depth analysis (Davis 2005). As can be seen in Figure 39, there are outliers present for the variable change reaction, therefore the lines will extend a maximum of 1.5 box lengths outwards, and then the outliers are represented by a circle, and extreme outliers are represented with an asterisk (Manning and Munro 2007). Even though the variable change reaction contains outliers, there are no extreme outliers present.

Figure 39: Box plot for change reaction  
Source: Developed for this research

A box plot was then created for each of the remaining variables in turn. The variables project fundamentals, incremental change, risk, teamwork, training, and culture all contained outliers, but no extreme outliers were present. The variables importance and change however, contained extreme outliers. A z score was calculated for each of these variables, and the majority of the outlier cases were between the normal distributions limits of +3.29 and -3.29, and were therefore not considered univariate outliers (Manning and Munro 2007). However, the variable importance contained a deviation of +3.92 (case 19) and the variable change contained a deviation of +3.50 (case 9). These two participants displayed standard scores with an absolute value in excess of 3.29 ($p < .001$).
Multivariate outliers

To test for the existence of multivariate outliers in the variables, the method described by Tabachnick and Fidell (1983, p. 75) was employed. Using the data from the set of nine variables, the Mahalanobis distance was calculated for the 53 cases. Tabachnick and Fidell (1983) note that the Mahalanobis distance is a chi square ($\chi^2$) variable, with the degrees of freedom equal to the number of IVs. A criterion of $p < .001$ is recommended for evaluation of multivariate outliers, and therefore a critical value of $\chi^2_{9} = 27.877$ was used (Davis 2005, p. 571). The highest Mahalanobis distance produced was for case 19, with a score of 20.811, and therefore no multivariate outliers were identified.

Normality

The variables were investigated to determine if they deviated significantly from a normal distribution. This process involved discovering the values for skew and kurtosis for the distribution of the nine variables.

To test if the skew had a significant deviation from a normal distribution, the values for skew were divided by the standard error of the skew. The resultant $z$-score for importance (3.69) was considered significant, since it was greater than an absolute value of 2.58 for samples less than 100, where $p < .01$ (Tabachnick and Fidell 1983, p. 79). Since the value exceeded the acceptable limits of skewness, this meant that importance needed to be adjusted to a normal distribution. However the rest of the variables did not exceed the absolute of 2.58, and therefore did not need to be adjusted.

The kurtosis was also examined with a similar procedure. The values for kurtosis were divided by the respective standard error of the kurtosis. The resultant $z$-score for importance (2.75) and change (3.02) were considered significant, since they were greater than an absolute value of 2.58 for samples less than 100, where $p < .01$ (Tabachnick and Fidell 1983). Since the value exceeded the acceptable limits of kurtosis, this meant that importance and change needed to be adjusted to a normal distribution. However the rest of the variables did not exceed the absolute of 2.58, and therefore did not need to be adjusted.
For the variable *importance*, the extreme univariate outlier in case 19 was removed and the skew and kurtosis checked once again. The resultant $z$-score for the skew and kurtosis no longer exceeded the absolute of 2.58, and therefore did not need to be adjusted further.

For the variable *change*, the extreme univariate outlier in case 9 was removed and the skew and kurtosis checked once again. The resultant $z$-score for the skew and kurtosis no longer exceeded the absolute of 2.58, and therefore did not need to be adjusted further.

Hair et al. (2009, p. 65) mention that outliers can be classified into one of four classes, and the third classification mentioned is the one that is most fitting to these outliers:

...comprises extraordinary observations for which the researcher has no explanation. In these instances, a unique and markedly different profile emerges. Although these outliers are most likely to be omitted, they may be retained if the researcher feels they represent a valid element of the population. ... Here the researcher must use judgement in the retention/deletion decision.

The responses for these two outliers were investigated, using the initial items that comprised the composite variable. The answers to these questions involved questions about project management, and what could happen if project management goals change during a project, and it was noted that the answers were notably against the trend, by a single participant. Turning once again to Hair et al. (2009, p. 67), the following text was considered before making a decision on how to handle the outliers:

Many philosophies among researchers offer guidance as to how to deal with outliers. Our belief is that they should be retained unless demonstrable proof indicates that they are truly aberrant and not representative of any observations in the population.

The responses by this participant were carefully studied, and the comments in the final qualitative field also consulted before making a final decision. One of the participants stated:

Honestly, I don’t really know what an IT project is. As a user often the insight is missing, despite the fact that we are working quite closely together.
A tentative conclusion was therefore drawn that possibly these two participants did not understand the concept being polled, and could therefore be excluded as not presenting a valid representation. Since the objective of the questionnaire was to provide a deeper insight into the theory, it was decided to remove the outliers from the data, as by leaving the outliers in place would have overly affected the results in a negative manner. Any future calculations involving these variables would be tested twice however, once with the removed case, and once without. If the results were significantly different this would be noted.