Kingston University London

A new approach to Project Management based on a combination of Predictive and Adaptive thinking

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Thesis Submitted to

the Faculty of Science, Engineering and Computing,

Kingston University London

in Partial Fulfilment of the Requirements for the

Degree of Doctor of Philosophy

In Project Management

December 2011

Declaration

I declare while registered for a research degree at Kingston University, I have not been a registered candidate or enrolled student for another award at any other academic or professional institution.

I declare that no material contained in the thesis has been used in any other submission for an academic award.

I declare that all material contained in the thesis is my own original work, and that any references to or use of other sources have been clearly acknowledged within the text.

Tahir Hanif

December 2011

Abstract

This thesis looks at the two main thinking types currently encountered in project management i.e. Predictive & Adaptive Project Management.

Predictive project management thinking consists of the development of a schedule from a known scope and then managing the implementation of the project in accordance with that schedule. This type of thinking is also known as the traditional approach to project management and has been extensively used since the introduction of project management in the 1960s.

Adaptive thinking is used for fast track projects that are going to be subjected to a high rate of change and uncertainty. Methods have been developed mainly in the IT industry to deal with the fast turn-around and demand for IT and software development projects. Projects utilising adaptive project management thinking deliver the final product through a series of iterations and rely on high calibre and empowered individuals to make critical decisions.

There is much to learn from both thinking types. This thesis looks at a selected few methods that fall under each category, to highlight the main similarities and differences. In addition to this a questionnaire survey was carried out amongst clients, promoters, project managers and team members to find out their views and perceptions about their experiences relating to project management.

To supplement the research, an analysis of keywords from the International Journal of Project Management was conducted from 1983 through to 2010. This amounted to reviewing 1,863 papers over a 28 year period containing 5,776 words. Some interesting trends have emerged from this analysis.

As a direct result of the keyword analysis, a new pictogram has been developed that can be used for teaching and highlighting project management principles to students, project team members, clients, stakeholders and end users.

Finally the thesis concludes with a framework for implementing good project management called SixP. This framework can be used on any type of project and ensures that the right project management approach is selected, customised, implemented and maintained throughout the project life cycle. This approach was presented to delegates at the International Project Management Association (IPMA) 24th World Congress in Istanbul, Turkey on 2nd November 2010.

"Project management is not rocket science. It's all about delivering a project on time, on budget, to specification and to a good quality with zero defects. We all know what to do; it's just having sufficient time to do it all properly which is never the case."

One of the many comments received from the questionnaire survey

Acknowledgements

The completion of this thesis has been a life changing experience. Whilst this journey of the last four years was sometimes hard, unpredictable and tiring, it was equally enjoyable. I not only learnt more about the research topic but also discovered new strengths within me. This feels more like an awakening of my inner self, over and above the sense of satisfaction of completing a thesis. I have come to realise that my journey to seek knowledge has only just begun and these were merely the initial steps.

However, this thesis would not have been possible without the help of others. Firstly, I would like to thank God (Allah SWT) for giving me the health, strength and determination to see this through to a successful end. I would like to thank both my parents for guiding me and teaching me the virtues of patience when faced with difficulty. I would like to thank my son, Sulmaan, and daughter Aminah, brothers Tanvir and Sohail, sisters Saltanat and Muzlifah and nieces, Yasmeen, Mariyah, Alayna and Anaiyah for being a great source of support, love, joy and laughter. You all gave me the inspiration I needed to complete this task!

This thesis would not been have possible without the direct encouragement and guidance of my Supervisor, Professor Mukesh Limbachiya.

I am eternally grateful to Alan Ellis, Dr Milan Radosavljevic and Dr George Blumberg for allowing me to lecture at Kingston University, University of Reading and Oxford Brookes University as 'guest lecturer'.

I would like to thank all the students that attended my lectures. I learnt more about project management by teaching them the basics, by reflecting upon my own experiences and learning from theirs. I am truly humbled and appreciative of the feedback received from all students.

Finally, I am grateful to the firms and individuals that took part in the questionnaire survey and to colleagues, friends and fellow PhD research candidates for their constructive discussions, feedback and advice.

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Abbreviations

The following abbreviations have been used in this thesis:

AACE (Association for the Advancement of Cost Engineering)

ACostE (Association of Cost Engineers)

ACWP (Actual Cost of Work Performed)

AdPM (Adaptive Project Management)

AIPM (Australian Institute of Project Management)

APM (Association for Project Management)

BAA (British Airports Authority)

BAC (Budget At Completion)

BCWP (Budgeted Cost for Work Performed)

BCWS (Budgeted Cost for Work Scheduled)

CAPM (Certified Associate in Project management)

CCPM (Critical Chain Project Management)

CPM (Critical Path Method)

DUCE (Dynamic Uncertain Complex Environment)

EAC (Estimate At Completion)

ECC (NEC Engineering Construction Contract)

ETC (Estimate To Complete)

ICCPM (International Centre for Complex Project Management)

IJPM (International Journal of Project Management)

IPMA (International Project Management Association)

KPI (Key Performance Indicator)

KRUE (Known Regular Uniform Environment)

MoR (Management of Risk)

PDUs (Professional Development Units)

PERT (Program Evaluation and Review Technique)

PgMP (Program Management Professional)

PMBoK (Project Management Body of Knowledge)

PMI – RMP (PMI Risk Management Professional)

PMI-SP (PMI Scheduling Professional)

PMP (Project Management Professional)

PPM (Predictive Project Management)

PRINCE (Projects IN Controlled Environments)

RAD (Rapid Application Development)

RFID (Radio Frequency IDentification)

UCAS (Universities and Colleges Admission Service)

VAC (Variation At Completion)

XP (eXtreme Programming)

XPM (eXtreme Project Management)

1 INTRODUCTION

1.1 Background

Since its introduction between 1930 and 1950, project management has increased in popularity and usage (Morris 1994). In today's business climate project management has become the vehicle for delivering projects (end results) that would not be possible by using other management methods (Morris & Jamieson 2004).

When someone is assigned to a project as a project manager or a team member, they know that they are in for a challenging time. That the environment that they are about to face could be hostile and unpredictable leading to a completely new experience from their current or even past project experiences. No two experiences on projects, even on a similar type of project, will be comparable. Projects are delivered by people and people have different traits or patterns of behaviour.

Regardless of rank or hierarchy, at the heart of good project management lays the individual. The individual is the source of energy and inspiration that when combined with other similar or like-minded individuals (team members) will create a unique environment. Within this environment a new culture will emerge and it is this culture that will play an influencing factor in shaping the team's values and behaviour. The right culture is an important ingredient to project success and this should not be overlooked (Cope 2000).

Stacey describes how individuals come together and share thoughts when working in a team. A common shared set of rules, behavior and beliefs end up in a culture, an ideology or a bureaucracy (Stacey 1996).

In addition to the individual there are other key actors in project management for example professional bodies, consultants, gurus, consumers, academics and researchers (Morris et al.2006).

There are many methodologies, tools and techniques available to the project manager today. The vast majority of these have been influenced by research conducted in the construction industry (Crawford et al. 2006).

However, despite all the latest developments in project management, projects are still not delivered to original expectations. Regular statistics regarding project performance produced by organisations like the Standish Group confirm this fact. Project managers and team members are frustrated as they find that they are becoming more and more remote from the day-to-day reality of how their projects are performing. The process and procedures they follow sometimes create a bureaucratic maze of form filling and associated paperwork that prevents them from doing 'real' work. This is just one end of the spectrum.

(Hodgson 2004) also has written about the bureaucratization of project management and has said the following regarding this matter:

"Project management can be seen as an essentially bureaucratic system of control, based on principles of visibility, predictability and accountability, and operationalized through the adherence to formalize procedures and constant written reporting mechanisms. At the same time, however, project management draws upon the centra; rhetoric of empowerment, autonomy and self-reliance central to post-bureaucratic organizational discourse"

Cook writes in his book, "... I have seen project management grow from an adhoc application of common sense to the over application of complex processes (Cook 2005)".

(Koppenjan et al. 2011) also emphasises the current challenges faced by project managers:

"This contribution supports the observation made in the literature that theoretical approaches, focusing on either planning and control or complexity and flexibility, are one-sided and do not reflect the problems project managers are confronted with in reality"

This further highlights the dissatisfaction of current methods and their inability to provide effective control especially in the current business climate.

Project management requires discipline and it is important to have a regimental approach to ensure consistency, auditability and proper execution of actions. As the project team size grows, there is also a need to have in place further procedures to ensure that adequate management and control is being exercised. However, there must be a balance between project bureaucracy and flexibility for the project team to act creatively.

In addition to this, there has been a rise in the advocacy of more agile solutions for project management. Whilst they have been developed and used in the IT industry they are quite innovative methods for dealing with fast track, constantly changing and unpredictable projects. Methodologies like SCRUM, eXtreme Programming (XP) and eXtreme Project Management (XPM) are examples of a few that are used in the IT industry. The mindset of the project team is completely different to that of a team using traditional project management approaches commonly used in the construction and engineering industries.

There is a real opportunity to observe and learn from these methodologies and apply some of the principles into construction& engineering projects, where possible and practical to do so. IT and construction are totally different industries and face different challenges, imposed on projects due to the nature of work undertaken. Nevertheless, there is a great potential to cross-fertilise ideas and share experiences.

To fully understand and appreciate how and where these various methods, tools and techniques relate to one another, it is better to view them as falling under one of two categories - Predictive Project management and Adaptive Project Management.

1.2 Scope of Study

This thesis looks at project management and in particular the two distinct thinking types, - Predictive Project Management and Adaptive Project Management.

Predictive Project Management (PPM)

This type of project management thinking predominately relates to creating a 'plan' and then 'working to the plan'. If any changes are encountered along the way they

are factored into the 'plan'. This type of project management has been around since project management started as a recognised profession.

Adaptive Project Management (AdPM)

In AdPM the final solution is progressively delivered through a series of outputs delivered through shorter durations known as iterations. This method has emanated from the IT industry and is mainly used for the delivery of IT and software development projects.

1.3 Objectives

The objectives of the research are to ascertain and determine the following:

- Review a selected few methods, methodologies and techniques that fall under PPM i.e. Gantt Charts, Program Evaluation and Review Technique (PERT), Critical Path Method (CPM), Earned Value, BS 6079 and PRINCE2.

- Review a selected few methods, methodologies and techniques that fall under AdPM i.e. Managing Successful Programmes (MSP), SCRUM, Extreme Programming (XP), Rapid Application Development (RAD), and eXtreme Project management (XPM).

- Provide a summary of the similarities and differences of the various methods, methodologies, tools and techniques under PPM and AdPM.

- Conduct an online questionnaire survey and analyse the final results.

- Conduct a keyword analysis from a leading project management journal to see if there has been any change in project management thinking over the last 20 years.

- Develop a new approach based on a combination of Predictive and Adaptive thinking that allows the project team to address the challenges of projects that fall within Quadrants I and IV of the Rumsfeld matrix.

1.4 Research Problem

Since the development and introduction of project management methods in the 1930s we have seen a steady growth of new methods and techniques. Today

there are many to choose from, each advocating greater and better project success if they are implemented and followed.

The promoters of project management process have developed these as theoretical constructs based on generalisations of different project environments. It also assumes that the project team has the requisite skills and project management knowledge. It also presupposes that team members are highly disciplined and carry out their tasks diligently and are not subject to project politics, personal agendas or divided loyalties.

The dilemma for the project manager is as follows:

- Which method will be suitable and most appropriate for my project?
- What skills does the team have and will they require further training, coaching or mentoring to perform in accordance with the principles of the process?
- How will the 'off the shelf' process be customised so that the process can be effectively implemented on the project?
- How will the process be modified as there are changes in the environment within which the project is operating in?
- How can the process be kept meaningful so that it is not seen or becomes an unnecessary burden?
- What happens if the environment changes drastically that the process becomes obsolete?

The project management process is a means to an end and not the end in itself. The project process must be flexible and adapt to the changing needs of the environment within which the project is being delivered.

In the current climate, too much emphasis is on following best practice approaches developed by others or used on other projects. It is important to learn from other peoples' mistakes and there is a lot of value in doing this. However, when we copy

a process used on another project and adopt it on ours, we may not get the exact results as the project that was originally using it.

There are other dynamics at work that make successful implementation difficult like politics, personal agendas and the general behavior of a group of people. This 'culture' that is created within groups of people can vary from project to project.

In summary, one cannot follow a process blindly and expect for the results to simply follow. A project management expert who understands the project environment and how to get the best out of people is required to continuously shape and mould the process as the project continues towards its final destination.

1.5 Thesis Layout

Chapter 1 provides a high level view of project management and provides an introduction to the scope of the research described in this thesis.

Chapter 2 provides a further insight into how the research was carried out, why it was considered necessary and what the hypothesis is. It incorporates comments received from practitioners in industry, supporting the research topic. It also describes the research problem in detail setting the scene for the research itself.

Chapter 3 provides a brief history of project management, how ideas have changed over time and how new methods have been developed to deal with the ever-increasing complexity that project teams find themselves in today. It charts the history of the development of tools and techniques pioneered by the US Government and US business organisations that have provided the industry with tools such as Gantt Charts, Critical Path Method (CPM), Program Evaluation and Review Technique (PERT) and Earned Value. These are the foundation blocks of project management. The chapter goes on to highlight the latest developments in this area. It describes the PMI Body of Knowledge and provides an overview of the various professional bodies that are promoting good project management practice. In particular it briefly touches upon the use of the NEC suite of contracts as a promoter of good project management practice, within the engineering and construction industries.

Chapter 4 provides an overview of Predictive Project Management thinking. It primarily focuses on Gantt Charts, CPM, PERT, Earned Value, BS 6079, PRINCE2 and Critical Chain Project Management (CCPM). The idea behind this chapter is to demonstrate what PPM focuses on and what the key principles are.

Chapter 5 provides an overview of Adaptive Project management thinking. It describes the history surrounding the formulation of the Agile Manifesto and describes the main methods that are currently being used in the IT industry. It focuses on SCRUM, eXtreme Programming (XP), Rapid Application Development (RAD) and eXtreme Project Management (XPM). It also describes the approach Managing Successful Programmes (MSP), developed by the UK's Office of Government Commerce (OGC). At the end of the chapter a summary shows the key similarities between these methods.

Chapter 6 combines the findings from Chapters 4 and 5 to provide a summary of both Predictive and Adaptive thinking. It focuses on the main differences and how they can be used in multiple situations.

Chapter 7 describes the current perceptions about project management. This was achieved through an online questionnaire survey that was conducted in 2008. Respondents ranged from client, promoters, project managers, project team members to academics. Some interesting findings and themes have emerged from this survey.

In addition to the questionnaire survey, a keyword analysis study was undertaken of the International Journal of Project Management (IJPM). This is described in Chapter 8 and involved the review of 1,863 papers, which amounted to 5,776 keywords over a 28-year period from 1983 to 2010. As a result of this analysis a new pictogram for project management has been developed. This pictogram can be used for training and educational purposes to help individuals understand the dimensions of project management and how their role is related to the successful delivery of projects.

Chapter 9 describes a project approach called SixP. This six-step framework provides project teams with the confidence in ensuring that the right project approach is selected, customised, implemented and effectively managed

throughout the project life cycle. This approach was presented to delegates at the 24th IPMA World Congress in Istanbul, Turkey on 2nd November 2010.

Chapter 10 concludes the research with a summary of the key findings, conclusions along with recommendations for future research.

Chapter 11 contains the bibliography listing the documents, journals, books and websites that have been cited in this thesis.

The appendices section is contained in Chapter 12. This includes a rich picture for the SixP framework, Questionnaire survey, Statistical analysis of the results, Summary of the survey results including key themes, raw data from the survey and the keyword analysis results for each year between 1983 and 2010.

2 RESEARCH METHODOLOGY

2.1 Introduction

A flexible and agile system is needed to manage projects. Such a system should:

- Be flexible, adaptable and easy to use.
- Require fewer resources to administer it.
- Be accurate enough to 'model' the environment that the project is being delivered in, so that it promotes better decision-making.
- Provides real-time information so that effective and efficient management decisions can be made.
- Allow for better control of projects, especially projects that are subject to constant change and are operating in uncertain environments.

Projects do not operate in a vacuum and include interactions with many people and groups. They ultimately provide end results in the form of outputs or outcomes for the organisation that is promoting them in the first place. The organisation promoting these projects may be subject to external pressures whereby they require their projects to be delivered sooner than originally planned or may want to cancel these, if business circumstances change.

Once a project is formally launched, it is important the project manager constantly monitors the project in accordance with the environment that it is operating in. Modifications or alterations to project processes must be made to ensure that the project manager has proper and effective control of the project. Having an accurate enough idea of how the project is performing will aid better decision making by the project manager and the project team.

2.2 Scope of the study

The scope of study for this thesis can be explained in context of the 'unknowns andknowns' quotation by Donald Rumsfeld, the Secretary of Defence, under George Bush during 2001 - 2006. His famous quote is as follows:

"There are known knowns; there are things we know we know. We also know there are known unknowns; that is to say we know there are some things we do not know. But there are also unknown unknowns – the ones we don't know we don't know."

On reflection, the Rumsfeld quotation above can be converted into a two by two matrix as shown in figure 2-1.

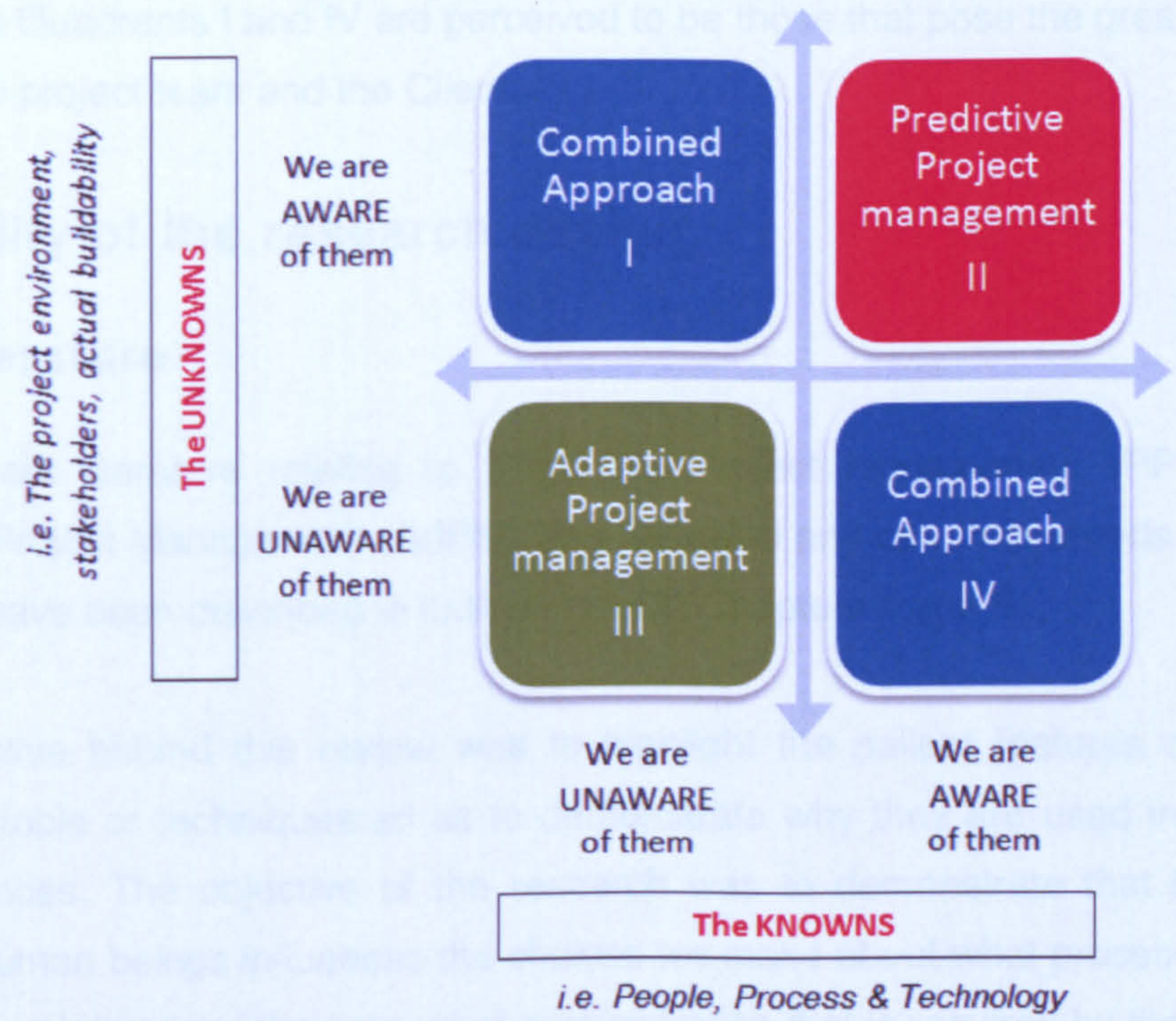


Figure 2-1 The Rumsfeld Matrix

The Rumsfeld Matrix can be used to classify project types. Along the 'knowns' axis of the matrix are things like people, process and technology. The 'unknowns' axis contains things like the project environment, stakeholders and actual buildability,

Quadrant III projects require adaptive project management thinking. For example, a project to create a database to track international criminals could fall under this

category. On the other hand, Quadrant II will require Predictive project management and could include a project to build a single storey house extension.

Then there are those projects that are hard to classify and can be addressed by a combination of the two project management thinking types. These are projects that lie in Quadrants I and IV.

The scope of this thesis deals with projects that fall within Quadrant's I and IV. It attempts to provide answers on how to deal with such projects and how can the project team ensure that they achieve their objectives by delivering the project to client expectations, whilst managing stakeholder and end users appropriately. Projects in Quadrants I and IV are perceived to be those that pose the greatest risk to both the project team and the Client.

2.3 Rationality of the research design

Review of literature

The relevant literature relating to Predictive Project Management (PPM) and Adaptive Project Management (AdPM) was reviewed and certain methods in each category have been described in further detail in Chapters 4 and 5.

The objective behind this review was to highlight the salient features of these methods, tools or techniques so as to demonstrate why they are used in certain circumstances. The objective of the research was to demonstrate that how we think as human beings influences the choices we make about what process to use which in turn influences the amount of administration that is required by the project team.

Method used for the questionnaire survey

It was considered important to also obtain the views from practitioners and academics in order to understand the challenges they faced when involved in project management activity. The main means of obtaining such information was through the use of a questionnaire survey.

An online survey tool (QuestForm) was used which allowed emails to be sent to respondents along with a link to the survey. The results were then imported into excel which made it easier to analyse the data received. It was important to have a questionnaire survey design that was intuitive, easy to follow and that ensured that respondents completed it without avoiding any of the questions.

Method used for the keyword analysis

Another stream of research related to how project management topics have changed over time. To achieve this it was decided to select a well-known journal in the field of project management and to analyse the keywords from individual journals. The keywords from each journal were then counted and ranked and this in turn provided an indication of the popularity of keywords.

For the keyword analysis, the International Journal of Project Management was chosen.

2.4 Research design

Figure 2-2 shows the research design adopted for this thesis. A literature review was conducted of the selected methods that fall under Predictive and Adaptive project management thinking.

For PPM, Gantt Charts, Program Evaluation and Review Technique (PERT), Earned Value, BS 6079 (A Guide to Project Management) and PRINCE2 were reviewed.

SCRUM, eXtreme Programming (XP), Rapid Application Development (RAD) and eXtreme Project Management (XPM) were reviewed under AdPM.

Key similarities and differences were highlighted for all methods.

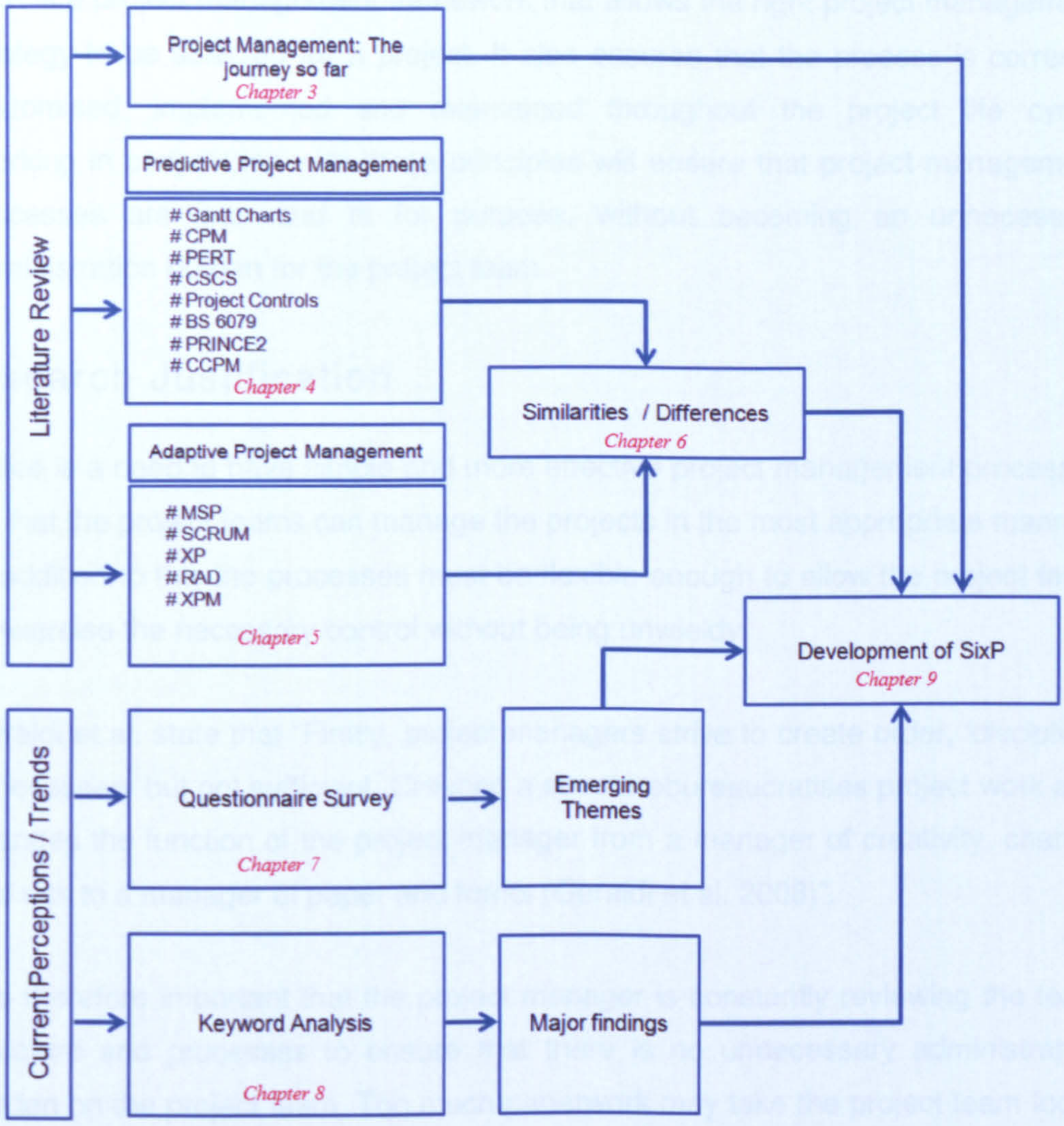


Figure 2-2 Research approach diagram

In addition to the literature review, an understanding of the current perceptions and trends in project management was also carried out. The current perceptions were measured from the results obtained via an online questionnaire survey, which was carried out in 2008. Trends in project management were determined by analysing keywords from journals of the International Journal of Project Management (IPMA). 5,776 keywords (1,863 papers) were analysed spanning a 28-year period between 1983 and 2010.

Emerging themes from the questionnaire survey and the trends noticed from the keyword analysis were then concluded. The survey findings and the keyword analysis in conjunction with the findings from the literature review, have been the catalyst for the development of the SixP framework.

SixP is a project management framework that allows the right project management strategy to be selected for a project. It also ensures that the process is correctly customised, implemented and maintained throughout the project life cycle. Working in conjunction with these principles will ensure that project management processes are lean and fit for purpose, without becoming an unnecessary administration burden for the project team.

2.5 Research Justification

There is a need to have simple and more effective project management processes so that the project teams can manage the projects in the most appropriate manner. In addition to this the processes must be flexible enough to allow the project team to exercise the necessary control without being unwieldy.

Geraldi et al. state that "Firstly, project managers strive to create order, 'discipline' is necessary but not sufficient. Creating a structurebureaucratises project work and changes the function of the project manager from a manager of creativity, change and risk to a manager of paper and forms (Geraldi et al. 2008)".

It is therefore important that the project manager is constantly reviewing the team structure and processes to ensure that there is no unnecessary administration burden on the project team. Too much paperwork may take the project team focus away from effectively managing the project.

There are numerous methods, methodologies, tools and techniques in existence today, which provides greater choice for the project manager. However, despite all of the choices available, projects are still not achieving their objectives and project teams feel frustrated that they cannot exercise proper control over their project due to the unnecessary paperwork.

To see if these views resonated within industry, selected practitioners were asked for their comments, which are described in the following sections.

2.6 Views from industry

"This has been subject to research in previous years, normally as a means of using fuzzy logic etc to provide smart methods of providing project management. The issue is that normally these approaches all increase documentation loading and over complicate the project management process. So leaving many managers working on quite complex projects, using documentation or information management processes that are not suitable for such approaches. It is also interesting to note that in Germany a different approach is used for providing information to clients of large scale and large spend projects, this is also been emulated in China with many of their city development projects. The system is often referred to as Project Administration Management. This is different to your proposal, however as it is still a documentation process, but greatly simplifies the process at strategic management levels, allowing for additional detail to be brought into the process at the operational level.

The key issue here is how to bridge the gap from strategic level and bring this all the way down through the supply chain to the meet the needs of SMES."

Dr Andrew Platten BSc(Hons), PhD, FCIOB

Project Manager, Elevate East Lancashire

"Yes, management of multiple projects is a useful area for research"

Howard John Lambert Parsons B.Eng. MSc C.Eng MCIBSE FSOE FIPlantE MIBC CMC

Project Manager, Cabinet Office

"With regard to your research, I believe it will be very interesting not only because the subject is so big but also because it will mean that you will be researching around a tool that has been developed to help Project Managers. Also you could expand around some areas so that you can introduce originality."

Dr Dimitris Antoniadis PhD MSc BEng(1st Hons) CEng MIMechE MAPM MCMI

Project Manager, Carillion

"Your proposal to develop a more effective system of managing multiple projects is an important aim which could benefit the sometimes over complicated systems in use in our industry.

Any system that is put into use should be easy enough to train and operate for different skills-set and knowledge levels of all those expected to use it, as a 'genius only' system is doomed to failure.

The benefits should be evident and easy to explain from the outset as an investment will need to be made in both cost and man hours which will be needed for change to become a reality.

The real-time element to your proposal will need to rely on a web based database. There will be a cost to set up, use and support this. External users who will expect to use the new system may be expected to pay a fee for this and this may need some form of subsidising or possibly paid for through the project."

Dave Ashton MCIOB

Divisional Construction Director, ISG Interior ExteriorPlc

"I think your research subject is useful and beneficial in all project environments, 'agile' and 'non-agile' alike since there is not enough literature on this incredibly important subject except for Doug Decarlo's famous XPM book and his seminars and lectures. In fact, many XPM practices are just common-sense approaches to solving rapidly changing complex problems. I had been developing many 'fit-for-purpose' IT solutions over the years focusing on simplicity, values and results and always understanding that the change is inevitable. At that time, I did not know anything about agile practices at all, but looking back closely, now I see that is exactly what I had been doing. I think your research topic has a market for it since it will focus more on XPM practice than XPM theory."

Keith Gunaratne BSc(Hons) CEng., MICE

Consultant, Turner & Townsend

"Your chosen subject area is undoubtedly interesting to those who oversee projects or indeed project management functions. Your ambition of finding a balance between appropriate project control mechanisms and unnecessary bureaucracy is laudable and your aim of optimising the administration burden is a mission that could be likened to searching for the Holy Grail of project management. I would add that other project control techniques fail to strike the right balance - for example the Prince2 methodology offers exemplar project control but can easily increase project administration to uneconomic levels. It should be recognised that project management services must be commercially viable to remain attractive to clients making the drive for optimal control techniques ever more relevant.

I would be interested in finding out more, in particular the view of client organisations as any project inevitably takes its lead from the employing authority.

As one who oversees and implements project management activities, I am sure that I could benefit from your proposed research, as none of us has all the answers!"

Keith Butler MSc

Project Director, Lend Lease Projects

2.7 Hypothesis

The research hypothesis is as follows:

"Extreme Project Management principles can reduce project bureaucracy when compared to traditional project management methods."

The hypothesis will be tested against the feedback received from the questionnaire survey and the findings of the literature review.

2.8 Limitations

This research focuses on the best use and implementation of the appropriate project management processes in order to achieve the objective of successful delivery. It relies on having the right calibre and capable project team members, without whom the process implementation may not provide the desired benefits.

2.9 Key Assumptions

Projects are only successful due to the positive interaction of the individuals that form the 'project team'. The key assumption here is that the success and failure of

the project depends on the use of appropriate resources that have high levels of emotional intelligence.

Emotional intelligence can be defined as follows:

"The ability to monitor one's own and others feeling and emotions, to discriminate among them, and to use this information to guide one's own thinking and actions (Salovey & Mayer 1990)"

In addition to emotional intelligence, the team will have the requisite project management knowledge and be able to make common sense judgments rather than blindly follow a process for the sake of doing so.

It is challenging if not difficult to describe detail work sequences in elaborated processes for the team to follow. The team must be empowered to make some decision themselves.

The process is a guide for team members to follow and not an exact step-by-step guide to executing their tasks. Individuals must have the freedom and liberty to execute their tasks, whilst respecting the overall project timetable.

Therefore the key assumptions for this research are:

- Good quality people who have a good balance of hard and soft skills (i.e. emotional intelligence).
- Good project management awareness and appreciation of its fundamental principles.
- The ability to have a sense of perception and be able to 'read between the lines' in order to make decisions rather than using logic.

3 PROJECT MANAGEMENT: THE JOURNEY SO FAR

3.1 The structure of knowledge

New discoveries are being made as human beings learn more about their existence on planet Earth. New theories are developed as we become more aware and we put these into practice to gain more knowledge.

Theory and practice go together like hand in glove. This was demonstrated, by those practitioners and academics that took part in the 2006 initiative by the UK Government to look into better working between these two groups (Winter, Cooke-Davies & Cicmil 2006). New discoveries lead to more methods or theoretical constructs for understanding behaviour of projects. Our knowledge is increasing all the time, what we once knew about project management in the early 1960s is much different to what we know in the present era.

Some important principles never change but the manner in which they are applied changes over time. For example, in the early 1960s there was great emphasis on planning work to a very high degree of detail and then controlling the project according to these planned activities. This concept is still used today in the construction and engineering industries, as it also suits the nature of how business in conducted in this particular sector.

Figure 3-1 shows the structure of how knowledge is created for a particular subject.

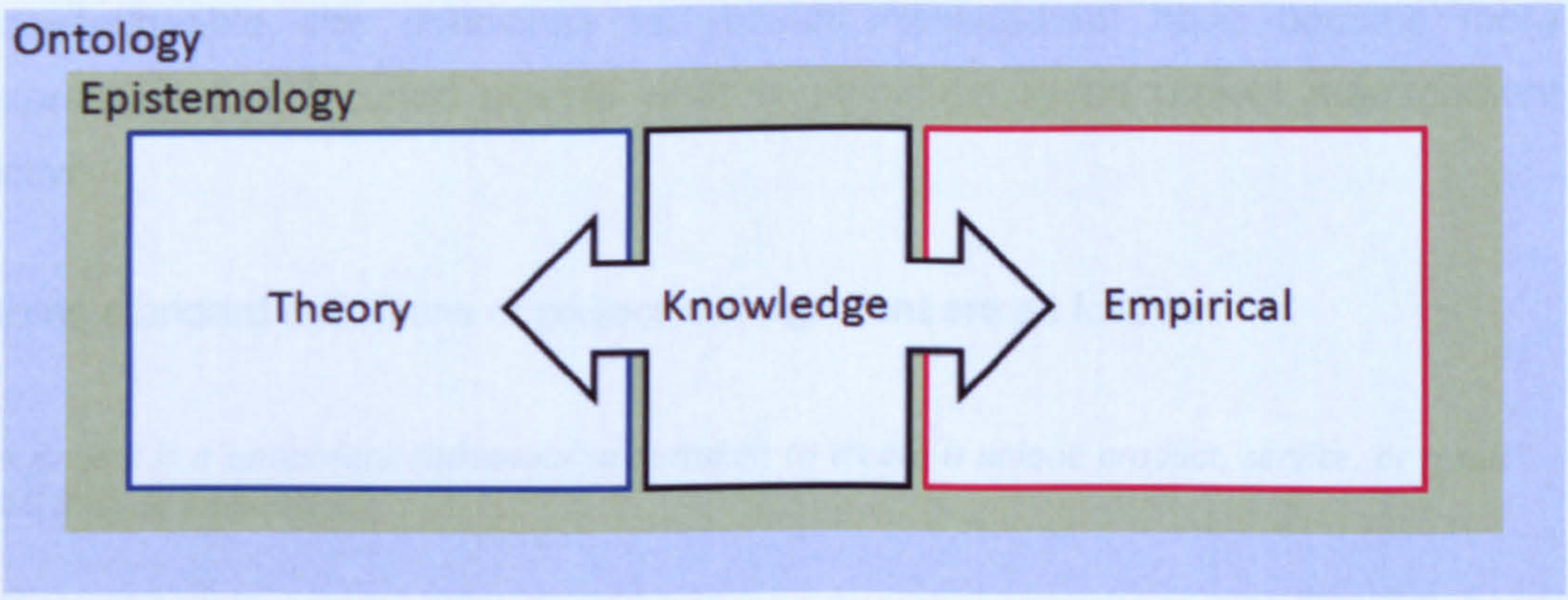


Figure 3-1 Structure of Knowledge

Our knowledge increases as we test out our theories and get good feedback from results as we apply them in the practical world. The better the results, from implementing our theories in practice, provides encouragement for developing further theories. Whilst our knowledge increases there will always be a small amount that we will not know. Epistemology a branch of philosophy, which looks into the structure of knowledge and how it is attained, structured and interpreted. Within project management, knowledge comes from individuals and teams and at the end of the project, the team is disbanded as they are mobilised to another project.

Epistemology sits within ontology. Ontology is a branch of philosophy that looks into the existence of an entity.

Therefore project management has primarily developed from theories and practice.

3.2 Characteristics of projects

Projects have a defined start and end and must achieve an end goal or objective. They normally involve a team of people and the number and size of the team is dependent upon the size of the challenge presented to them.

Van Der Merwe suggests that project management brings together a team of people from diverse levels of education, social backgrounds, religions and experience to form a coercive group that can reach the objectives put to it in an efficient and effective manner (Van Der Merwe 2002).

Project management has evolved over the years and as we have become more knowledgeable, the definitions for project management have become more expressive and focused around what is perceived to be project management activity.

Some standard definitions of project management are as follows:

"A project is a temporary endeavour undertaken to create a unique product, service, or result" – PMI Body of Knowledge

"A management environment that is created for the purpose of delivering one or more business products according to a specified Business Case" – PRINCE2

"A project is a temporary endeavour undertaken to create a unique product, service, or result" – APM Body of Knowledge

"A set of coordinated activities, with a specific start and finish, pursuing a specific goal with constraints of time, cost and resources" – International Standards Organisation (ISO 8402), (Nokes & Kelly 2007)

"Any management activity that introduces a new objective or causes change and has a definite start and finish time is a project" – BS 6079: A Guide to Project Management

"A project can be considered to be the achievement of a specific objective, which involves a series of activities and tasks which consume resources. It has to be completed within a set specification, having a definite start and end dates" – (Munns & Bjeirmi 1996)

"Project management can be defined as the process of controlling the achievement of the project objectives" – (Munns & Bjeirmi 1996)

"A project is a human activity that achieves a clear objective against a time scale" – (Reiss 1993)

"The art and science of converting vision into reality" – (Turner 1996)

All these definitions help to understand that projects provide end results and have to be performed within certain predetermined measures of cost, time and performance.

All the definitions for project management above have highlighted the fact that they involve teams of people working together on a temporary basis. The team works in a coordinated manner and have cognisance of the interactions of people around them. The team operates as a homogenised entity and works towards a common goal. Project management activity requires a constant balance of trade-offs between competing demands and it is against this backdrop that the project must be ultimately delivered. A degree of planning goes into delivering projects and the plan is used to structure team size but it cannot be used blindly as the environment within which the project is being delivered, will be subject to change and uncertainty.

Projects involve the interactions of people. Henrie & Sousa-Poza state that, "projects include people which work cooperatively together toward a common goal,

within an established time frame, and within an established budget to produce identifiable deliverables (Henrie & Sousa-Poza 2005)"

Projects also take up investment, in terms of resources and cost and therefore the objective of most projects is to complete it as practically possible. This is especially true of organisations that are in the business of promoting many projects which are all part of an overall business strategy. An example of such a client is BAA (British Airports Authority). BAA need to maintain their airports and are in a continual process of updating their assets through promoting a series of projects of varying sizes and values.

Figure 3-2, diagrammatically described from (Leach 2005), shows that investments are absorbed at the beginning and a return on investment is provided at the end of the project duration. Therefore the goal is to complete the project as soon as possible.

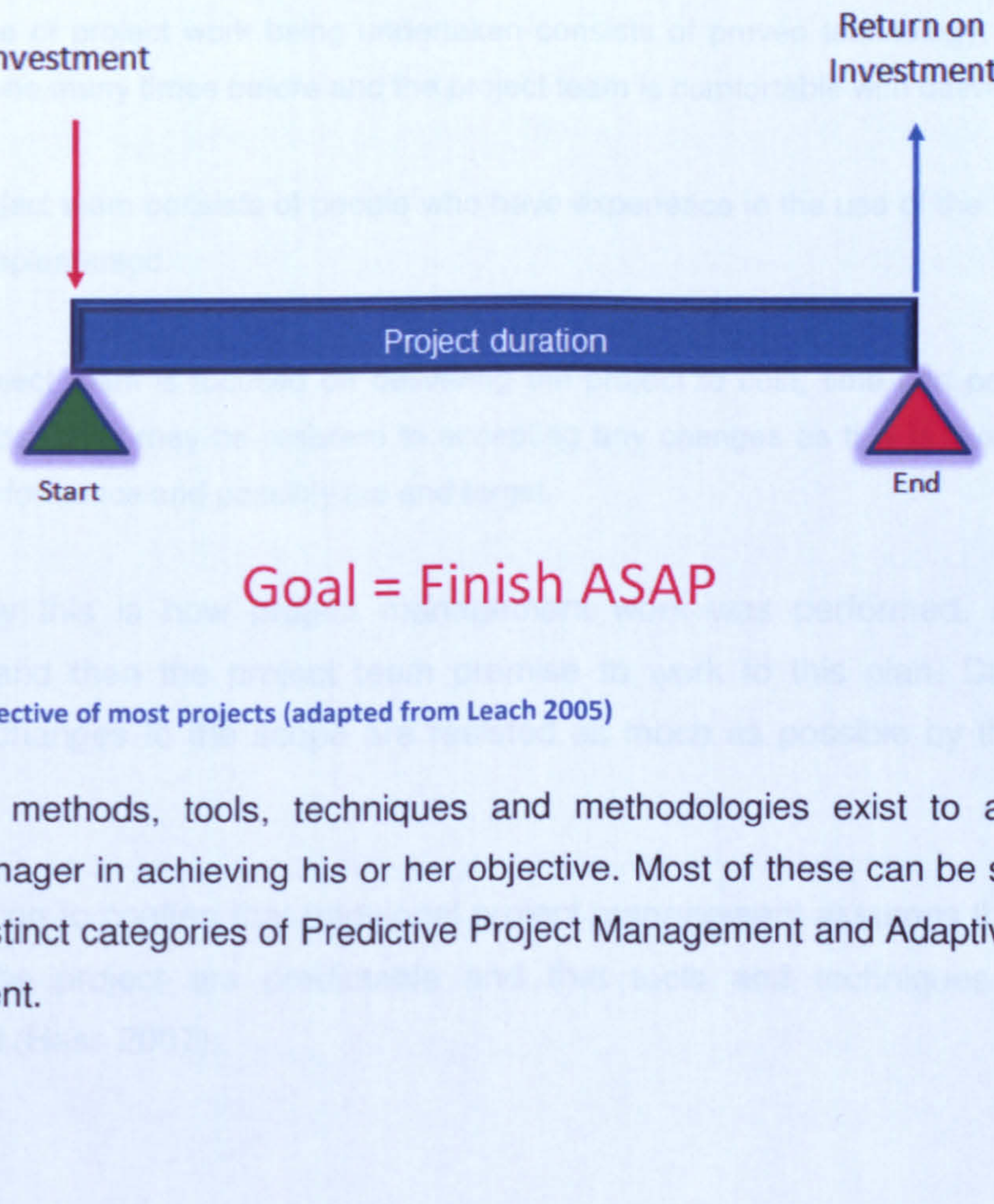


Figure 3-2 Objective of most projects (adapted from Leach 2005)

Numerous methods, tools, techniques and methodologies exist to assist the project manager in achieving his or her objective. Most of these can be separated into two distinct categories of Predictive Project Management and Adaptive Project Management.

3.3 Predictive Project Management (PPM)

This type of project management thinking predominately relates to creating a 'plan' and then 'working to the plan'. If any changes are encountered along the way they are factored into the 'plan'. This type of project management has been around since project management started as a recognised profession.

This type of project management thinking assumes the following:

- The work activities that need to be carried out can be planned accurately.
- The project team works in accordance to what is detailed on the plan and does not perform any other work items not included in the plan.
- Changes to the scope of work will have to be agreed and the project team will only act on this additional scope when instructed to do so.
- The type of project work being undertaken consists of proven technology, which has been done many times before and the project team is comfortable with delivering it.
- The project team consists of people who have experience in the use of the technology being implemented.
- The project team is focused on delivering the project to cost, time and performance standards. They may be resistant to accepting any changes as this is likely to affect their performance and possibly the end target.

Traditionally this is how project management work was performed. A plan is produced and then the project team promise to work to this plan. Due to this mentality, changes to the scope are resisted as much as possible by the project team.

Hass goes on to confirm that traditional project management assumes that events affecting the project are predictable and that tools and techniques are well understood (Hass 2007).

This method of thinking was suitable for the business environment within which projects were being delivered between the 1930s and 1990s. However as businesses had to change and adapt to the faster demands of their customers, projects too had to change. No longer is it possible to spend a huge amount of time in planning and working out what has to be done. The increasing demand for new products is placing new pressures on the project team to deliver end results faster and possibly sooner than planned.

This was particularly the case in the IT industry where development teams have to turn-around software projects quickly and to the right quality as the demand for IT projects is increasing.

In the construction industry, the traditional approach is still the modus operandi. This is largely due to tradition and the nature of procurement of construction projects. Project work is normally tendered for and won in competition with other organisations. The work that needs to be executed is normally contained graphically in a schedule. The schedule then becomes the 'plan' and the project team are then entirely focused on executing all works detailed on this plan. If they do not deliver all the activities in the plan, then the team can be criticised for non-performance. This method of working to a plan has made it possible for the traditional project management approach to flourish within the construction and engineering industries.

3.4 Adaptive Project Management (AdPM)

In AdPM the final solution is progressively delivered through a series of outputs delivered through shorter durations known as iterations. This method has emanated from the IT industry and is mainly used for the delivery of IT and software development projects.

This type of project management thinking provides more flexibility whilst still providing a framework for monitoring and controlling the project. Also known as agile, Highsmith, describes it as, "Agile development focuses on speed, mobility and quality. To accomplish this, individuals and teams must be highly disciplined – but with self discipline rather than imposed discipline (Highsmith 2004)."

Virine goes on to describe Adaptive Project Management as "learning by doing" (Virine 2008).

AdPM assumes the following:

- The entire scope of the project cannot be planned due to the uncertainty and the number of unknowns. The scope of work is broken down in terms of a list of features that represent the final product. These features are grouped together and prioritised. Once completed they are further developed in short iterations of a few weeks. The work of the team is reviewed after each iteration and based on successful completion, a further iteration is planned and executed. Working in this manner allows the team to navigate through to the end of the project.

- The team is very capable and possess soft skills i.e. emotional intelligence in order to perform their routine tasks and work with fellow team members.

- The project team is highly disciplined both as a cohesive team and as individuals.

- Changes are taken into account as the project progresses and as they appear. For this reason the team does not complain when a change affects the project.

- The emphasis is on face-to-face communication with minimal amounts of written procedures or processes.

AdPM isn't a licence to create anarchy on a project by not having elaborate plans but a very innovative method of dealing with fast track projects that are in volatile environments and subject to constant change. This method of thinking is ideal for today's business environment where the demand for the end product is high and projects must be executed accurately and delivered well before the due completion date.

3.5 The Project Environment

Projects do not exist in a vacuum. There are many interactions with many different groups of people who may or may not have the same interest in the project.

Artto & Wikstorm suggest that "our overall analysis strengthens the view that projects are part of overall business and a central part of the development,

strategic sight and maintaining of the firm's competiveness (Artto & Wikstorm 2005)".

Projects therefore provide an end result that is considered important for any organisation; public or private sector. Projects are vital to the successful operation and survival of any organisation. All organisations have their own unique internal environment, which in turn interacts with the external environment. Figure 3-3 shows this in diagrammatic view.

The external environment applies pressures on the organisation and the organisation's internal environment applies an equal and opposite pressure in order to survive.

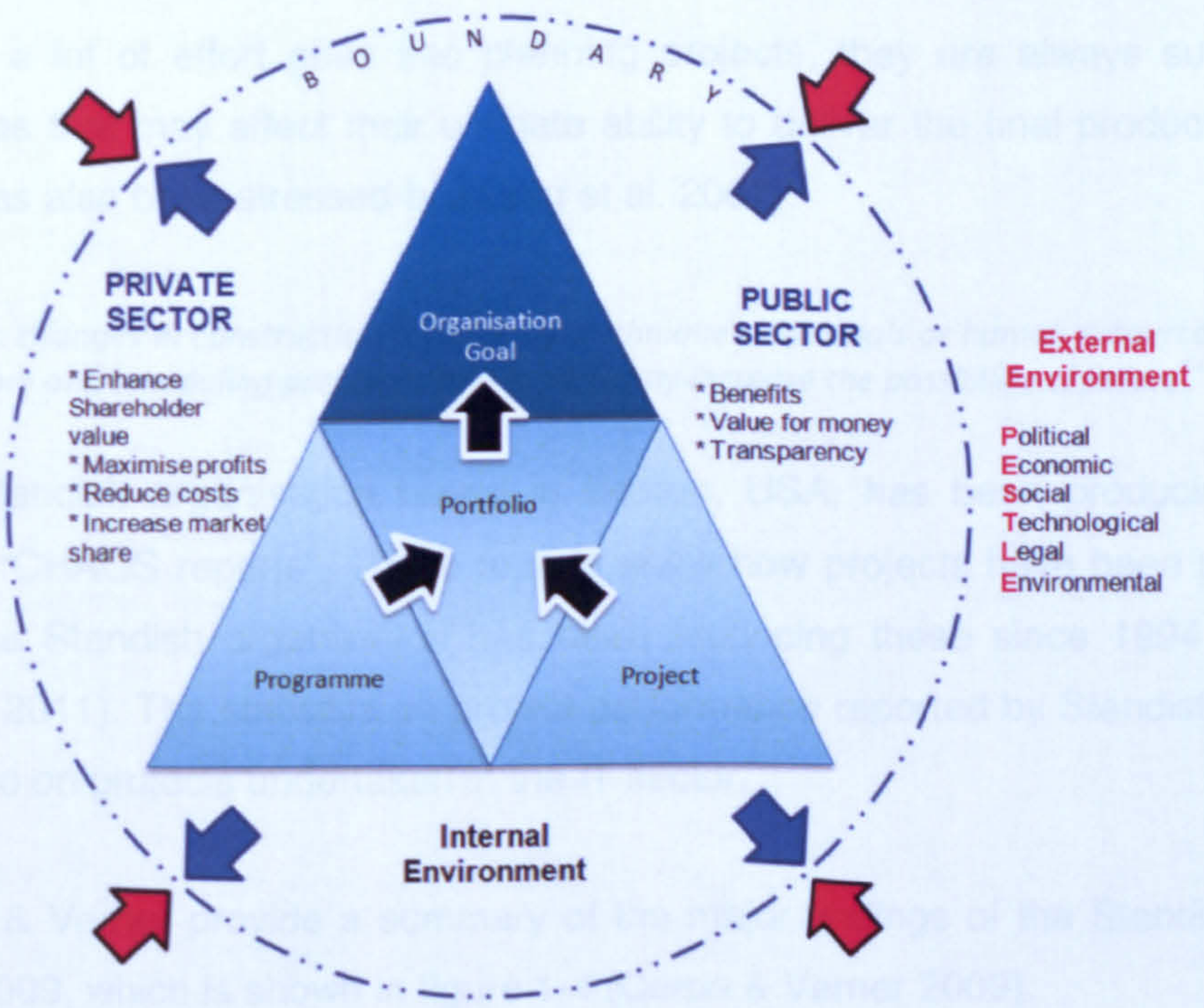


Figure 3-3 The 'business' environment

All projects, whether grouped together as programmes or portfolios add value to the operations of the business. In this manner the business achieves its objectives of either greater profitability or greater social benefits depending upon its sector specifics, i.e. public or private sector.

Today's business environment is more dynamic and complex due in part to the affects of globalisation and more trade with international markets. Therefore in order to effectively deliver, the project team must be more innovative, knowledgeable and equally dynamic.

In a dynamic business environment the project team must be capable of anticipating challenges and opportunities, meeting stakeholder expectations and ensuring that the 'right' type of work is being executed that is constantly adding value and ultimately delivers the desired end product.

3.6 Project performance

Success and failure rates in project management vary from industry to industry.

Whilst a lot of effort goes into planning projects, they are always subjected to changes that may affect their ultimate ability to deliver the final product or result. This has also been stressed by (Zeng et al. 2007):

"Sudden changes in construction technology, techniques, materials or human resources can create budgetary and scheduling pressures that in turn may increase the possibility of failure."

The Standish organisation based in Boston, USA, has been producing reports called "CHAOS reports". These reports show how projects have been performing and the Standish organisation has been producing these since 1994 (Standish Group 2011). The statistics on project performance reported by Standish is mainly focused on projects undertaken in the IT sector.

Cerpa & Verner provide a summary of the major findings of the Standish reports from 2009, which is shown in figure 1-4 (Cerpa & Verner 2009).

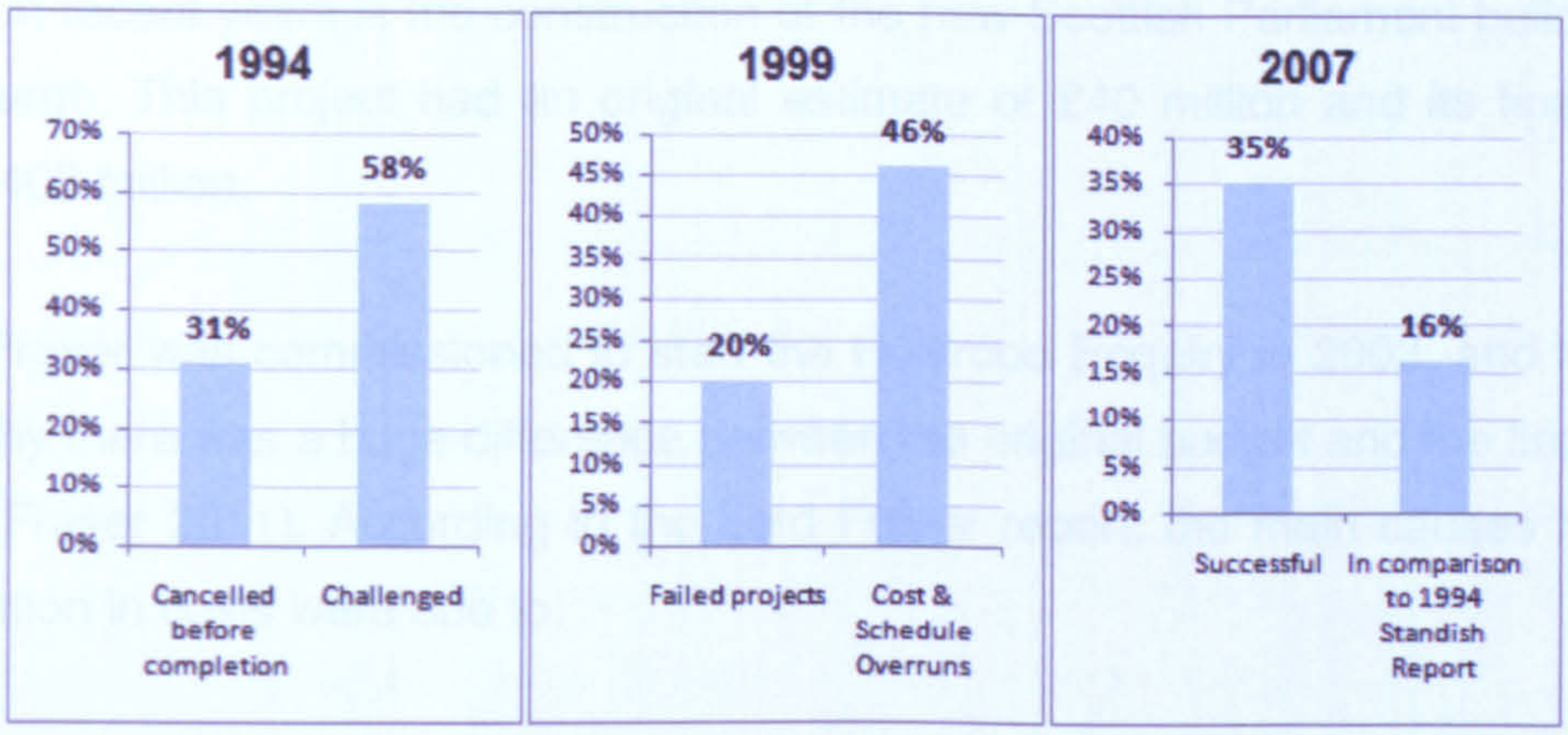


Figure 3-4 IT Project success rates according to (Cerpa&Verner 2009)

From figure 3-4, it can be seen IT projects have been challenged with cost and time overruns including cancellation of projects altogether.

One of the most high profile IT project failures in the UK has been the Taurus project. This project was commissioned by the London Stock Exchange to modernise the trading and regulatory framework of the entire securities industry. On 11th March 2003 it was cancelled after the city had invested 5 years and £500 million in this project (Drummond 2003).

In the UK, the National Audit Office (NAO) produces various reports on a whole range of Government projects (NAO 2011). The reports produced by the NAO are very detailed but only contain a review of public sector projects.

It is difficult to obtain more accurate data about project performance in the private sector as this information is considered commercially sensitive and not available for general inspection. No one likes to talk about their project and in particular highlight their failures.

It is therefore important that not too much reliance is placed on such sources as generalisations can sometimes leads to different conclusions. Having said this, it does provide an overall picture that most projects are challenged in a variety of ways.

Projects are mutli-dimensional and they are also surrounded by politics especially high profile public sector projects. One of the many projects that have received bad press in recent years is the construction of the new Scottish Parliament building in Edinburgh. This project had an original estimate of £40 million and its final cost was £400 million.

Lord Fraser was commissioned to start the Holyrood Enquiry in 2003, and looked into why there was a huge difference between the original budget and the final cost (Lord Fraser 2011). According to the Lord Fraser report, the main causes for the escalation in costs were due to:

a) Having an unrealistic budget to start with.

b) Changes to the project manager during implementation.

c) The use of construction management as a procurement method.

d) Mismanagement within the client organisation.

Whilst the findings from the Holyrood Enquiry were pertinent to that project, these factors (a & d only) are common with other projects that have become victim of failure and disaster.

According to Anderson & Merna, projects tend to fail with poor management at the front-end during strategy formulation rather than poor downstream execution (Anderson & Merna 2003).

To further highlight some of the most high profile projects that failed in terms of good project management control, (Munns & Bjeirmi 1996) state that:

"There are many examples of projects which were relatively successful despite not being completed on time, or being over budget, e.g, the Thames Barrier, the Fulmar North Sea Oil Project and Concorde, all of which turned out to be relative successes, even though the project control aspect of them failed."

(Thomas & Mengel 2008) also emphasis that there is no empirical evidence that 'trained' project managers are better at delivering projects that 'accidental' project

managers, especially in the current complex world within which these projects are being delivered.

3.7 Dealing with complexity and difficult projects

Changes in project management practice have been shaped by the simultaneous changes in the business landscape. For example, in the 1930s business pressures were different to what they are today. Globalisation has opened the frontiers of business allowing trade to be conducted in countries across the globe. Demand for products and services has increased and as a result the need for speedy delivery is increasingly becoming a major challenge for most businesses.

(Wiedemann & Jantzen 1999) state that

"Because of the competition in today's global economy enterprises in the capital-goods industry are increasingly compelled to manufacture their product innovations as quickly as possible, in other words minimise the time to market"

Therefore in the 21st century there is a need for faster delivery times so that businesses can deliver products or services in order to survive and remain competitive.

3.8 Project Management Timeline

Large-scale developments have been built ever since humans have occupied planet Earth. The Pyramids in Egypt and the Great Wall of China are just two examples that demonstrate the results of human endeavours and achievements (Geraldi et al. 2008). These well known landmarks required a great amount of planning and control in order to make them a reality and to be admired by generations of people.

Project management was developed out of US military projects like the Manhattan project, which was responsible for the development of the atomic bomb (Meredith & Mantel 1989). Later private companies sought to use these techniques and they were used for the aircraft engine development by General Electric and Pratt & Whitney. The earlier development of project management has its beginnings in post World War II America (Crawford 2002).

Since its early beginnings, project management thinking has moved from construction and engineering industries to others. This is confirmed by Turner, who comments that project management once used in construction, aerospace and engineering is now moving to other industries like, Financial services, IT and Education. Projects have become the mechanism by which 'business change' can be brought about in organisations (Turner 2003).

Figure 3-5 shows an indicative timeline of key historical moments, events that led to the advancement of project management knowledge and key project management achievements. In addition to this it also contains aselection of world events in order to provide some context to these dates. The timeline shows the development & formation of, tools, techniques, professional bodies and methodologies that have helped in promoting the project management profession.

Whilst the majority of textbooks start with the discoveries made by the US Government and US organisations, the person that really made a startling discovery in the field of project management was Karol Adamiecki (Marsh 1975).

Karol Adamiecki, a Polish economist, engineer and management researcher first developed the concept of the harmonogram in 1896. The harmonogram was quite an innovative method of producing a timeline showing the critical path and the links with proceeding and preceding activities for a production environment. Adamiecki's work can be considered as the basis for the development for the American discoveries of Gantt Charts, CPM and PERT.

Frederick Taylor introduced the idea of scientific management in 1911, where tasks given to people could be managed and controlled. Taylor introduced the concept that maximum prosperity can only exist as a result of maximum productivity (Taylor 1967). Taylor observed bricklayers for 18 months and managed to reduce the number of steps in the process of laying bricks from 18 to 5 steps (Handy 1993). Taylor's central concern was with the efficient performance of the physical activities required to achieve an organisation's purpose (Stacey 2007).

Henry Gantt developed the Gantt Chart in 1914 and this method was used for the construction of the Hoover Dam and the Interstate Highway in the USA. The Gantt

Chart was instrumental in significantly reducing time to build cargo ships during World War 1(Burke 1992).

Critical Path Method (CPM) was developed by Remington Rand Univac in 1957. An algorithm was developed to be run on a computer called the UNIVAC -1 and was successfully used for the construction of a chemical factory in 1958. CPM allows activities to be logic linked and by working out the start and finish times in the entire network the overall critical path can be worked out. The critical path defines the overall duration of the project as any delays to this path can delay project duration.

The US Navy and Booz Allen Hamilton were working on the Polaris Submarine Program and devised Program Evaluation and Review Technique (PERT) in 1960. The activity durations in relation to CPM were seen deterministic and the major benefit was that PERT allowed for the three point estimates to be used for activity durations. This provided more probabilistic activity durations in critical path calculations.

In 1965 a group of innovative professionals created a forum whereby professionals could meet and share experiences. The result was the formation of the International Project Management Association (IPMA). This is an umbrella organisation and currently has 50 member associations from countries around the world. An annual World conference is held along with regular workshops and certifications programmes for project professionals (IPMA 2011).

Earned Value was developed by the US government in 1967. It was originally called CSCS (Cost and Schedule Controls System) and integrated the schedule and cost information through the project scope. The integration of cost and time allowed better control and management of projects.

In 1969, a group of people got together in Philadelphia, USA, and created the idea for a professional body for project management. The result of these discussions led to the formation of the Project Management Institute (PMI). Today the PMI has over 500,000 members worldwide and member organisations in 185 countries across the world. The PMI provides 12 certifications for project management

professionals, has specialist chapters where professionals meet and exchange ideas and also has annual conferences (PMI 2011).

The Association for Project Management (APM) was originally formed in 1972. At the time it was known as INTRENET UK and in 1975 changed its name to the APM. The APM currently has 17,500 members worldwide with 500 corporate members and joined the IPMA in September 2009 (APM 2011).

The Australian Institute of Project Management (AIPM) was formed in 1976 and currently has 9,793 members. As a professional body it too provides certification programmes for project managers and is active in promoting project management in Australia (AIPM 2011).

Dr Eliyahu Goldratt developed Theory Of Constraints (TOC) in 1985. This method was originally devised to solve production problems in a manufacturing environment.

Rapid Application Development (RAD) is an agile method for delivery of software development projects was devised and developed in 1991.

In 1991, another agile methodology called SCRUM was developed.

The Standish Group, based in Boston, Massachusetts was formed in 1985 and has been providing CHAOS reports on IT projects since 1994. Every year they publish their findings, in which they provide statistics about IT project failures and successes.

In 1996, Central Communications & Telecoms Agency (CCTA) devised PRojects IN a Controlled Environment (PRINCE) (OGC 2011). This methodology was originally developed to help deliver IT projects. The CCTA then subsumed with Office of Government Commerce (OGC) in 2000 (OGC 2005).

Another agile method for IT development projects called eXtreme Programming (XP) was developed in 1996.

The OGC developed the first edition of Managing Successful Programmes (MSP) in 1999. This was a standard for programme management to be primarily applied for Government programmes. The premise of MSP being that programmes produce outcomes and that projects produce outputs (OGC 2005).

The APM launched the 4th edition of the Project Management Body of Knowledge in 2000.

In 2002, a group of individuals met to discuss the challenges facing the delivery of IT software projects. The consensus was that traditional project management methods were not entirely applicable to IT software development projects and that a new approach was required. The result was the formation of the Agile Manifesto. Signatories to the manifesto agreed to promote the use of the 12 principles that help improve software project delivery through the better use of process, empowerment of people and better decision-making. There was recognition that in order to deliver software projects faster compromises in the formality of process administration needed to be made.

The OGC launched another publication in 2002 called Management of Risk (MoR) as best practice guidance for risk management of public sector projects (OGC 2002).

Following the signing of the Agile Manifesto, Doug DeCarlo, devises eXtreme Project Management (XPM) in 2004 (DeCarlo 2004). This methodology can be used for projects that are fast moving and subject to uncertainty.

In 2005, Australian, UK and US Government bodies and thedefence industry commenced an initiative to successfully deliver complex projects. In 2007, the International Centre of Complex Project Management (ICCPM) was formed, formerly known as College of Complex Project Managers (ICCPM 2011). The ICCPM believes that whilst traditional linear project management is necessary it is insufficient for managing complex projects. It provides access to education, research and development in the field of complex project management.

The APM revised their Body of Knowledge and in 2006 launched the 5th edition.

In 2008, Critical Chain Project Management (CCPM) based on Theory of Constraints (TOC) thinking was formally acknowledged as a planning technique by PMI. In the same year the 4th edition of the Body of Knowledge is released by the PMI.

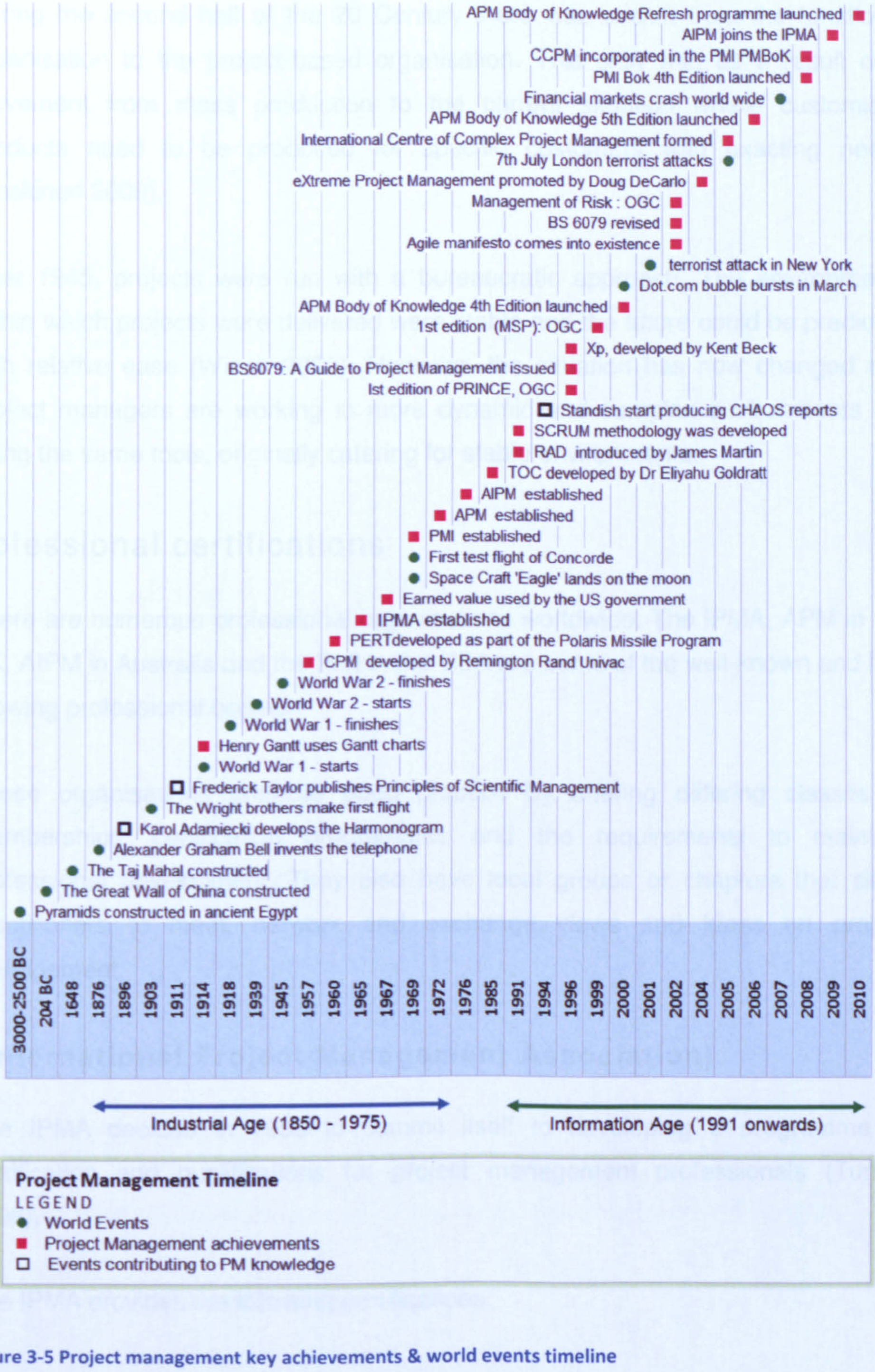


Figure 3-5 Project management key achievements & world events timeline

In 2009, the AIPM joined the IPMA as a member organisation (AIPM 2011).

Currently the APM is busy with a refresh of its Body of Knowledge and this should be issued later this year.

During the second half of the 20 Century there was a shift from the functional organisation to the project-based organisation. This shift was as a result of a movement from mass production to the current situation where customised products need to be produced for specific customers with exacting needs (Koskinen 2009).

After 1945, projects were run with a bureaucratic approach. The environments within which projects were delivered were stable and the future could be predicted with relative ease (Winch 2002). However, the situation has now changed and project managers are working in more dynamic and complex environments but using the same tools, originally catering for stable environments.

3.9 Professional certifications

There are numerous professional organisations worldwide. The IPMA, APM in the UK, AIPM in Australia and the PMI in the USA are some of the well-known and fast growing professional bodies.

These organisations promote good practice by offering differing classes of memberships, certification programmes and the requirements to maintain professional development. They also have local groups or chapters that allow practitioners to meet, network and exchange views and ideas on project management.

IPMA (International Project Management Association)

The IPMA decided in 1995 to commit itself to developing a programme of certification and qualifications for project management professionals (Turner 1996).

The IPMA provides the following certifications:

- Level D - Certified Project Management Associate.
- Level C - Certified Project Manager.
- Level B - Certified Senior Project Manager.

- Level A - Certified Projects Director.

APM (Association for Project Management)

The APM provides the following certifications:

- Introductory Certificate.
- APMP (Association for Project Management Professional).
- Practitioner Qualification.
- Certificated Project Manager.
- APM Project Risk Management Certificates.

The certifications by APM can be mapped back to the competency standards generally promoted by the IPMA.

AIPM (Australian Institute of Project Management)

AIPM offers the following competency standards for project managers:

- Certified Practising Project Practitioner.
- Certified Practising Project Manager.
- Certified Practising Project Director.

The standards can be mapped back to the competency standards of the IPMA.

PMI (Project Management Institute)

The PMI provides five certification programs, these are:

- Certified Associate in Project management (CAPM).
- PMI Risk Management Professional (PMI-RMP).

- PMI Scheduling Professional (PMI-SP).
- Program Management Professional (PgMP).
- Project Management Professional (PMP).

The most innovative aspect of the PMI certification program is that once an individual is certified, they have to keep up-to date with the latest developments and record their hours as PDUs (Professional Development Units). Certification holders are required to renew their certification at the end of three years. A record is entered online by practitioners and managed by the PMI. This promotes life long learning in a proactive manner, rather than just entering course details for the sake of doing so.

Like other professional bodies, the PMI has produced a large number of guidance documents for the project management community (PMI 2006).

The PMI is constantly looking at ways to improve access to project management information to its membership and later this year it will be launching a new qualification called PMI Agile Certified Practitioner (PMI 2011).

Membership at a glance

Figure 3-6 shows the membership profile of the three most significant professional bodies i.e. AIPM, APM and PMI.

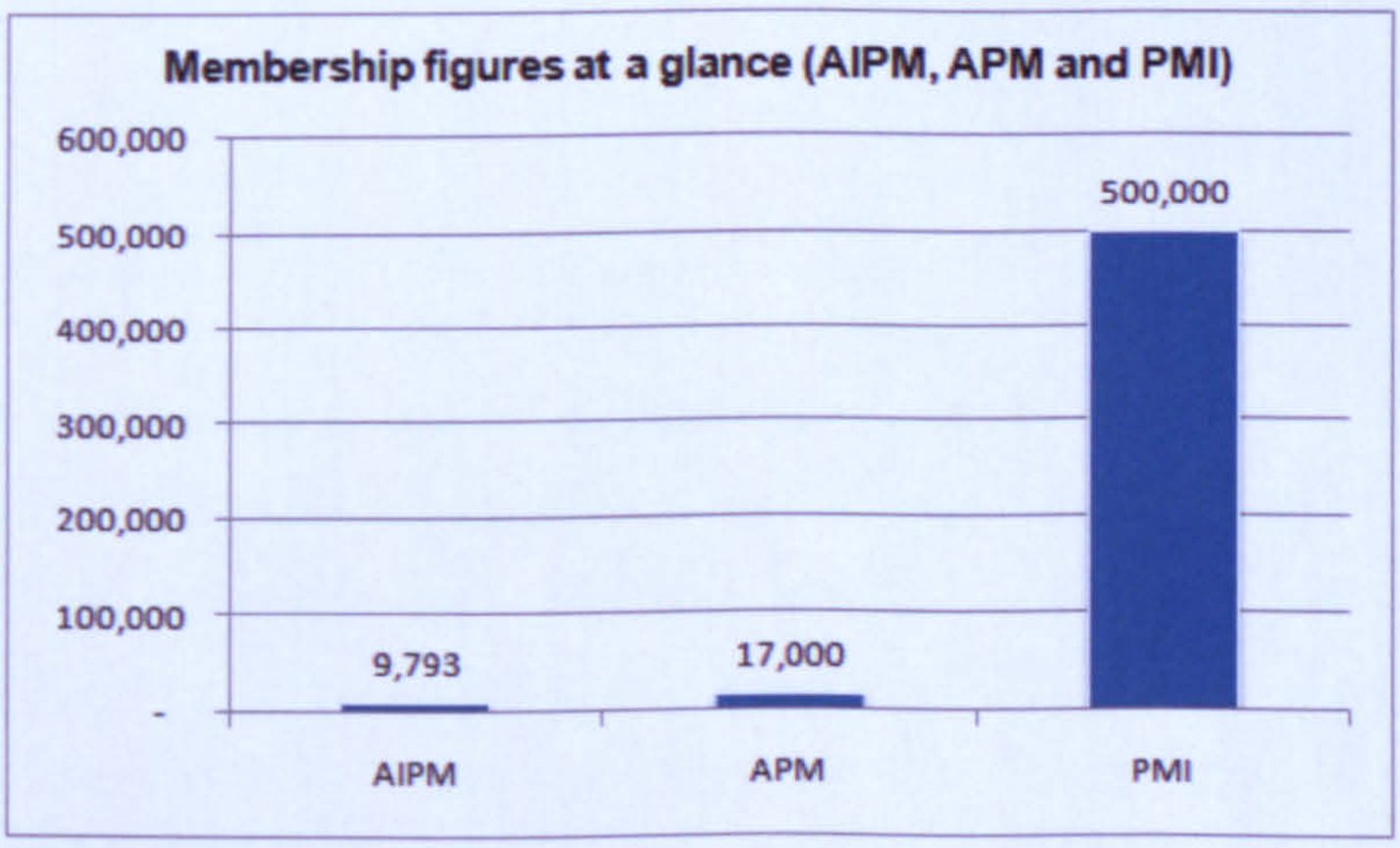


Figure 3-6 Membership numbers of AIPM, APM and PMI

As can be seen, the PMI has the most professional members in its organisation with 500,000 members worldwide.

Summary of Professional Standards

Professional standards are vital for the individual. It ensures that the basics and fundamental principles of project management are understood so that when an individual is assigned to a project, he or she will be better equipped and able to perform tasks.

The numerous associations and institutes for project management are all promoting their own standards. These essentially have the same and single objective in mind, to educate the project management community. A summary of the main certification programmes being offered by the PMI, APM, IPMA and AIPM is shown in figure 3-7.

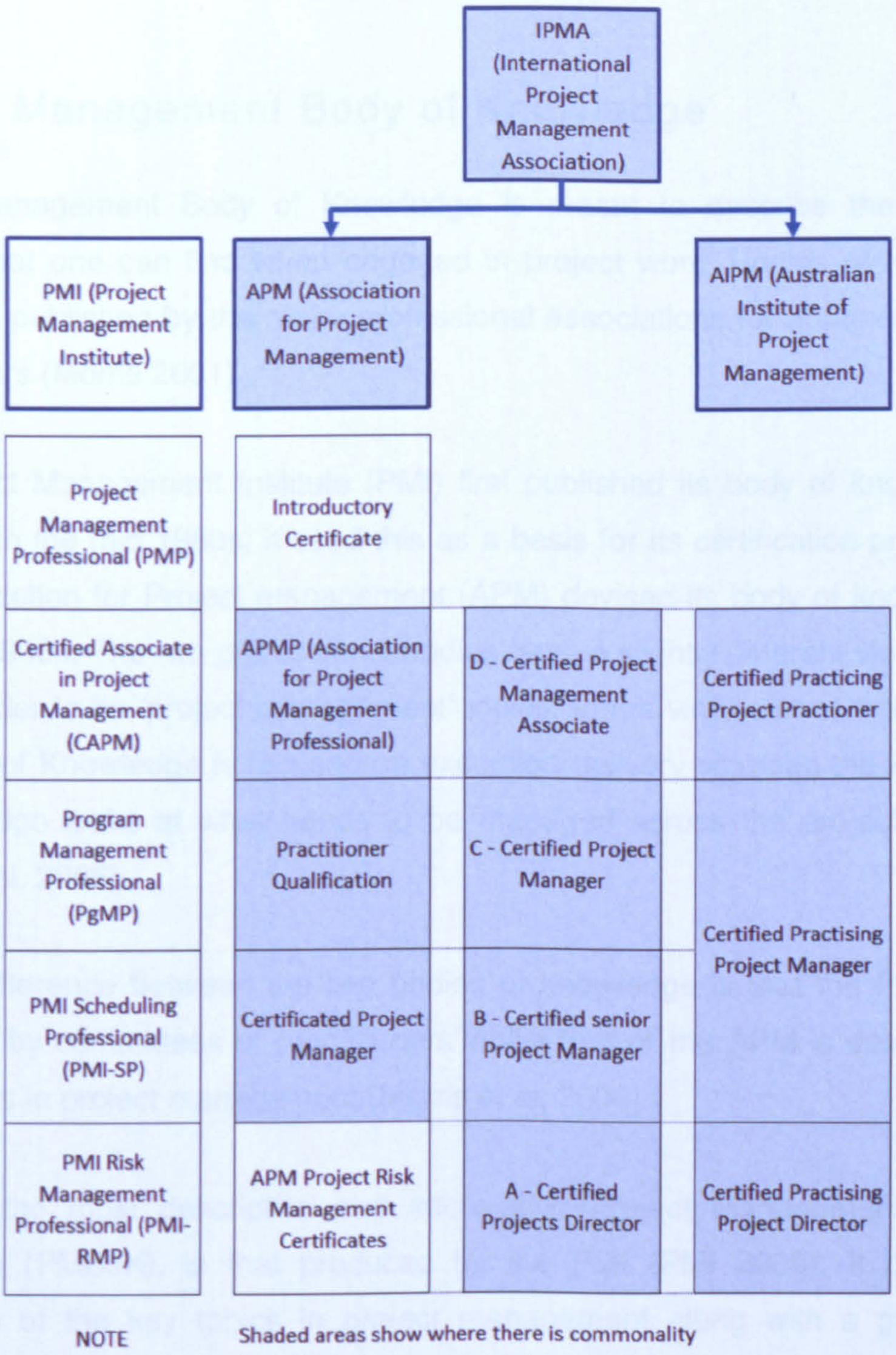


Figure 3-7 Overview of some of the Project Management Professional Standards

Professional certification forms an important part of the development of the project manager's career. It provides the individual with a toolset that can be used when exposed to project management activity. However, it merely provides the project manager with the basic fundamental principles. It is still up to the project manager to use his or her common sense and to apply these principles to the situation that the project manager is faced with.

Currently very little is known on how this gained knowledge through certifications is being used in real situations in order to accomplish work (Chen & Partington 2006).

3.10 Project Management Body of Knowledge

Project Management Body of Knowledge is meant to describe the range of subjects that one can find when engaged in project work. Bodies of Knowledge have been published by the major professional associations for approximately the last 20 years (Morris 2001).

The Project Management Institute (PMI) first published its body of knowledge in 1976 and in the mid 1980s, it used this as a basis for its certification programme. The Association for Project management (APM) devised its body of knowledge in the early 1990s. The two professional bodies have a slightly different view on what they consider to be 'project management' topics. In the viewpoint of the APM, the PMI Body of Knowledge is focused on execution delivery whereas the APM Body of Knowledge looks at what needs to be managed across the project life cycle (Morris et al. 2006).

Another difference between the two bodies of knowledge is that the PMI BoK is developed by committees of practitioners whilst that of the APM is developed by researchers in project management (Morris et al. 2006).

However, the most descriptive and informative Project Management Body of Knowledge (PMBoK), is that produced by the PMI (PMI 2008). It provides a description of the key topics in project management along with a glossary of frequently used terminology (Allen 1995).

Figure 3-8 shows a diagrammatic view of the PMBoK with Construction Extension. This PMBoK was developed to cater for the needs of the construction industry (PMI 2008).

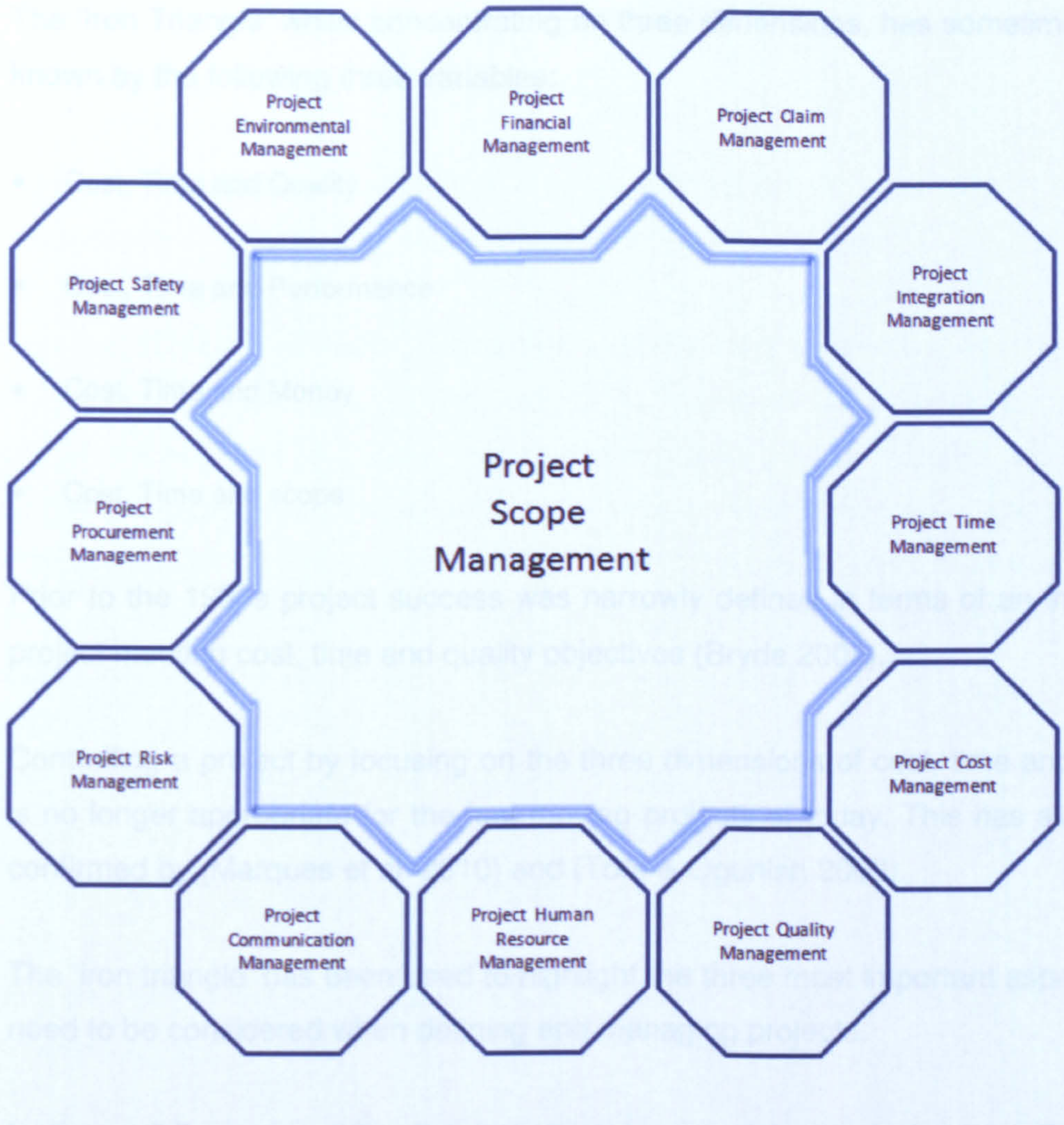


Figure 3-8 Diagrammatic view of the PMI Body of Knowledge with Construction Extension

In figure 3-8, we have arranged the project management sub topics in such a manner that they are all connected to the project scope. If the project scope changes then this in turn will affect all the other sub topics in equal proportions. The project scope is the common element throughout.

3.11 The Iron Triangle

The Iron Triangle has been in use since project management evolved as a discipline. The iron triangle consisting of the three dimensions of cost, time and quality has been used in project management journals since 1960s (Lavagnon 2009). It has also become the method of measuring success of a project. (Atkinson 1999), (Lamers 2002).

The 'Iron Triangle' whilst concentrating on three dimensions, has sometimes been known by the following three variables:

- Cost, Time and Quality
- Cost, Time and Performance
- Cost, Time and Money
- Cost, Time and scope

Prior to the 1980s project success was narrowly defined in terms of an individual project meeting cost, time and quality objectives (Bryde 2005).

Controlling a project by focusing on the three dimensions of cost, time and quality is no longer appropriate for the fast moving projects of today. This has also been confirmed by (Marques et al. 2010) and (Toor & Ogunlan 2009).

The 'iron triangle' has been used to highlight the three most important aspects that need to be considered when defining and managing projects.

In figure 3-9, we describe the iron triangle as originally devised by Dr Martin Barnes, consisting of the three dimensions of cost, time and performance (Project 2011). The rationale being that if these three dimensions are controlled then there is a high probability that the majority of the project can be managed effectively.

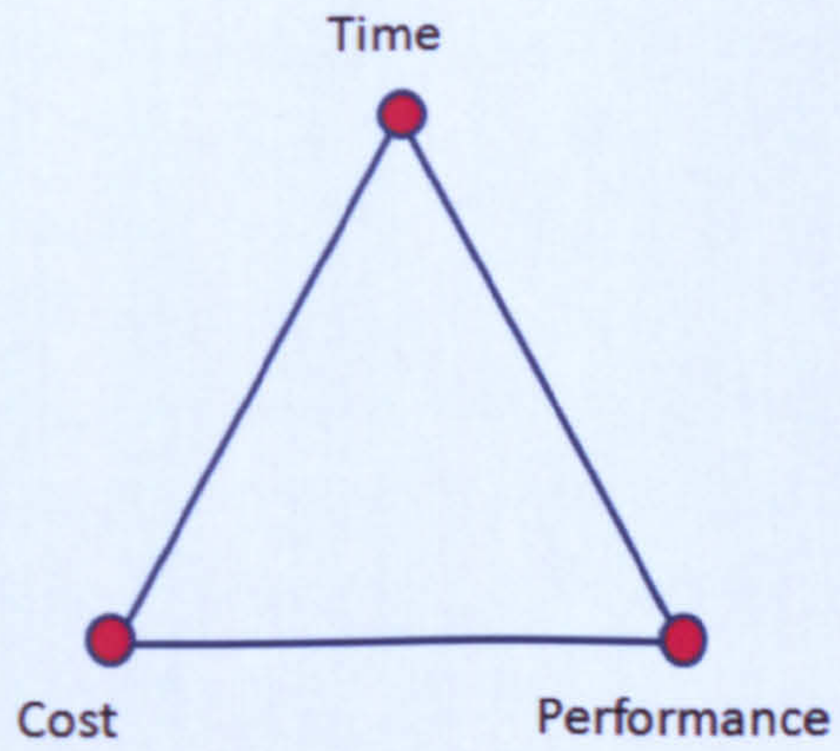


Figure 3-9 The Iron Triangle

The performance dimension is meant to represent, quality, health & safety, and sustainability.

The Iron Triangle has been used for training and educational purposes in stressing the importance of planning, controlling and managing projects.

The Iron Triangle has been an extremely useful tool for understanding the priorities in project management. It has helped in communicating these priorities to personnel engaged in project management activity and to educate students of project management. Cost is not the only priority, Time is important and so is the final Quality of the product or service. However, in the current business climate where a range of priorities need to be managed, the three dimensional framework of the Iron Triangle can be considered to be of limited use.

There are other priorities that also need to be managed by the project team and these cannot be summarised under the heading of 'performance' as to do this would not provide justice to these topics.

For example, some of the topics that also need to be managed throughout the life of a project are:

- Environmental
- Health & Safety
- Stakeholder communications
- Sustainability
- Benefits

Every project undertaken is unique and it is important that the salient topics are identified and managed through the life of the project. This may be the 'Iron Triangle' (Cost, Time and Quality) or the 'Iron Octagon' (Cost, Time, Quality, Environment, Health & Safety, Stakeholder Communications, Sustainability, and Benefits), as shown in figure 3-10.

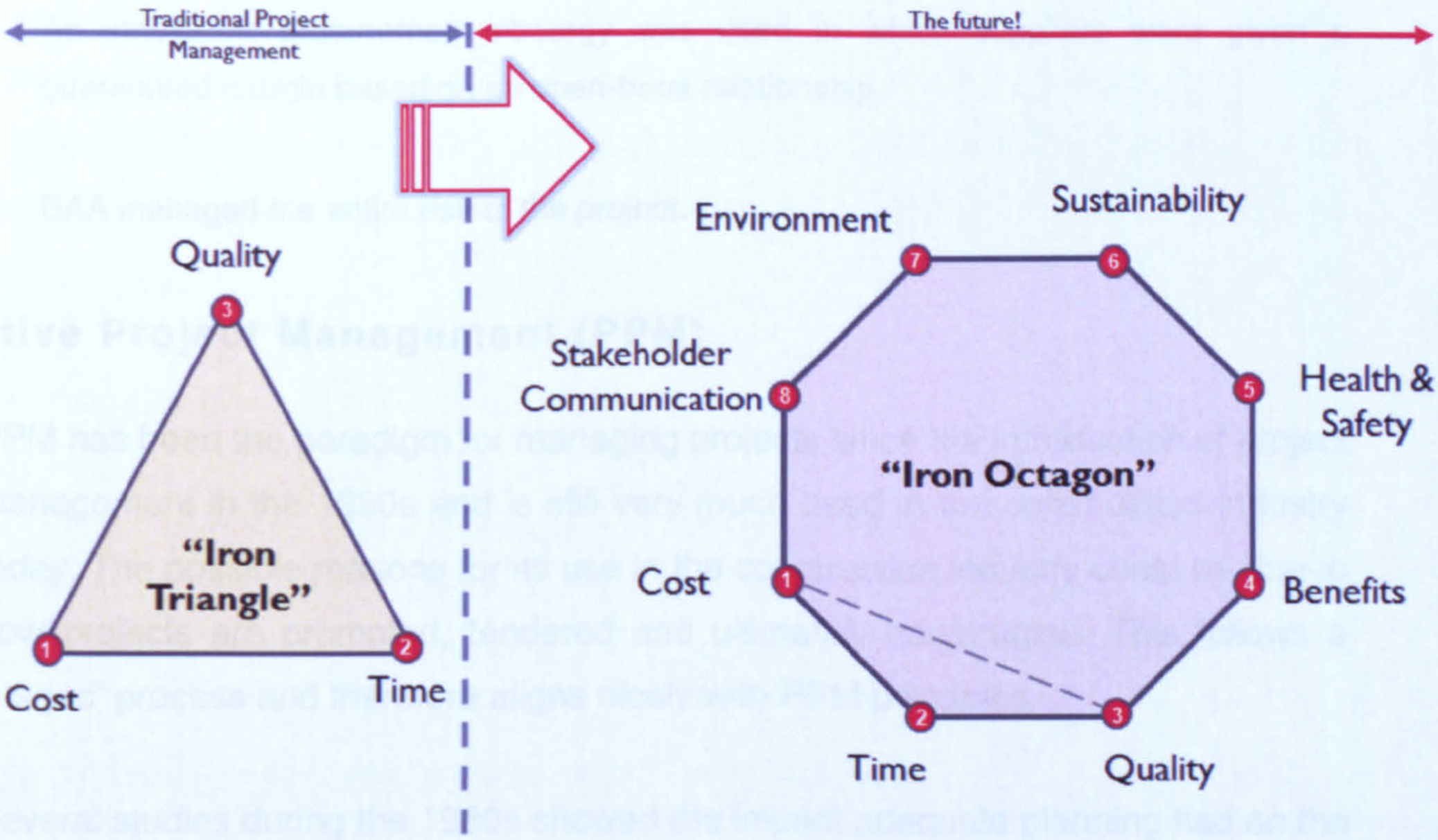


Figure 3-10 The changing face of the 'Iron Triangle'

3.12 Recent Developments

Globalisation has increased the demand of products and services. As a result, there is much more pressure exerted on projects to complete on or even before their planned completion. This pressure has added to the usual challenges faced by project managers and his or her team.

The most notable development in the UK construction industry has been the introduction of the NEC Engineering and Construction Contract (ECC). The ECC not only promotes greater harmony amongst the project team but also allows the opportunity to introduce better project management practice. It is an innovative contract that is increasing in popularity in the UK and Overseas.

In addition to this, the recent completion of the Terminal 5 project at London Heathrow Airport was an example of how innovative approach to project management was used in order to deliver the £4.2 Billion project. According to (Toor & Ogunlana 2010), three major features of British Airports Authority (BAA) approach was as follows:

- BAA focused on selecting the right people
- An innovative procurement strategy was used in which suppliers were given a guaranteed margin based on an open-book relationship.
- BAA managed the entire risk of the project.

Predictive Project Management (PPM)

PPM has been the paradigm for managing projects since the introduction of project management in the 1930s and is still very much used in the construction industry today. The possible reasons for its use in the construction industry could be due to how projects are promoted, tendered and ultimately constructed. This follows a 'staged' process and therefore aligns nicely with PPM principles.

Several studies during the 1980s showed the impact adequate planning had on the successful outcome of projects, with one study quoting as much as 40% cost savings due to good planning (Callahan, Quackenlash & Rowlings 1992). Construction and engineering projects in general, have invested a lot of time in planning their projects before commencing the implementation stage.

This is not only due to the need to understand the detail to be encountered once a project starts, but also to meticulouslyscrutinise and fully understand any health & safety risks associated with the project.

PPM generally follows a sequential or 'waterfall' method of progressively arriving at the final solution or end product.

Adaptive Project Management (AdPM)

In response to frustrations of not being able to deliver IT projects using PPM, Adaptive Project Management (AdPM) thinking was developed. Methods such as SCRUM, RAD and XP were starting to be used for software projects from 1991 onwards.

A new paradigm was required that allowed project managers to manage a project that was constantly being moved 'back and forth' and did not behave in a manner that allowed it to be controlled by the traditional 'waterfall' method. In addition to this, the IT projects were fast moving and were subject to major changes, which had to be managed and factored into the final product as the project was proceeding.

Agile project management can be defined as:

"the work of energising, empowering and enabling project teams to rapidly and reliably deliver business value by engaging customers and continuously learning and adapting to their changing needs and environments (Augustine 2005)"

The Iron Triangle in relation to PPM and AdPM

In the previous sections we described the Iron Triangle that has been traditionally used for project management education and for measuring project success. Within the context of PPM and AdPM, the Iron Triangle can be flexed to show how both thinking types relate to one another.

Another dimension of 'benefits' can be added to the Iron Triangle. Most AdPM methods also include an element of appreciation of the 'benefits' of the project.

In traditional projects using PPM, the benefits determination may have already taken place well before the implementation team has been appointed. For example, a promoter wishing to build a bridge say, across the River Thames, would have already carried out a feasibility study to confirm the validity of the project. Once this is done, he or she would appoint a project team to deliver the project by constructing it. The project team would then be focused on delivering the project to cost, time and performance parameters. They will not be too

concerned about the merits or demerits of building the bridge as this is not their concern. Their focus is very much to meet or beat the project targets otherwise they will not be seen as a successful project team.

On the other hand, imagine in the same scenario that the client appoints a consultant to look into the design of the various options available for a river crossing. The team would be looking at various options and also looking into the benefits of different structural solutionsi.e. cable stayed or suspension bridge, different materials etc.

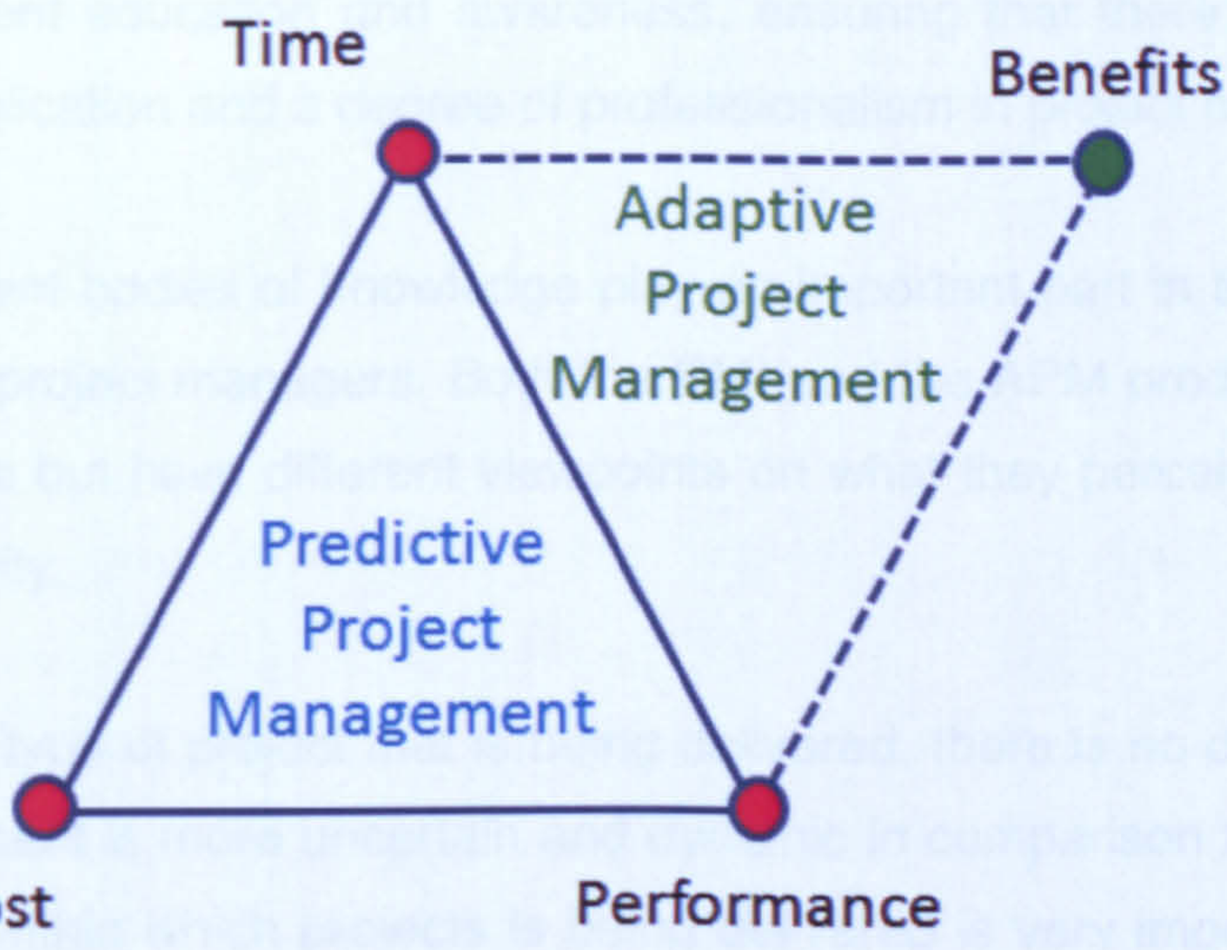


Figure 3-11 PPM and AdPM in terms of the Iron Triangle

In the context of software development projects, project teams are not only looking at cost, time and performance but also focusing on the benefits of the project work they are undertaking. This is shown in figure 3-11.

3.13 Summary of Findings

This chapter provided an overview of project management. It looked into the history of project management and how the profession has developed over the years since the 1930s. It also summarised the two different thinking categories i.e. Predictive and Adaptive Project Management thinking. It described the Iron Triangle as a framework for teaching project management principles and also measuring project success.

Whilst the 'Iron Triangle' has played an instrumental role in educating and measuring project performance, its concept may need to be modified to suit the current business climate within which projects are being delivered. The three components of Cost, Time and Quality are important but they are not the only important priorities that need to be managed by the project team. Additional priorities such as stakeholder communication, benefits, Health & Safety, Environment and Sustainability are examples of other areas that may need consideration when delivering projects today.

The professional associations have played a very important role in providing project management education and awareness, ensuring that there is a level of consistency in application and a degree of professionalism in project management.

Project management bodies of knowledge play an important part in the education and edification of project managers. Both the PMI and the APM produce a formal body of knowledge but have different viewpoints on what they perceive as project management activity.

Regardless of the type of project that is being delivered, there is no doubt that the business environment is more uncertain and dynamic in comparison to the 1930s. The environment within which projects is being delivered is very important as this tends to put added pressure on project teams to react responsively. The need to react quickly, in turn means that the project team must be equally dynamic and respond to changes in the environment appropriately. To do this it is imperative that the project management processes used by the team are lean and have the ability to provide the necessary information efficiently and effectively.

There is too much effort being placed into trying to understand how to implement good project management. Professional associations are trying to define everything in an attempt to 'model' the project environment so that members may understand it and pass their certification examinations. Passing these certifications does ensure that members are fully versed in project management knowledge but it does not ensure that they will be successful in delivering projects.

The PMI first published its Body of Knowledge and it describes project management activity in a very mechanistic manner. It is a very useful document

that can be referred to in order to design project management processes. The APM have taken on a slightly different stance, and have provided a high level view through its Body of Knowledge. The Bodies of Knowledge of both the PMI and APM are useful, albeit that the one from the PMI can be used to develop project management processes easily.

In the current climate, there is too much discussion and debate on trying to understand what project management is and how to create more processes, procedures and methodologies so as to guarantee project success. There is no doubt that knowledge, experience and processes are required by project teams. However, like any sport, project management is team orientated. The dynamics of the team plays a crucial and important role in project success. Human beings are complex creatures and one cannot predict how they will behave under certain conditions. The project environment can be stressful and can have a profound effect on how team members react to certain situations.

Project management does not need more methodologies or processes. It requires good people who have good awareness or emotional intelligence, have a firm understanding of the fundamentals of project management and know how to apply it to real life situations.

As seasoned project managers, we all have our personal experiences of how we have tackled and overcome challenges but we should not be rigid in our approach towards future challenges. Many people tend to fall back on their experience and reuse past templates for new project management activity. This initially saves time but in the long could lead to rework as the uniqueness of the current project may not have been taken into account. New projects will pose new challenges that require an open mind and the ability to create new solutions rather than merely copying old ones from the past projects.

People are the life-blood of projects. The right team with the right behaviours to face challenges when delivering projects, is the team that will be successful in delivering it. The process or methodology is an enabler to facilitate success. It is for this reason that a project management process cannot be followed blindly. It will require careful customisation to the environment and the persons using it will need to finesse it to suit the situation being encountered.

4 PREDICTIVE PROJECT MANAGEMENT

4.1 Introduction

Since project management's introduction as a profession dating back as far as the 1930s, all tools, techniques and methodologies have been geared to accommodate Predictive Project Management thinking. The business climate at that time was relatively stable and it was considered normal to 'plan' and then control the project in accordance with the developed 'plan'.

Once the plan was produced this was considered a near enough depiction of the anticipated events that the project team will encounter, once the project commences its journey.

There was a general acceptance that the future could be planned with a high degree of accuracy. This was and currently remains the premise of PPM.

In this chapter we will describe the basic tools that are considered the cornerstone of modern day project management.

4.2 Harmonograms

Karol Adamiecki, a Polish economist, engineer and management researcher first developed the concept of the harmonogram in 1896 (Marsh 1975). The harmonogram was quite an innovative method of producing a timeline showing the critical path and the links with proceeding andpreceding activities in a production environment. Adamiecki's work can be considered as the basis for the development for the American discoveries of Gantt Charts, CPM and PERT.

The Harmonogram was an advanced management tool of its time. The most astonishing fact is that it not only diagrammatically showed the duration of activities but also determined the critical path including the logical relationships between each activity. An example of the harmonogram is shown in figure 4-1.

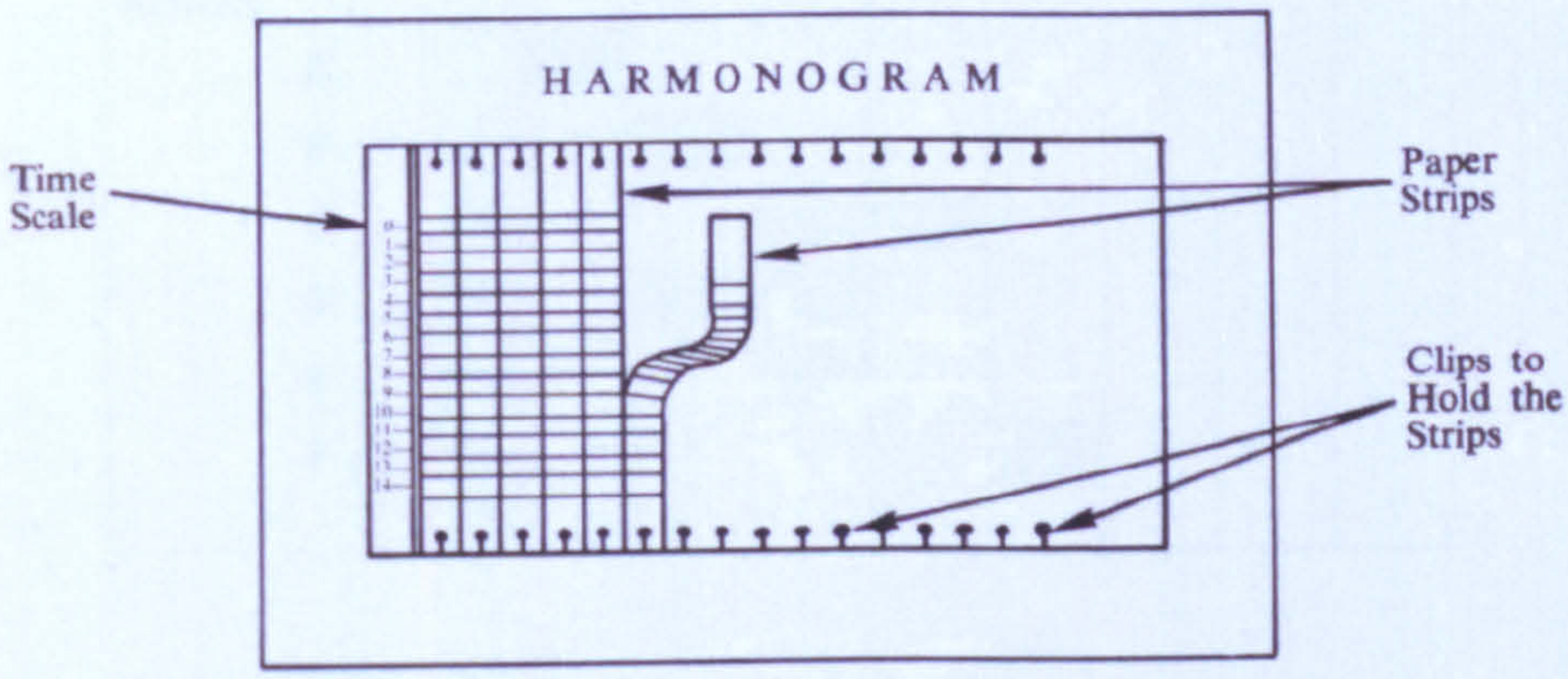


Figure 4-1 Example of the Harmonogram developed by Karol Adamiecki (taken from Marsh 1975)

4.3 Gantt Charts

What is it?

Henry Gantt, an American Mechanical Engineer and Management Consultant, was the pioneer of Gantt Charts. The Gantt Chart was instrumental in significantly reducing time to build cargos ships during World War 1 (Burke 1992).

How does it work?

It is a graphical pictorial that contains activities on the left hand side which are drawn against a timeline on the right hand side. The length of the bar represents the duration of the bar.

An example of the concept is shown in figure 4-2.

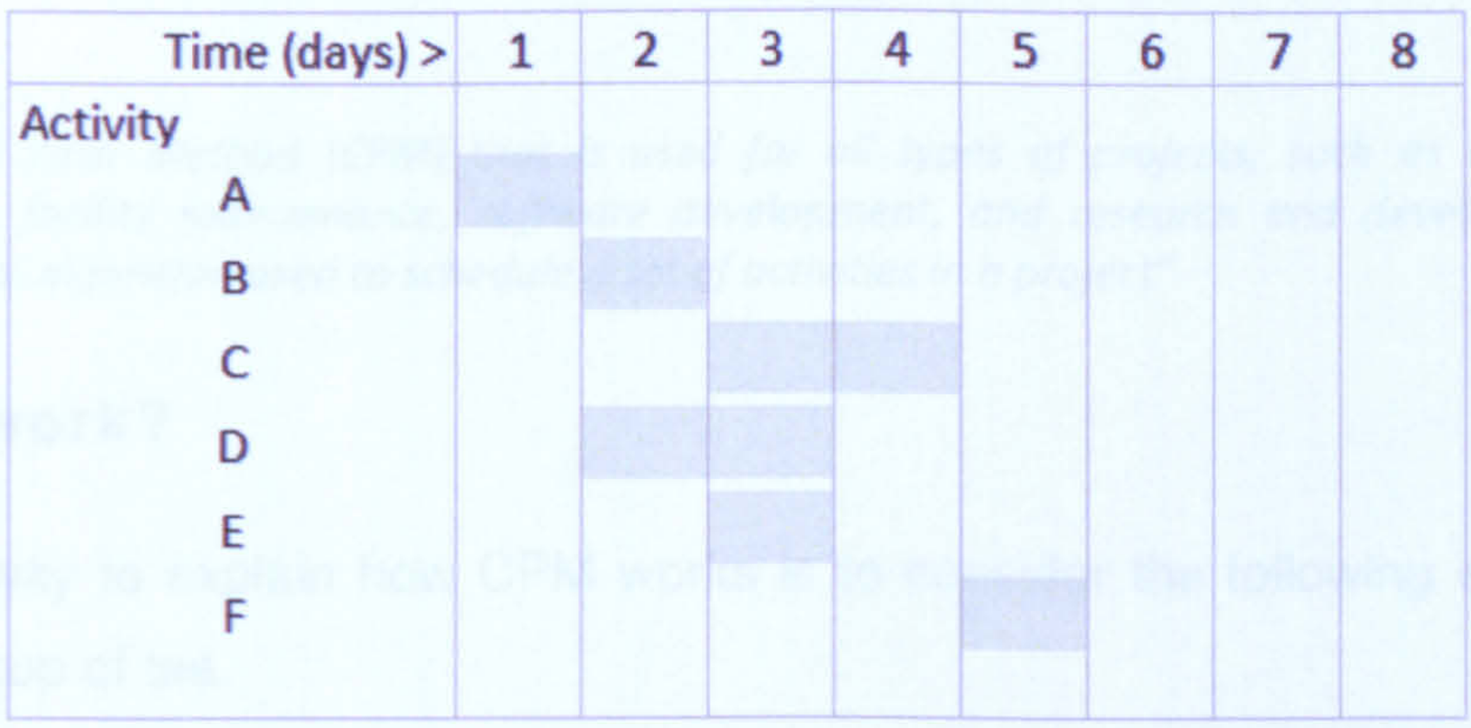


Figure 4-2 A typical Gantt Chart

When all the activities are plotted with their individual durations, the overall project duration can be ascertained.

Limitation(s)

Gantt Charts are very illustrative method for showing activities and some relationships between them but is does not clearly provide a mechanism for determining the critical path.

Conclusion

Gantt Charts are very useful to produce simple schedules with a few activities. As the size of the activities increase or if there is a need to determine the critical path then this method would be limiting.

4.4 CPM (Critical Path Method)

What is it?

Critical Path Method (CPM) was developed by Remington Rand Univac in 1957. CPM allows activities to be logic linked and by working out the start and finish times in the entire network the overall critical path can be worked out. The critical path defines the overall duration of the project as any delays to this path can delay project duration.

(Kim et al 2011) provide a summary of what CPM is as follows:

"The Critical Path Method (CPM) that is used for all types of projects, such as construction, engineering, facility maintenance, software development, and research and development is a mathematical algorithm used to schedule a set of activities in a project"

How does it work?

The best way to explain how CPM works is to consider the following example of making a cup of tea.

ID	Activity	Time (mins)	Cost (p)	Resource
1.1	Boil water	3	20	Joe
1.2	Clean cup	2	10	Ed
1.3	Add tea bag	1	5	Sam
1.4	Pour hot water	1	0	Joe
1.5	Remove milk from fridge	2	15	Ed
1.6	Brewing time	5	0	Ed
1.7	Remove tea bag	1	0	Sam
1.8	Add milk	2	25	Joe
1.9	Add sugar	2	35	Sam

Figure 4-3 - CPM example (Base data)

Figure 4-3 shows the base data that will be used for the tea-making example. Using this information a network diagram can be produced as shown in figure 4-4.

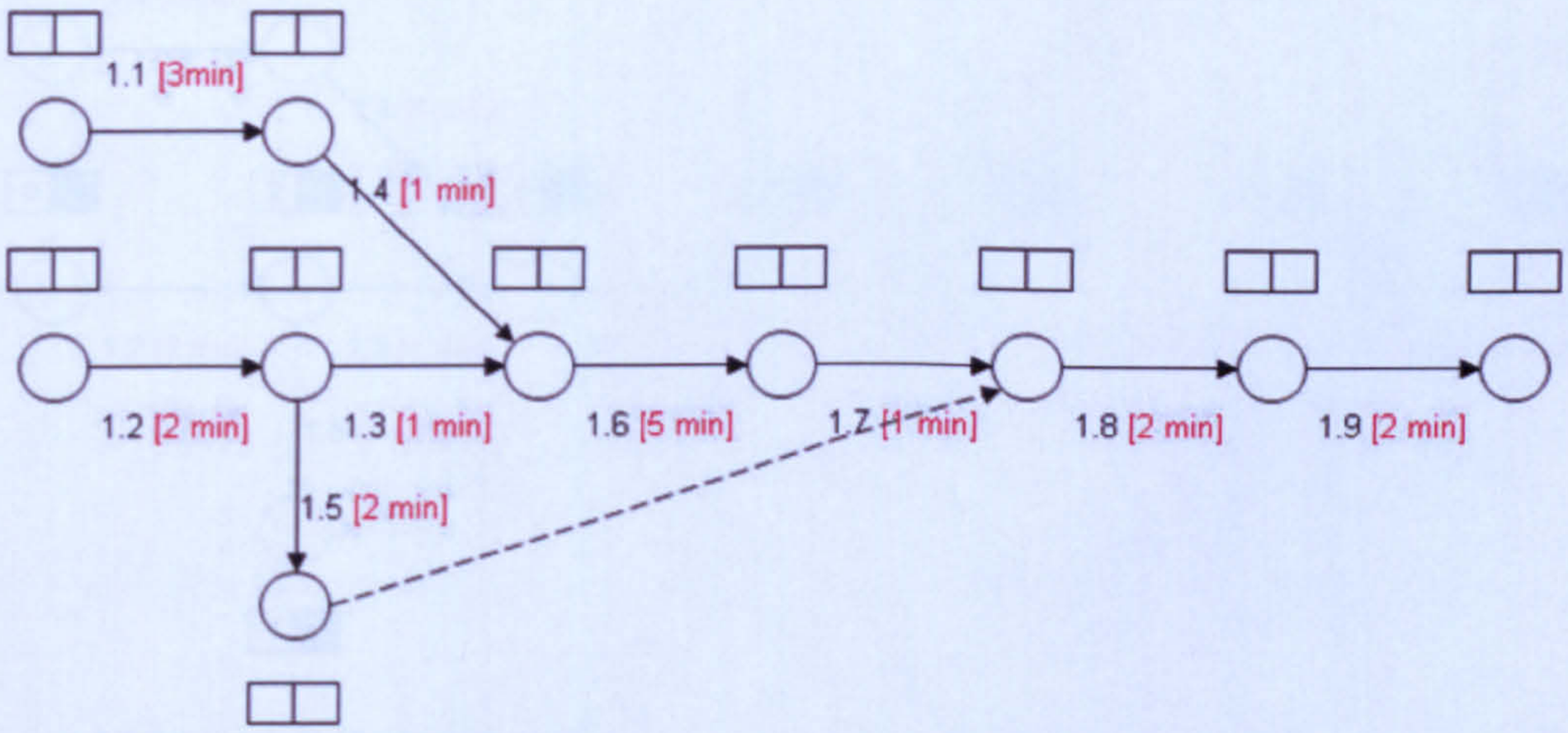


Figure 4-4 CPM example (Network diagram)

Starting with the first activity we logically work through the network and add the duration shown on the arrows, until we reach the last activity. Working in this manner is known as the forward pass, which is shown in figure 4-5.

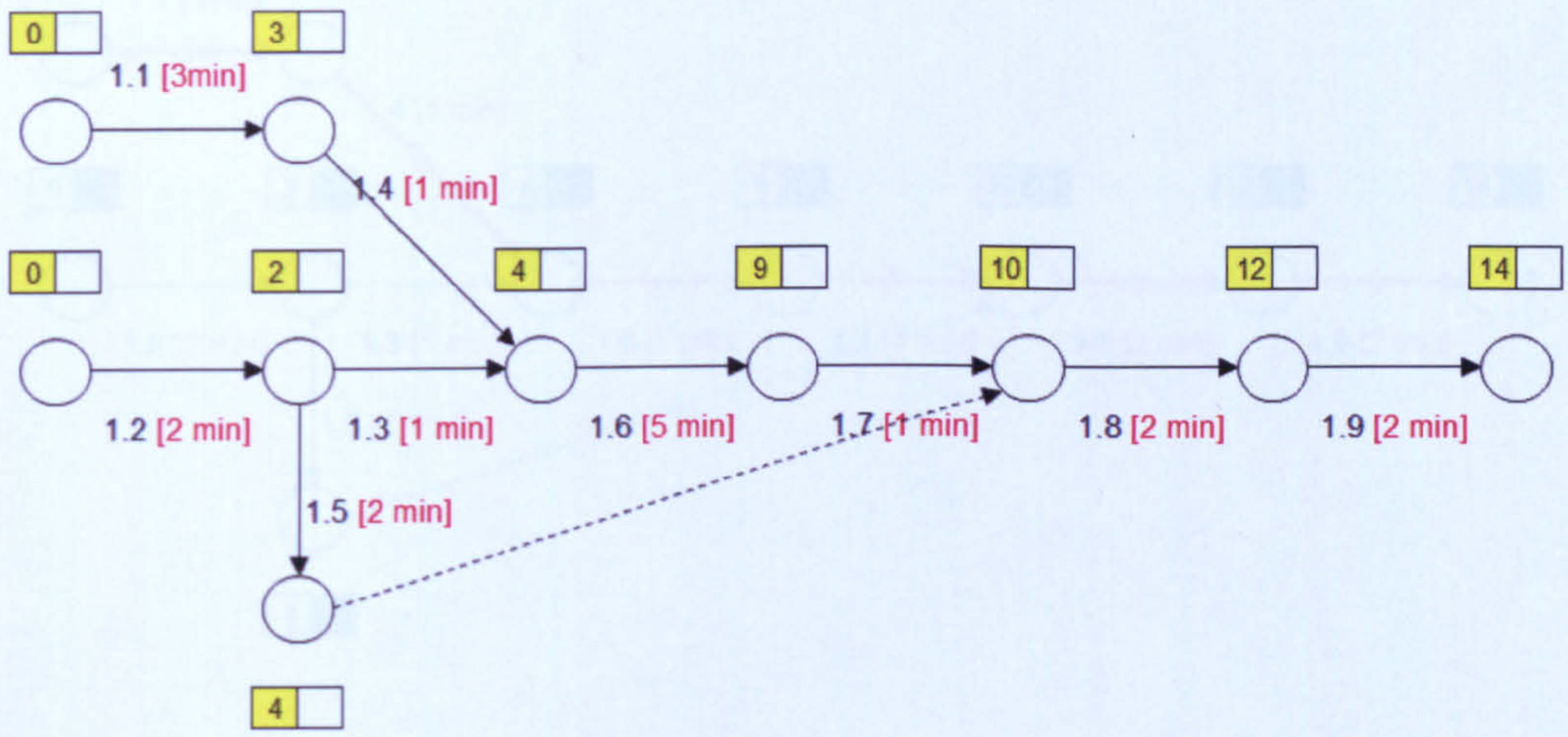


Figure 4-5 CPM example (Forward Pass)

Once the forward pass is completed, we work back from the last activity and minus the durations and continue to do this until we work our way back to the first activity. This is known as the backward pass and the working out is shown in figure 4-6.

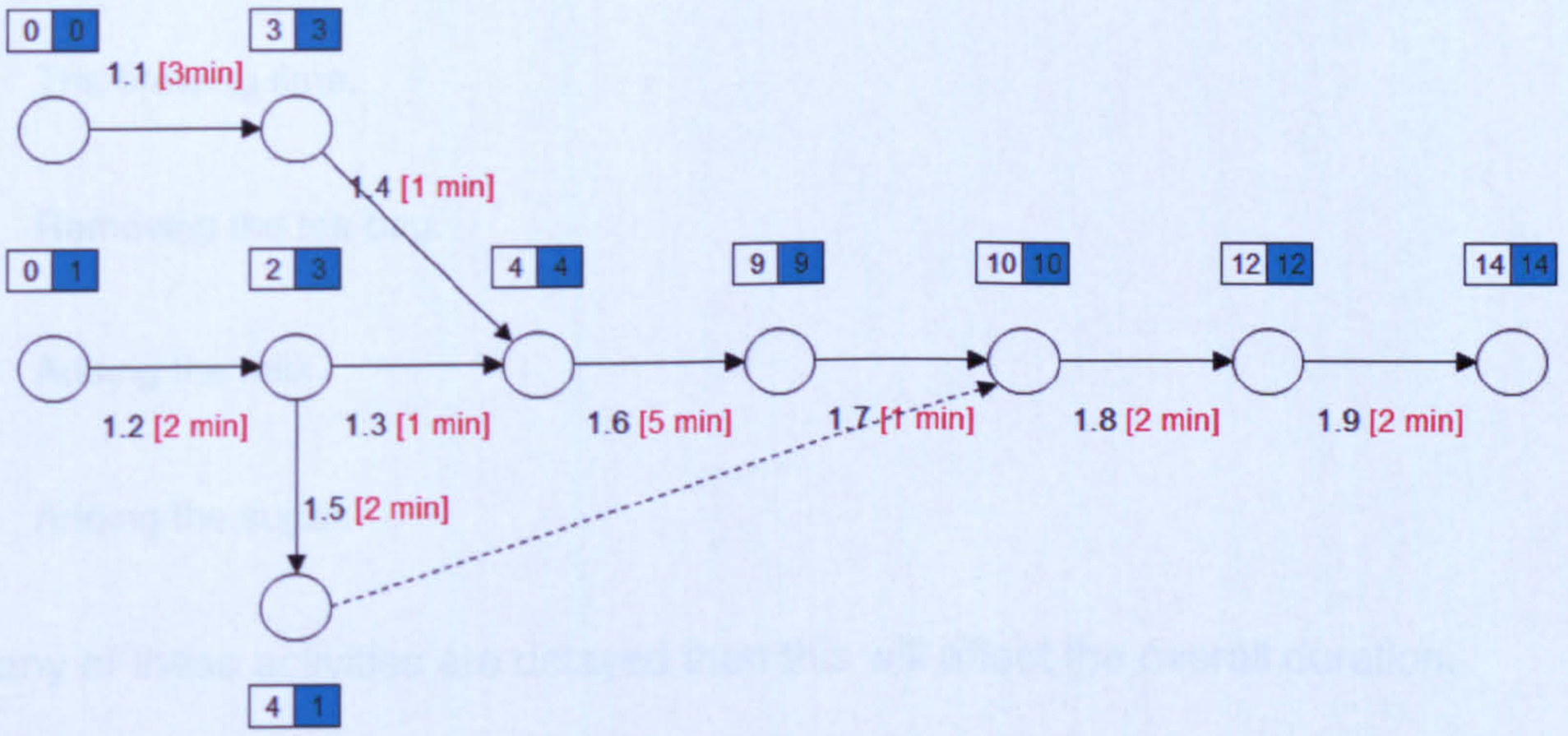


Figure 4-6 CPM example (Backward pass)

Once the forward and backward pass calculations are made the critical path can be determined. For activities that have same start and finish times, they have no

float and hence are on the critical path. The critical path is marked up as shown in figure 4-7.

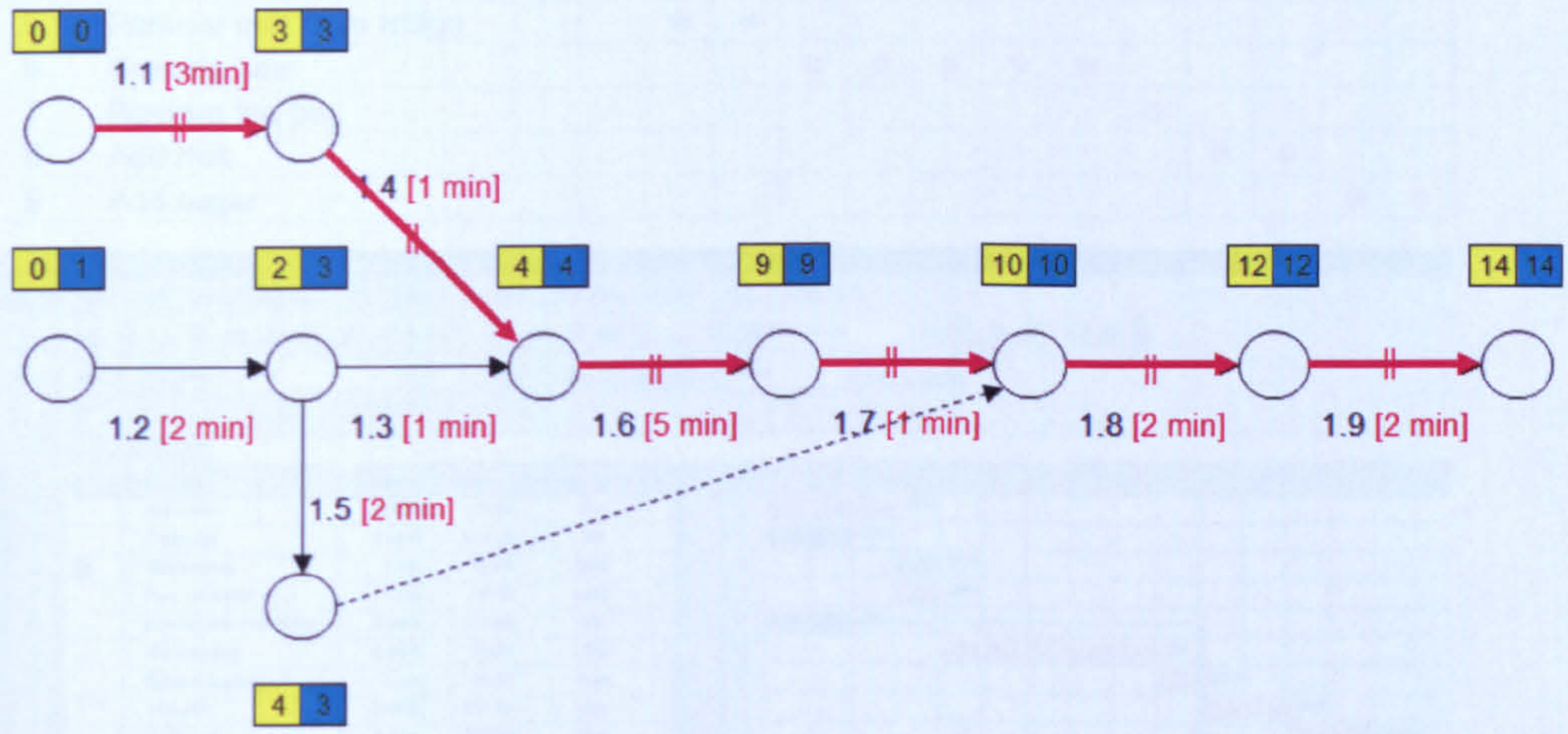


Figure 4-7 CPM example (Critical Path)

From figure 4-7, it can be seen that the following activities are on the critical path:

- Boiling the kettle.
- Pouring the water in the cup.
- The brewing time.
- Removing the tea bag.
- Adding the milk.
- Adding the sugar.

If any of these activities are delayed then this will affect the overall duration.

This information can then be used to create a Gantt Chart showing the activities, their sequencing and the critical path as shown in figure 4-8.

Duration (mins)

ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Boil water	●	●	●											
2	Clean cup	●	●												
3	Add tea bag				●										
4	Pour hot water				●										
5	Remove milk from fridge			●	●										
6	Brewing time					●	●	●	●	●					
7	Remove tea bag										●				
8	Add milk											●	●		
9	Add sugar													●	●

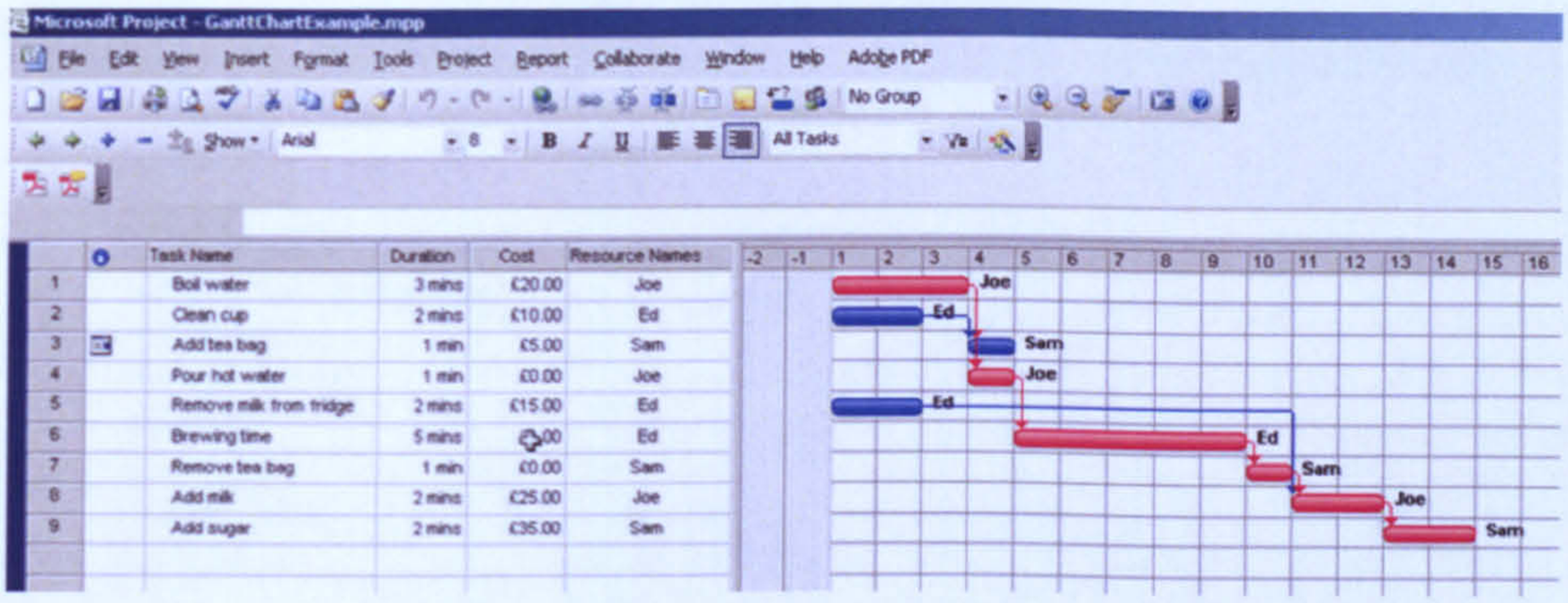


Figure 4-8 CPM Example (Gantt Chart)

In addition to the determination of the critical path, the earliest start and latest finish dates can be determined to see what is the most optimum duration is for certain activities. This is shown in figure 4-9.

Duration (mins)

ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Boil water	●	●	●											
2	Clean cup	●	●	●											
3	Add tea bag				●										
4	Pour hot water				●										
5	Remove milk from fridge			●	●	●	●	●	●	●	●				
6	Brewing time					●	●	●	●	●					
7	Remove tea bag										●				
8	Add milk											●	●		
9	Add sugar													●	●

Early Start

Duration (mins)

ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost
1	Boil water	6.7	6.7	6.7												20
2	Clean cup	5	5													10
3	Add tea bag				5											5
4	Pour hot water				0											0
5	Remove milk from fridge			15												15
6	Brewing time					0	0	0	0	0						0
7	Remove tea bag										0					0
8	Add milk											13	13			25
9	Add sugar													18	18	35
	Column Totals	12	12	22	5	0	0	0	0	0	0	13	13	18	18	
	Cumulative	12	23	45	50	50	50	50	50	50	50	63	75	93	110	

Late Finish

Duration (mins)

ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost
1	Boil water	6.7	6.7	6.7												20
2	Clean cup		5	5												10
3	Add tea bag				5											5
4	Pour hot water				0											0
5	Remove milk from fridge										15					15
6	Brewing time					0	0	0	0	0						0
7	Remove tea bag										0					0
8	Add milk											13	13			25
9	Add sugar													18	18	35
	Column Totals	6.7	12	12	5	0	0	0	0	0	15	13	13	18	18	
	Cumulative	6.7	18	30	35	35	35	35	35	35	50	63	75	93	110	

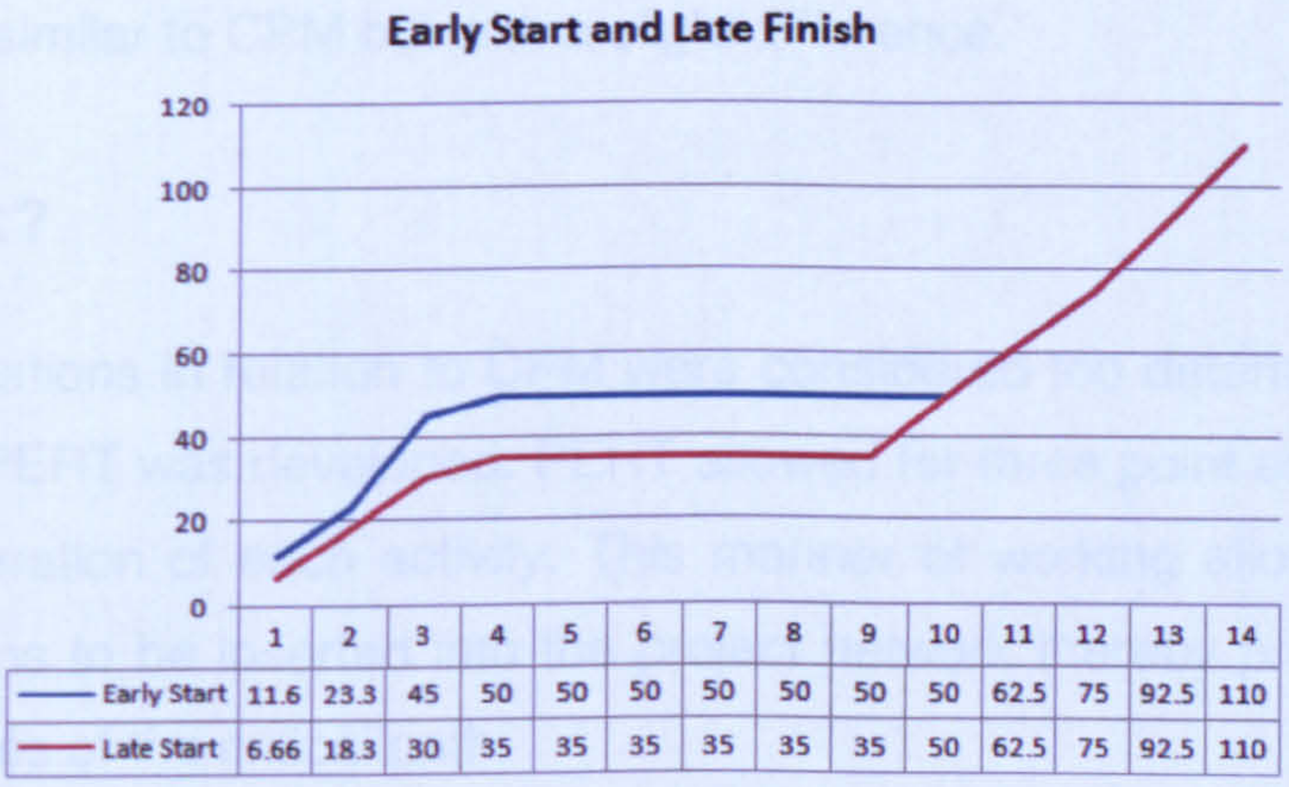


Figure 4-9 Early start and late finish dates

Limitation(s)

The immediate limitation is that the calculations for a huge network can take time however these days they can be performed using the appropriate project management software.

This method of ascertaining the critical path is deterministic, i.e. we are supposing that we know exactly the duration of each activity. For relatively simple projects this can be performed with ease but for projects that involve a large amount of change or uncertainty to the scope of work it can be challenging to forecast activity durations accurately.

Conclusion

This method provides a good indication of the critical path along with a logic linked bar chart. This tool can be used for planning most projects.

4.5 PERT (Program Evaluation & Review Technique)

What is it?

The US Navy and Booz Allen Hamilton were working on the Polaris Submarine Program and devised Program Evaluation and Review technique (PERT) in 1960. This method is similar to CPM but with a slight difference.

How does it work?

The activity durations in relation to CPM were considered too deterministic and to overcome this PERT was developed. PERT allowed for three point estimates to be used for the duration of each activity. This manner of working allowed for more realistic durations to be inserted into the project network thereby producing more realistic estimates of the critical path.

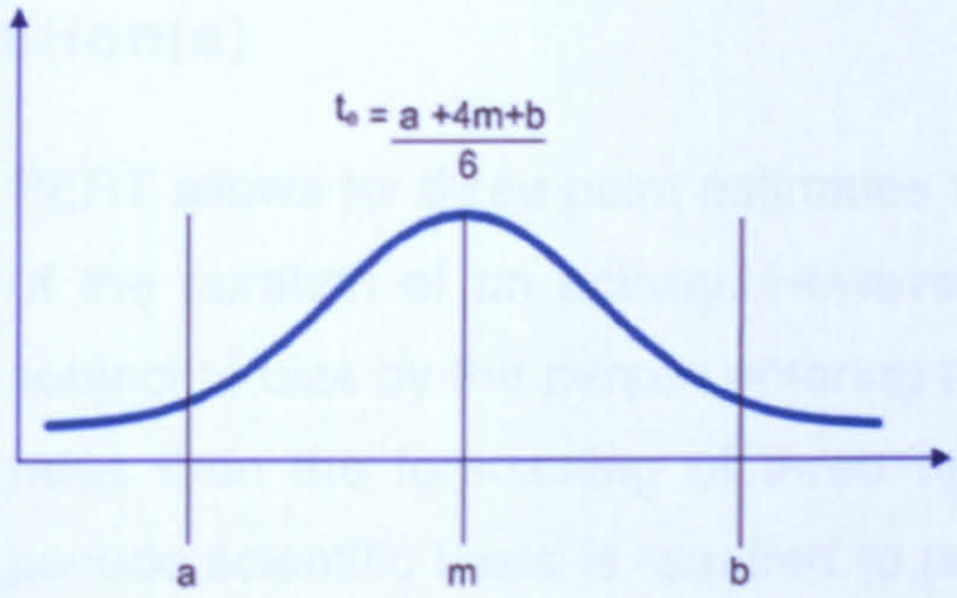


Figure 4-10 Activity duration using PERT

In figure 4-10, the algorithm for estimating each activity is described. This uses the three point estimates to work out the overall activity duration. The three estimates are optimum, normal and pessimistic. Therefore for each activity the following equation would be used:

$$t_e = \frac{a + 4m + b}{6}$$

Where 'a' is the optimum duration, 'm' is the normal and 'b' the pessimistic duration.

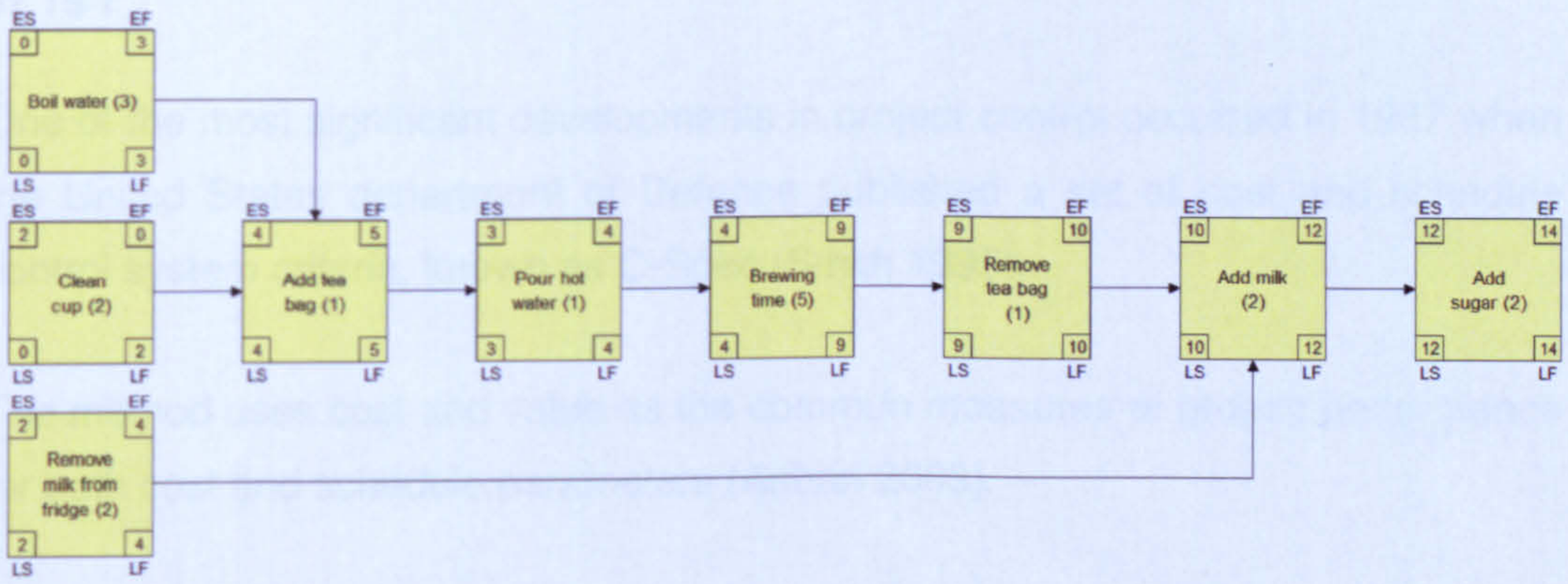


Figure 4-11 PERT network example

Figure 4-11, shows the project network using a precedence diagram method for the same example used in the CPM example.

Limitation(s)

PERT allows for three point estimates to be factored into the overall determination of the duration of an activity. However like any estimating technique this too is subject to bias by the person entering the data. Where there are known production rates then the forecasting of three estimates can be easily worked out. Some pseudo scientific basis is required to produce three point estimates that are going to reflect the perceived variability in the activity duration.

It is tricky to enter three point estimates for say, the affects of bad weather on activity durations (Stevens 1990).

Conclusion

PERT allows for better and accurate schedule determination using three point estimates for activities. The calculations can be difficult to do manually however most propriety project management software packages these days are capable of working this out.

4.6 CSCS (Cost and Schedule Controls System)

What it is?

One of the most significant developments in project control occurred in 1967 when the United States department of Defence published a set of cost and schedule control system criteria, known as C-Spec (Smith 1995).

The method uses cost and value as the common measures of project performance for both cost and schedule parameters (Anbari 2003).

CSCS is known as Earned Value and the APM defines it as follows:

"The value of useful work done at any given point in the project. The value of completed work expressed in terms of the budget assigned to that work. A measure of project progress. (APM 2008)"

The budget may be expressed in cost or labour hours.

How does it work?

In order to setup an earned value management system for a project the starting point is to have a Work Breakdown Structure (WBS) for the project scope. The project scope needs to be broken down into a meaningful structure that shows how the project will be assembled together. There are many way of developing a WBS and the most appropriate structure is one that provides the most effective management and control of the project.

Using the tea example from thepreceding sections, a typical WBS for that example would like that as shown in figure 4-12.

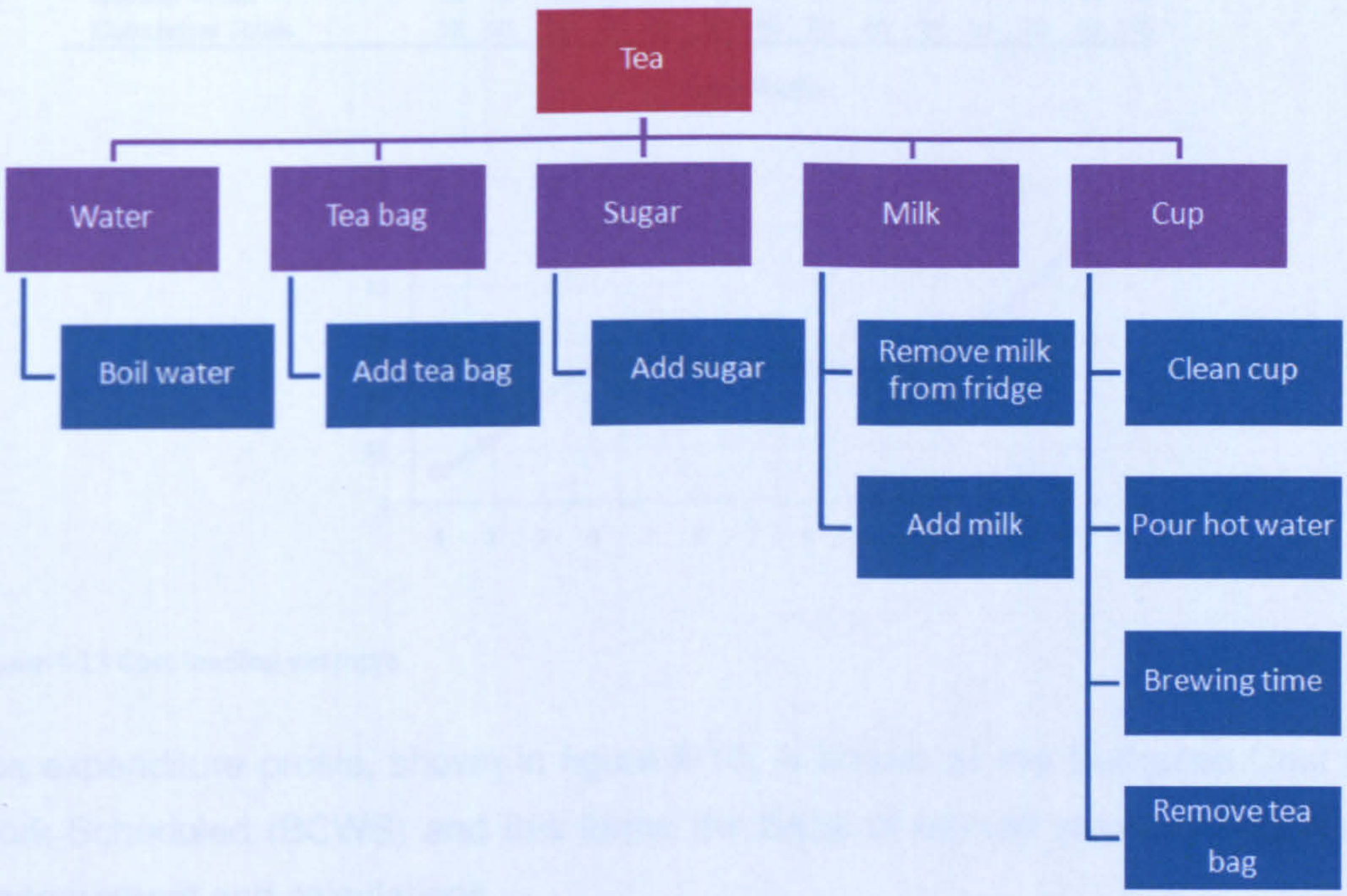


Figure 4-12 WBS example

Once the WBS is developed, a schedule is required describing the sequencing of the work activities. Costs are added to the schedule known as 'cost loading' so that the expenditure profile of the project can be determined.

Using the same tea-making example, figure 4-13 shows the working out to produce the cost profile.

Duration (mins)

ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Boil water	●	●	●											
2	Clean cup	●	●												
3	Add tea bag				●										
4	Pour hot water				●										
5	Remove milk from fridge			●	●										
6	Brewing time					●	●	●	●	●					
7	Remove tea bag										●				
8	Add milk											●	●		
9	Add sugar													●	●

Duration (mins)

ID	Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Cost
1	Boil water	6.7	6.7	6.7												20
2	Clean cup	5	5													10
3	Add tea bag				5											5
4	Pour hot water				0											0
5	Remove milk from fridge			7.5	7.5											15
6	Brewing time					0	0	0	0	0						0
7	Remove tea bag										0					0
8	Add milk											13	13			25
9	Add sugar													18	18	35
	Column Totals	12	12	14	13	0	0	0	0	0	0	13	13	18	18	
	Cumulative Totals	12	23	38	50	50	50	50	50	50	50	63	75	93	110	

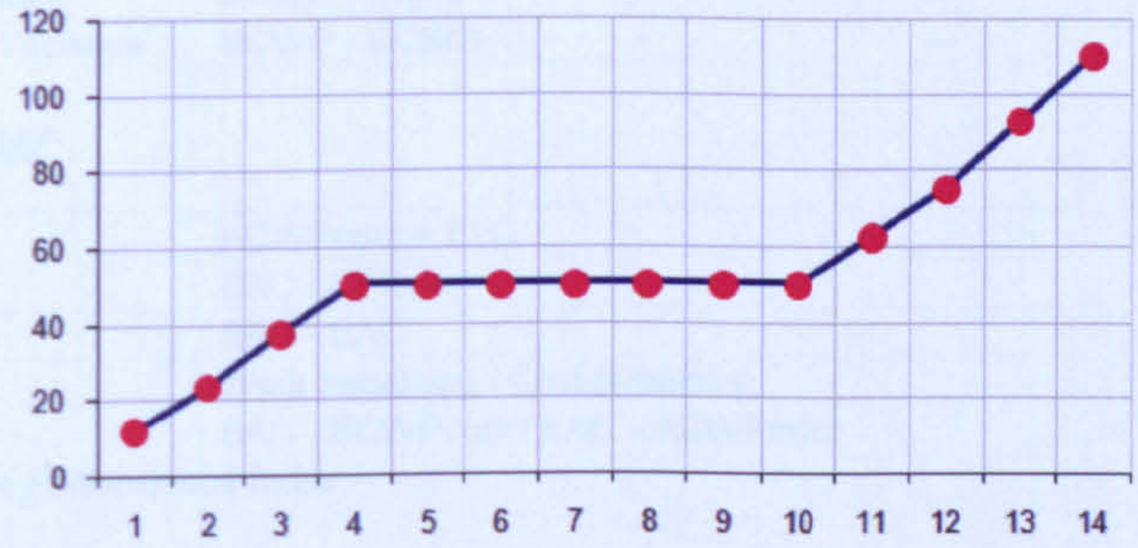
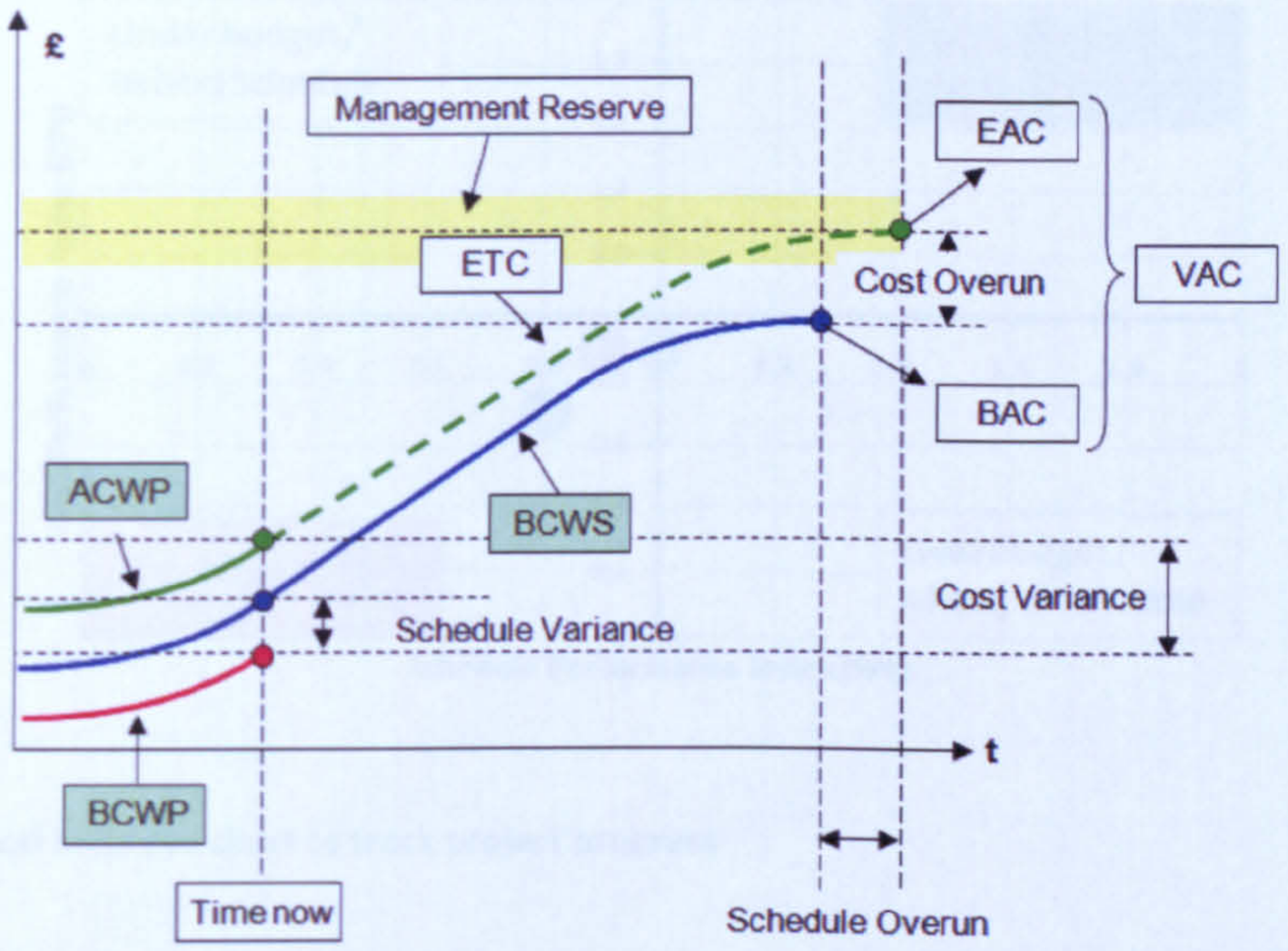


Figure 4-13 Cost loading example

The expenditure profile, shown in figure 4-13, is known as the Budgeted Cost for Work Scheduled (BCWS) and this forms the basis of earned value management measurement and calculations.



Earned Value Metrics

Where are we?	formula	Favourable	Unfavourable
CPI	BCWP / ACWP	>1	<1
SPI	BCWP / BCWS	>1	<1
Cost Variance	BCWP - ACWP	+	-
Schedule Variance	BCWP - BCWS	+	-

Predictability

EAC	ACWPcum + ETC
EAC*	BAC / CPIcum
VAC	BAC - EAC
TCPI	Work remaining / Cost remaining BAC - BCWPcum / EAC - ACWPcum

To Complete Performance Index

Figure 4-14 Earned Value Graph

The other dimensions of EV are Actual Cost of Work Performed (ACWP) and Budgeted Cost of Work Performed (BCWP). The typical EV graph along with some key metrics used is shown in figure 4-14. The metrics are consistent with those advocated by the Defense Acquisition University in the United States (DAU 2011).

Using EV, the project manager has at his or her disposal information that can be used to predict if the end goal will be reached based on the production levels achieved by the team.

Trends can be produced to see how project productivity is fairing. In addition to this, bulls-eye charts can be used to show how the project is progressing as shown in figure 4-15.

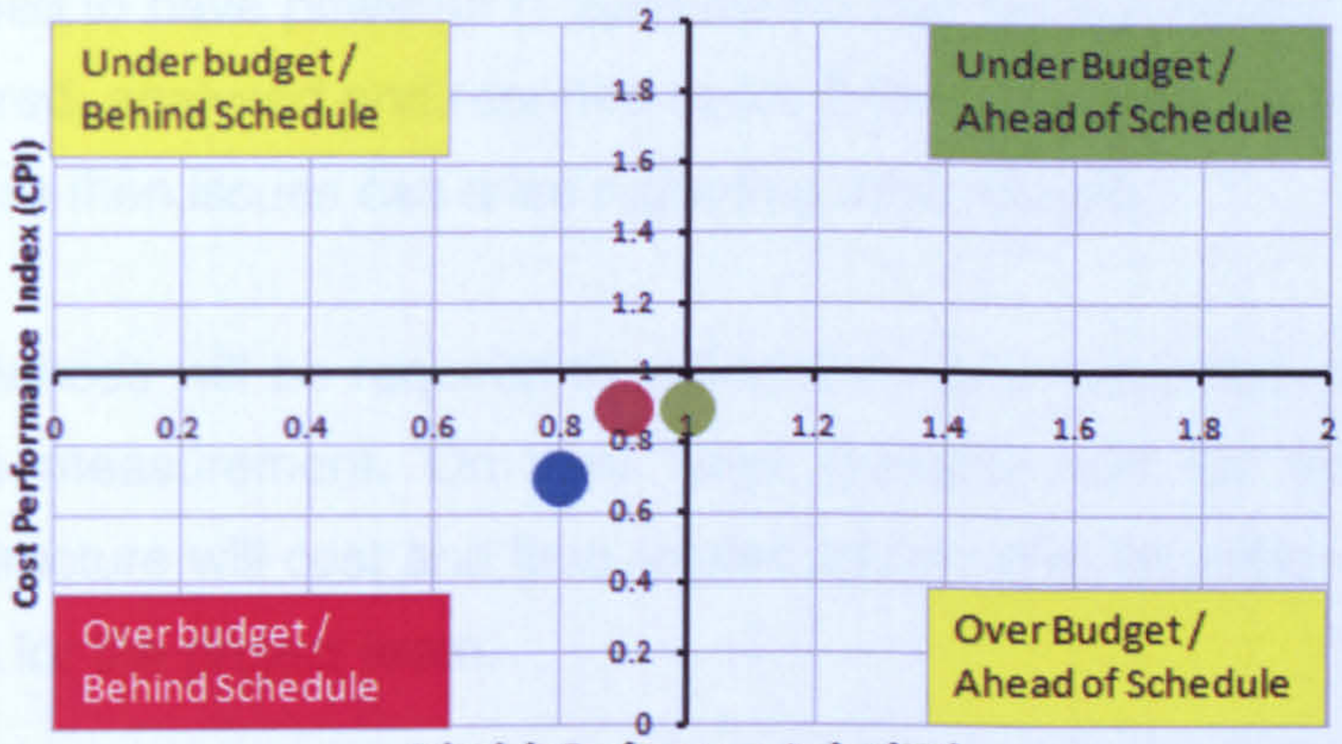


Figure 4-15 Typical bulls eye chart to track project progress

In figure 4-15, a bulls-eye chart is constructed using the Cost Performance Index (CPI) on one axis and Schedule Performance Index (SPI) on the other. The idea being that the objective is to have a CPI and SPI value of 1 as a minimum. Plotting the CPI and SPI indices in this manner provides a useful indication of the trajectory of the project.

The APM has produced Earned Vale Management guidelines, which describe how to implement and work with earned value (APM 2008). In addition to this, theAcostEhave published a Standard Code of Accounts to facilitate better management and control of costs when implementing earned value (ACostE 1994).

The PMI also has many guidance documents on the same topic including the development of work breakdown structures (PMI 2006).

Limitation(s)

Earned Value is an extremely useful tool for integrating both cost and time parameters of the project. However, it does require a lot of effort in implementing and maintaining it.

Obtaining timely and accurate data can be an issue. In addition to this the project team needs to be well versed in its application and use. They must be grouped into the appropriate teams so that they all work together harmoniously to provide integrated cost and time information.

There is a need to have powerful IT systems so that large amounts of information can be gathered, analysed and reported upon. If the implementation of IT systems is not seamless then issues can arise regarding data integrity.

Innovative methods will be required to collect the necessary data with regards to say progress measurement. On very large projects how far down the work breakdown structure will cost and time related information be collected, is a major consideration for the project team.

If the client is unfamiliar with the concept of earned value it may take longer to advocate the use of earn value and it is advisable that the project manager takes the necessary time to explain the full implications to the client.

Earned value management cannot be implemented without top-down management, training and support (Kim, Wells & Duffy 2003).

Conclusion

In addition to EV being used by US Government Agencies, it has been extensively used in the Oil & Gas industry for managing projects.

Many major UK clients like British Airports Authority (BAA) they use EV as part of their project reporting and performance monitoring of their capital projects.

4.7 Project Controls

What is it?

Originally project controls was developed and used in the Oil & Gas industry. It has since been implemented in the UK construction industry with major clients promoting its use. British Airports Authority (BAA), Network Rail and Thames Water being a few examples of organisations, which promote project controls thinking.

How does it work?

The philosophy of this type of thinking is that cost, planning and estimating functions are interrelated and joined via a common work breakdown structure. This allows accurate and more focused estimating, planning and cost control as shown in figure 4-16.

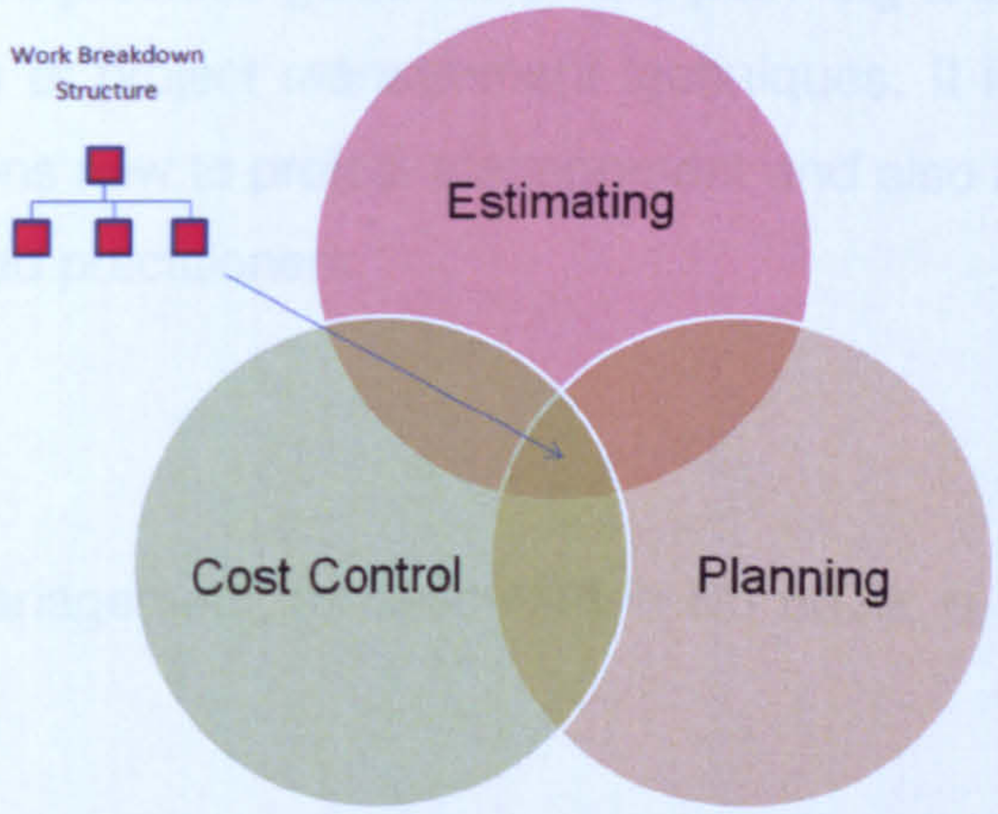


Figure 4-16 Integration of Estimating, Planning and Cost Control

Limitation(s)

Project controls thinking can be thwarted if the necessary skilled staff are not in place. The organisation that is intending to use project controls thinking needs the appropriate systems and processes in place for it to work successfully. The effort required to introduce project controls thinking into an organisation that is new to it, should not be over estimated.

Conclusion

For project controls to work efficiently and effectively IT systems are required so that project information can be easily shared between the main functions of planning, estimating and cost control.

Working in such a structured and integrated manner ensures that information about projects can be controlled better and can assist in the forecasting of project budgets, actual expenditure and overall performance.

For project controls thinking to exist in an organisation, the three major departments must work closely in order to achieve the benefits.

4.8 BS 6079: A guide to project management

What is if?

This British Standard provides guidance on the planning and execution of projects and the application of project management techniques. It is meant as a training document for persons new to project management and also act as an aid memoire for more experienced practitioners.

How does it work?

Effective project management, as described in BS 6079, is broken down into five key elements:

- Planning.
- Organising.
- Motivating.
- Implementing.
- Control by review and accountability.

British Standard 6079 is a comprehensive document and provides a good insight on how projects should be planned and controlled. It incorporates earned value thinking and a diagrammatic view of the main components is shown in figure 4-17.

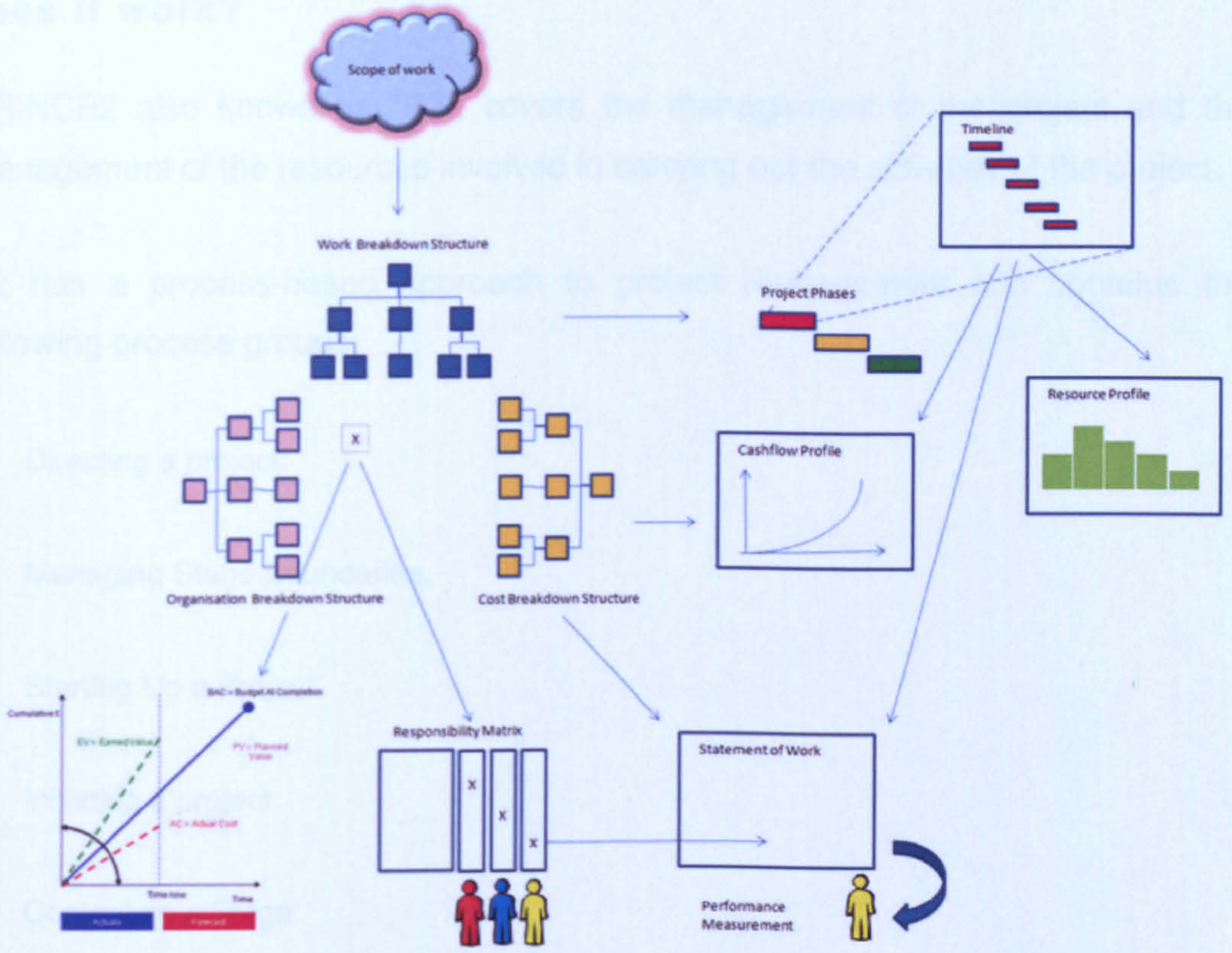


Figure 4-17 Diagrammatic view of BS6079

Limitation(s)

It terms of what it sets out to achieve, it is a good document and does not have any limitations as such.

Conclusion

BS 6079 is a good document to describe the basics of project management to students and acts as a good aid memoire for more experienced practitioners.

4.9 PRINCE2

What is it?

PRINCE is an acronym for Projects IN a Controlled Environment. It was originally developed by Central Communication and Telecoms Association (CCTA), which later merged with Office of Government Commerce (OGC). PRINCE2 was used for mostly IT government projects and it rose to popularity in 1996.

How does it work?

PRINCE2 also known as "P2", covers the management of the project and the management of the resources involved in carrying out the activities of the project.

P2 has a process-based approach to project management and contains the following process groups:

- Directing a project.
- Managing Stage Boundaries.
- Starting Up a Project.
- Initiating a project.
- Controlling a Stage.
- Managing Product Delivery.
- Closing a Project.

The process flow model is shown in figure 4-18.

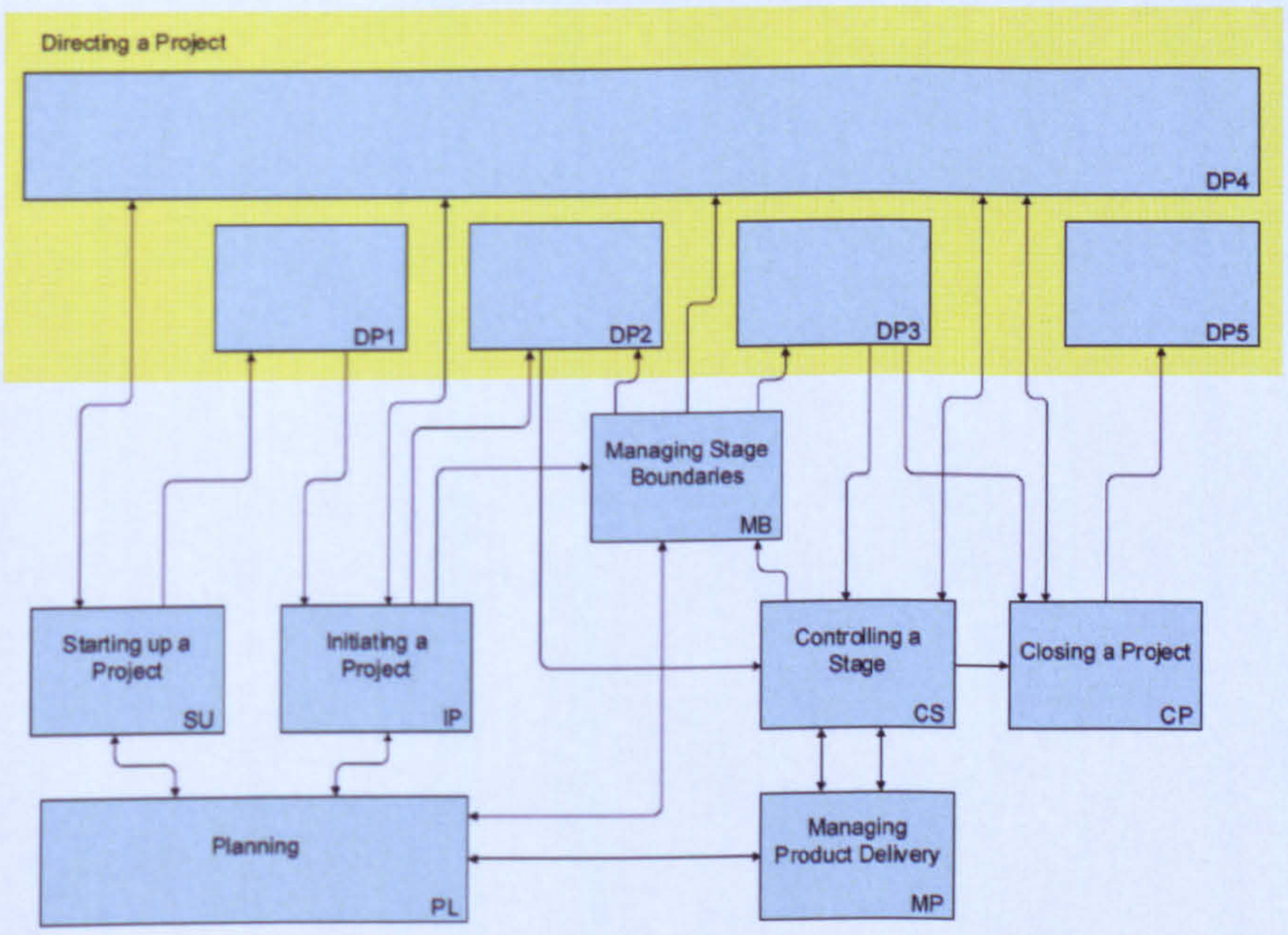


Figure 4-18 PRINCE2 process flow model

For each process there are a series of steps and artefacts that need to be produced before moving to the next one.

It can be quite cumbersome to navigate through the entire process whilst trying to manage a project. A schematic showing the various layers is displayed in figure 4-19.

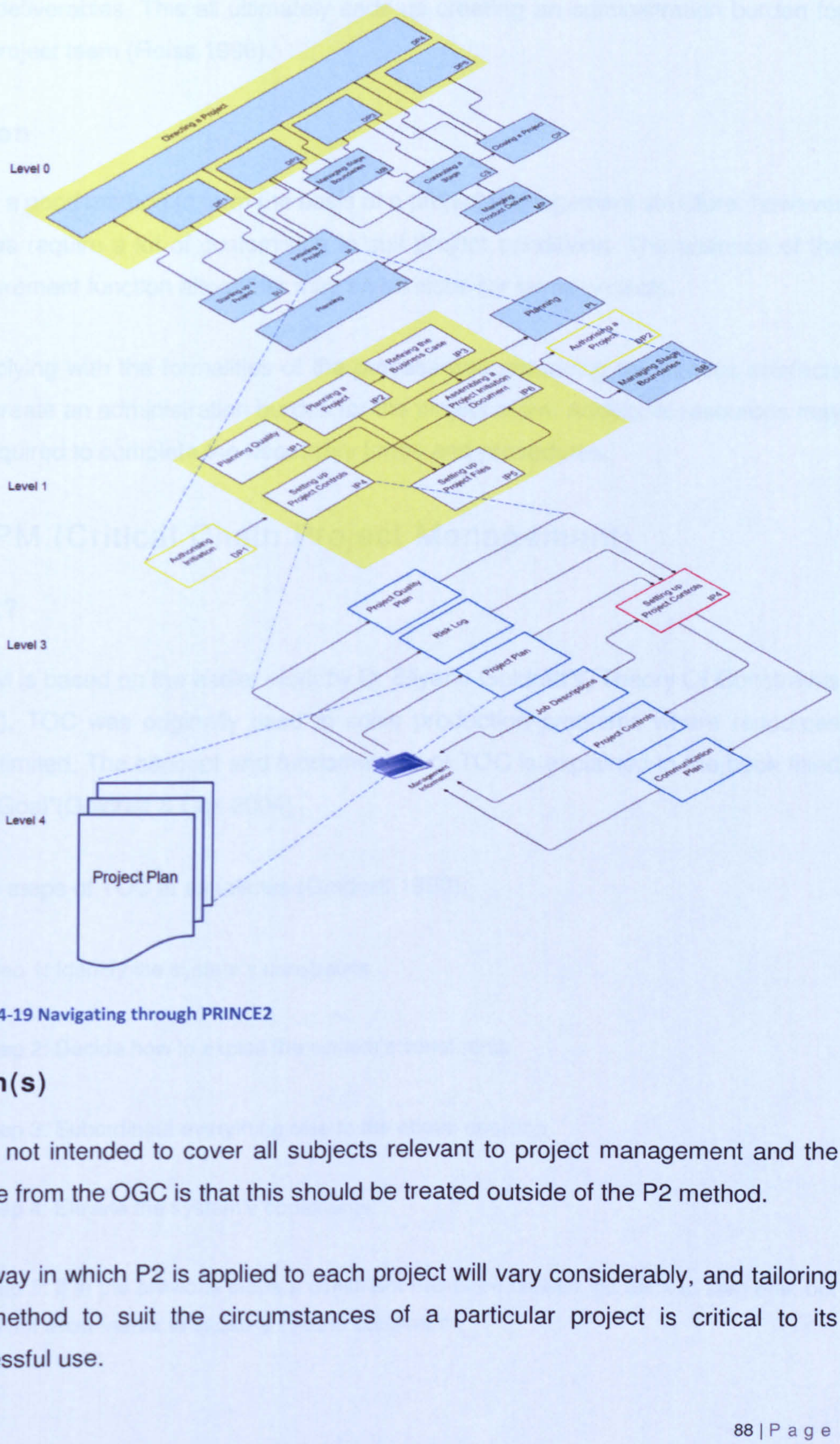


Figure 4-19 Navigating through PRINCE2

Limitation(s)

P2 is not intended to cover all subjects relevant to project management and the advice from the OGC is that this should be treated outside of the P2 method.

The way in which P2 is applied to each project will vary considerably, and tailoring the method to suit the circumstances of a particular project is critical to its successful use.

PRINCE breaks a project down into stages, each of which starts with a specific set of deliverables, documents and approvals and then ends with more documents and deliverables. This all ultimately ends up creating an administration burden for the project team (Reiss 1996).

Conclusion

P2 is a good method to form the basis of a project management structure; however it does require a lot of customising to suit project conditions. The absence of the procurement function altogether may be an issue for some projects.

Complying with the formalities of the process and producing the various artefacts can create an administration burden for the project team. Additional resources may be required to complete the necessary forms and procedures.

4.10 CCPM (Critical Chain Project Management)

What is it?

CCPM is based on the earlier work by Dr Eliyahu Goldratt's, Theory Of Constraints (TOC). TOC was originally used to solve production problems where resources were limited. The concept and fundamentals of TOC is explained in the book titled "The Goal"(Goldratt & Cox 2004).

The 5 steps of TOC is as follows (Goldratt 1990):

- Step 1: Identify the system's constraints
- Step 2: Decide how to exploit the system's constraints
- Step 3: Subordinate everything else to the above decision
- Step 4: Elevate the system's constraints
- Step 5: If in the previous steps a constraint has been broken, go back to step one, but do not allow inertia to cause a system constraint

CCPM is considered a relatively new planning technique and is also included in the PMI Body of Knowledge syllabus. Critical chain is a methodology to plan and manage projects for greatly increased project flow and significantly reduced cycle time per project (Kendall & Rollins 2003).

How does it work?

Goldratt advocates that the cause of schedule failure is due to the following:

- Bad multi-tasking
- Parkinson's Law
- The Student Syndrome

Student Syndrome suggests that people work on the most prioritised tasks in a project regardless of how much time has been allocated.

Parkinson's Law states that work expands to fill the time available, so the more time allowed the longer people take to complete their work.

Taking these two aspects into account it can be concluded that the estimates for time in a schedule can be subject to exaggeration and overestimation by the individual preparing the schedule in the first place. It is for this reason that CCPM claims that the critical path approach to project management is flawed.

The constraint to a single project is the critical chain, defined as the longest path through the network after resource levelling. In other words,

Critical Chain = Critical Path + Resource Levelling

With unlimited resources, the critical chain is the same path as the critical path. With a resource constraint, the critical chain is an acceptable solution to the resource-levelled critical path. Thus the critical chain contains the critical path solution.

In addition to this, Goldratt also distinguishes between two common causes of variations that projects are subjected to. These are similar to those variations that have been defined by Deming. All projects are subject to two causes of variation, i.e. common cause and special cause variations.

Common cause variations are those variations within the capability of a system to repeatedly produce results.

Special cause variations extend beyond that range, usually due to causes outside the system.

Common cause variations are difficult to deal with whereas a contingency can be allowed for special cause variations.

CCPM can be explained with reference to an example, which has been derived from (Wysocki 2009)

In figure 4-20, a typical schedule is shown consisting of 7 activities that are logic linked to provide an overall project duration of 16 days. Activities (A1–A2) and activities (B1-B2) have some slack whereas activities (C1–C3) do not.

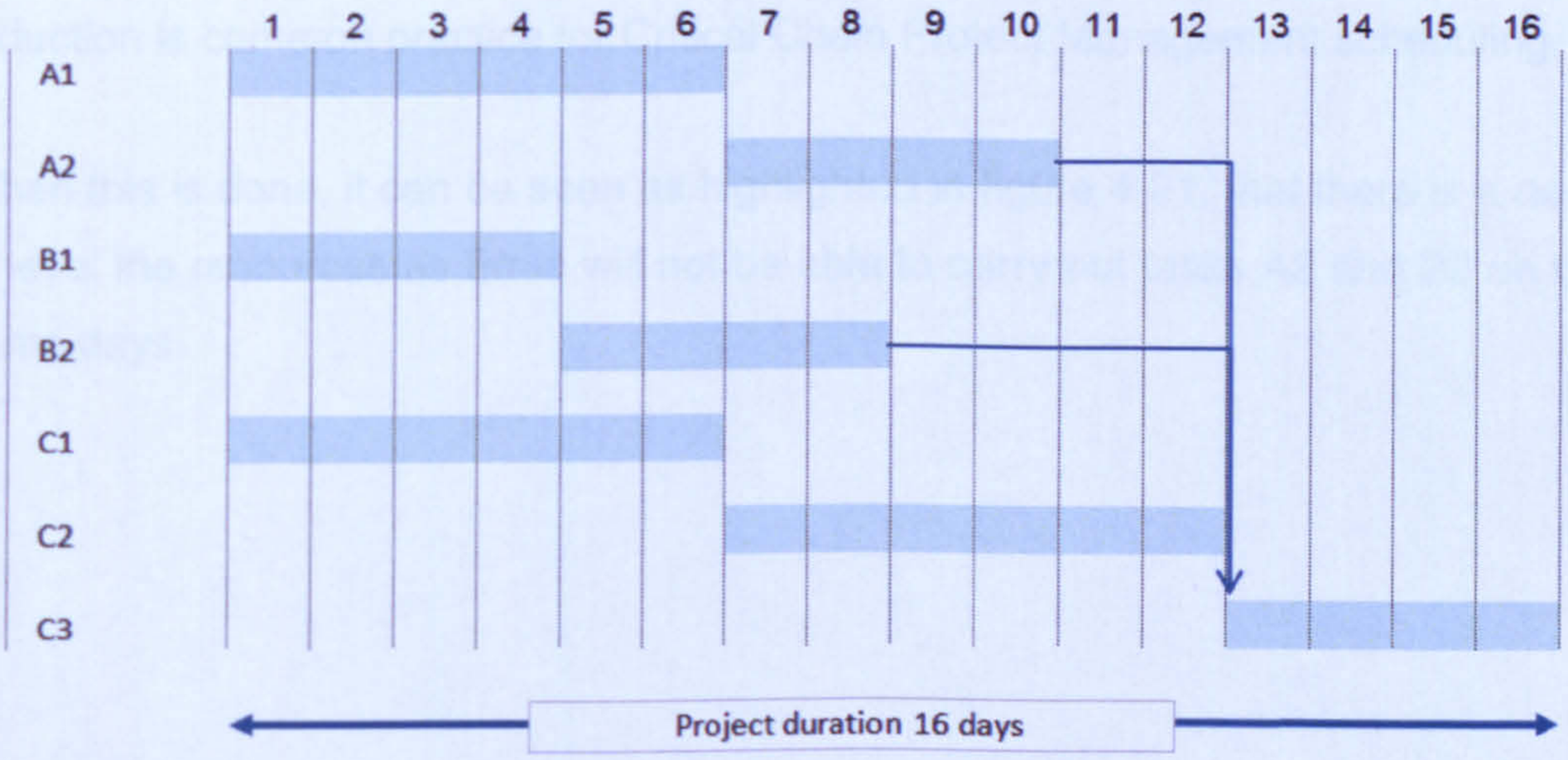
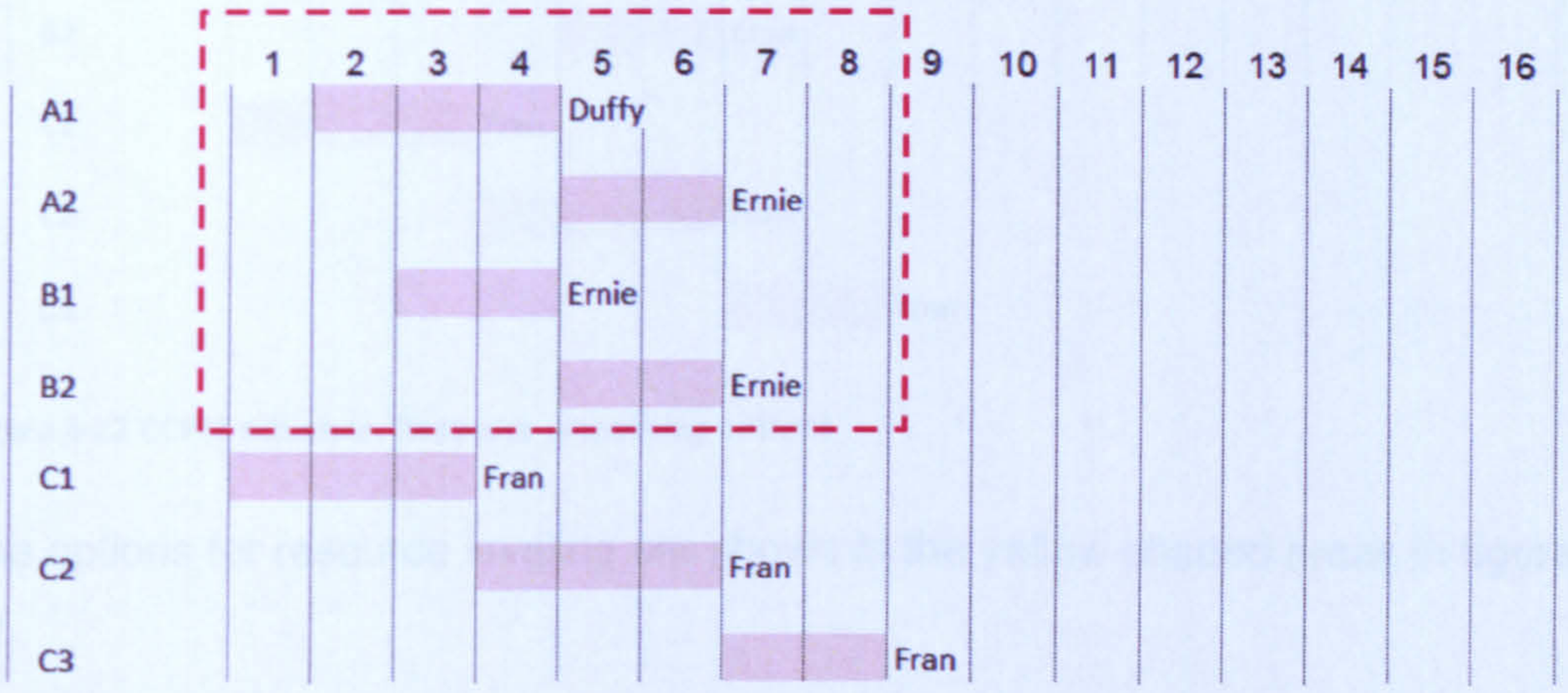


Figure 4-20 CCPM example, typical schedule

It can be deduced that activities (C1–C3) are on the critical path. Therefore any delay in these will have an impact on the overall project duration.

In order to create a CCPM schedule, the slack must be removed, the activities moved so that they start as late as possible, the activity durations reduced by 50% and resources must be assigned to them. This is shown in figure 4-21.



1) Remove the slack
2) Schedule activities to Late Schedule
3) Reduce the duration by 50%
4) Assign Resources

Figure 4-21 CCPM example, modifications to the schedule

The reduction of durations by 50% is made due to the factors mentioned earlier i.e. bad multi-tasking, Parkinson's Law and the Student syndrome. This percentage reduction is common practice for Critical Chain Project Management scheduling.

When this is done, it can be seen as highlighted in figure 4-21, that there is a need to level the resources as Ernie will not be able to carry out tasks A2 and B2 on the same days.

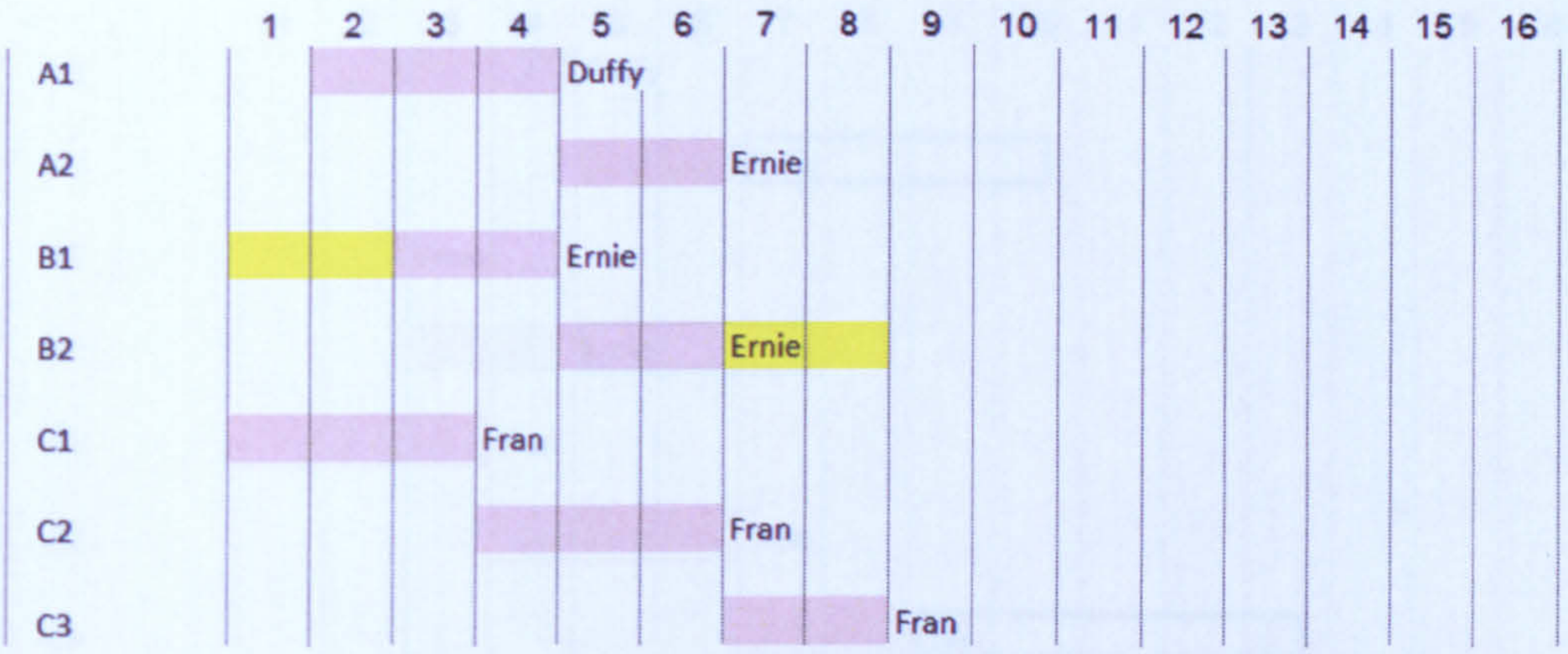


Figure 4-22 CCPM schedule, Resource smoothing options

The options for resource leveling are shown in the yellow shaded areas in figure 4-22.

Once the resources are leveled, buffers are added to the end of each chain. A feeding buffer is one that feeds into the critical chain and a project buffer is one that is at the end of the critical chain.

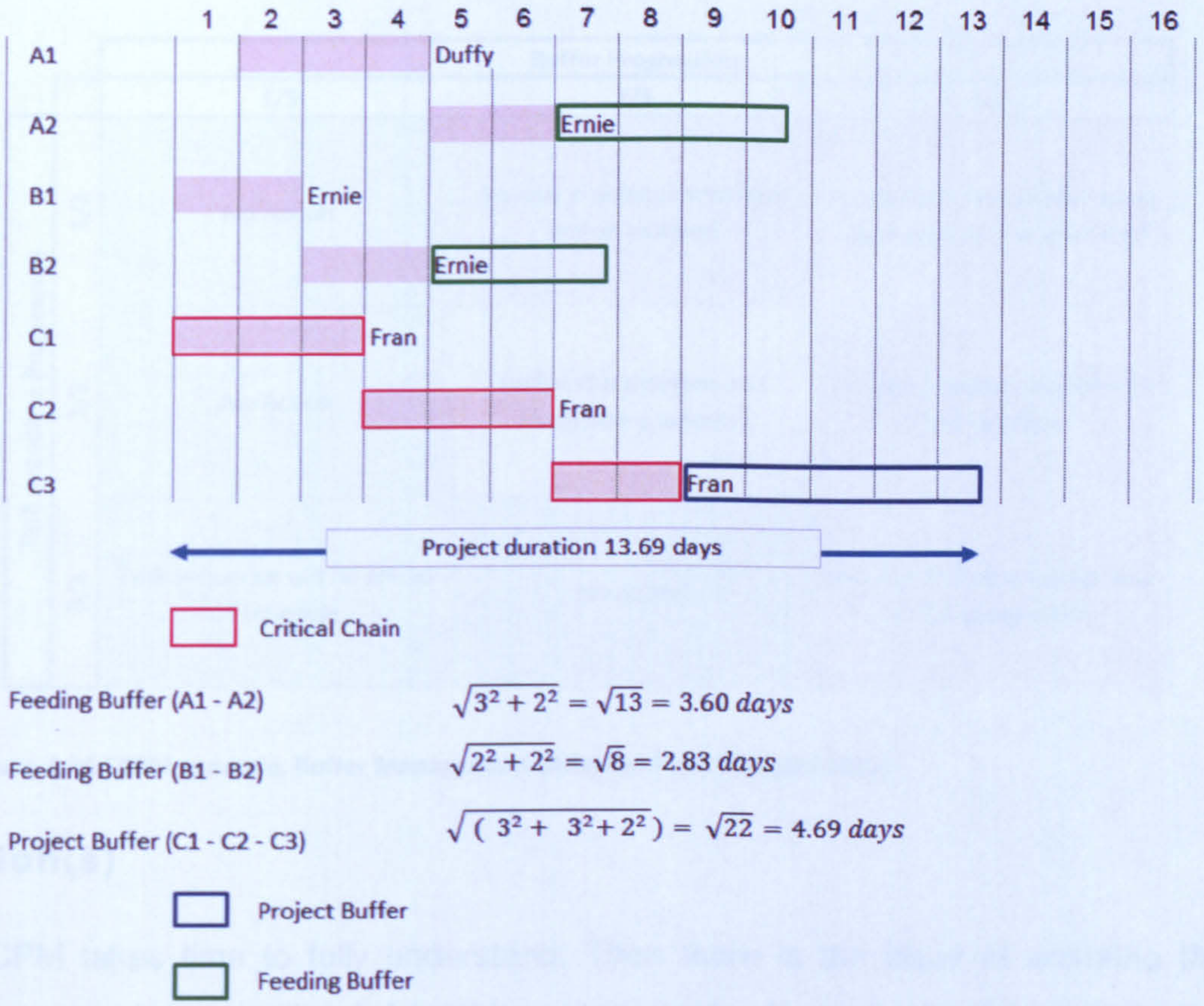


Figure 4-23 CCPM example, CCPM schedule development

Figure 4-23 shows the buffers and the associated calculations for these. This now provides the project duration of 13.69 days as opposed to the original figure of 16 days.

Once the CCPM schedule is developed, the project manager can now manage the entire project using the buffers. Wysocki has developed a three by three matrix that provides a guide as to when to react depending on the expenditure of the buffer and the progress made by a series of activities in the chain (Wysocki 2009). This is shown in figure 4-24.

Task sequence Progression	Buffer Progression 1/3	Buffer Progression 2/3	Buffer Progression 3/3
1/3	No Action	Serious problem immediate action required	A very serious problem exist; aggressive action is needed
2/3	No Action	Define the problem and formulate a solution	Serious problem; implement the solution
3/3	Task sequence will be ahead of schedule	No Action	Monitor the situation for any further progression

Figure 4-24 CCPM example, Buffer Management (Adapted from Wysocki 2009)

Limitation(s)

CCPM takes time to fully understand. Then there is the issue of ensuring that everyone else understands how this process works. It may be hard to implement in an organisation, especially one that is used to planning in the traditional manner.

CCPM has a number of valuable concepts, it does not provide a complete solution to project management needs, and that organisations should be very careful about the exclusion of conventional project management techniques (Raz, Barnes & Dvir 2003).

Conclusion

The TOC approach changes the way we think about project scheduling. It implies a paradigm that is radically different from the prevailing one .i.e. the traditional approach to project planning (Steyn 2000).

Whilst the Critical Chain concept is complex, many of its ideas can easily be adapted by practising managers (Lechler, Ronen & Stohr 2005).

Not many organisations are using CCPM, Lucent Technologies and Harris Semi Conductor are successfully using CCPM for their projects (Herroelen & Demeulmeester 2002). Leach also confirms that Lucent Technologies, The Israeli Aircraft Industry and the US Navy shipyards have used CCPM for their projects (Leach 2005).

TOC deals with how senior management deal with human behavior both in terms of constructing the network and managing it's afterwards (Rand 2000).

It is too early to evaluate if CCPM will be accepted as a planning tool over the traditional methods of planning (Wysocki 2000).

CCPM is an innovative method and could be used as an extra check on the project schedule in addition to the traditional way of producing schedules. It should be used in conjunction with traditional methods and not used to replace them entirely.

4.11 Summary of Findings

This chapter explained the main methods that fall under the PPM category of thinking. They are all process driven and are most appropriate for projects that are subjected to manageable levels of changes to the original scope. They are highly structured and involve the team to be highly disciplined and pedantic in their application.

Earned Value Management, if applied correctly, can provide many benefits over other conventional methods. For a start it integrates cost and time to provide a true picture of project status. Having stated this, to implement EV requires a lot of effort, especially for those organisations new to this concept. It requires new behaviours and cross-functional thinking between different groups and departments.

Earned Value Management once implemented, can be extremely useful. Especially in its ability to summarise project progress quickly and easily with cost and schedule information. However, it can be quite resource intensive and the cost of the additional resources required to administer it is less than the benefits that it can bring to the project.

Also, if EV is used on a project that incurs many changes to the project scope then trying to ensure that this is accurately reflected in EV calculations can be a challenge.

A summary of the methods discussed in this chapter is shown in figure 4-25, along with their unique characteristics and application assessment.

	Classification				Generalised Assessment							Typical Application			
	Methodology	Technique	Approach	Best Practice	Amount of procedures	Resource requirement	Requirement for IT systems	Resource capability - Technical	Amount of Formality	Time to implement	Training required	Complex Projects	High UNCERTAINTY	High CERTAINTY	Process driven
PRINCE 2	X				H	H		H	H	H	H			X	X
Project Controls			X		H	H	H	H	H	H	H			X	X
Earned Value		X			H	H	H	H	H	H	H			X	X
Critical Chain Project Management				X	M	M		L	M	M	L			X	X
BS 6079	X				M	H	H	M	M	H	H			X	X

Figure 4-25 Summary of Predictive Project Management Methods

With most PPM methods the following criteria must be in place for them to be used effectively:

- The scope must be clearly defined.
- There must be a clear mechanism for managing and incorporating changes to the project scope.
- The entire team must obey and work to the prescribed process and procedures.
- Accurate project information must exist.
- Greater cooperation and collaboration is required across different teams.

Modern project management developed over the last 50-60 years and as codified in project management bodies of knowledge, places emphasis on planning and control (Crawford, Morris & Winter 2006).

Although planning does not guarantee success, lack of planning will probably guarantee failure (Dvir & Shenhar 2003). Project success is about getting the requirements right and also planning and executing the project properly.

5 ADAPTIVE PROJECT MANAGEMENT

5.1 Introduction

The previous chapter described PPM, which involved the methods for controlling and managing projects that are considered 'linear' in nature. What happens when you need to manage a project that is non linear. The future is largely unknown. Most business decision-making takes place on the basis of assumptions, expectations, estimates and forecasts and this in itself involves risk (Raftery 1994).

Whilst the conventional bodies of knowledge form a good foundation for basic training and learning, they may not be useful in dealing with complex problems of today's projects (Shenhar and Dvir 2007). This is also echoed by the International Centre for Complex Project Management (ICCPM), who suggest that linear project management is insufficient to deal with the challenges of complex projects (ICCPM 2011).

Adaptive Project management (AdPM) also known as agile methods, evolved in the early 1990s. There was a major initiative from the IT industry to improve the delivery of IT projects. In 1992, some leading Agile practitioners and software development companies met to discuss the issues with IT project delivery. The result was the formation of the Agile manifesto and its twelve principles to which many people have signed up to, since its formation. The agile manifesto is shown in figure 5-1.

AdPM isn't a light-touch approach to project management but a different way of project delivery in comparison to traditional project management methods.

5.2 Manifesto for Agile Software Development

On 11th February 2001, leading thinkers and practitioners of SCRUM, XP, and many other adaptive methodsconvened to discuss the future of agile development for IT projects. A major output from that meeting was the formation of the manifesto for agile software development, shown in figure 5-1.

As can be seen the Agile Manifesto focused more on individuals, results, collaboration and response to change. In addition to this the working group devised 12 principles for Agile Software development.

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

Figure 5-1 Principles of the Agile Manifesto

The 12 principles underline the need for greater collaboration between teams, simplicity and empowering individuals to work together in order to make timely decisions. The 12 guiding principles are shown in Table 5-1.

1	Our highest priority is to satisfy the customer through early and continuous delivery of valuable software.
2	Welcome changing requirements, even late in development. Agile processes harness change for the customer's competitive advantage.
3	Deliver working software frequently, from a couple of weeks to a couple of months, with a preference to the shorter timescale.
4	Business people and developers must work together daily throughout the project.
5	Build projects around motivated individuals. Give them the environment and support they need, and trust them to get the job done.
6	The most efficient and effective method of conveying information to and within a development team is face-to-face conversation.
7	Working software is the primary measure of progress.
8	Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.
9	Continuous attention to technical excellence and good design enhances agility.
10	Simplicity -the art of maximizing the amount of work not done--is essential.
11	The best architectures, requirements, and designs emerge from self-organizing teams.
12	At regular intervals, the team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.

Table 5-1 the 12 principles of the Agile Manifesto

5.3 MSP (Managing Successful Programmes)

What is it?

Managing Successful Programmes (MSP) is a methodology developed by the OGC for managing programmes. It was developed to provide a framework for ensuring that proper governance was in place and that the benefits of programmes was better planned, managed and tracked. It introduced the role of the Business Change Manager, whose job is to monitor and ensure that benefits are identified, tracked, managed and realised throughout the programme life cycle.

How does it work?

MSP advocates that programmes are about delivering outcomes and projects are concerned with delivering outputs. The idea behind the MSP methodology is that once there is a proper governance structure in place and work packages are identified then PRINCE2 methodology can be used for the individual projects making up the programme.

MSP is very useful for forming and shaping programmes. It can help in the strategic establishment of programmes and help define the overall outcome into a series of outputs that can then be delivered via a group of interrelated or different projects.

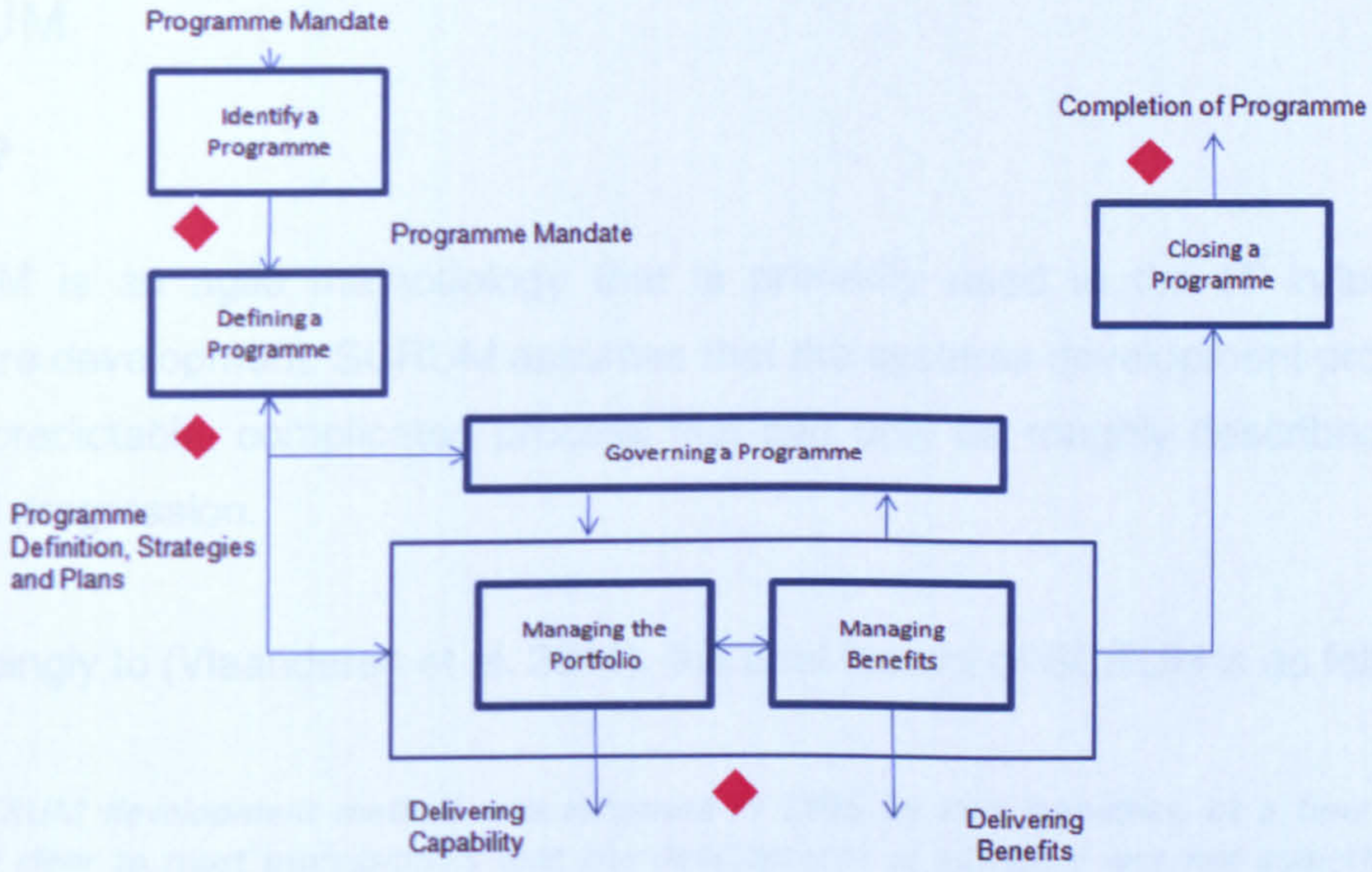


Figure 5-2 Managing Successful Programmes (MSP) process

The OGC advocates that MSP is a structured framework that can help organisations deliver change. It deals with uncertainty, complexity and risk (OGC 2005). The MSP framework is shown in figure 5-2.

Limitation(s)

It is a high level framework and lacks some detail. The detail is meant to be developed further by the use of PRINCE2, which may not be entirely appropriate for the programme being considered.

(Pellegrinelli et al. 2007) conducted research into MSP and their main conclusion was as follows:

".. the research highlights an apparent gulf between the broad, holistic perspective on programme management espoused in the first two chapters of MSP and the more reductionist, project-based underpinning of the tools and techniques contained in the rest of the guide. The mechanistic application of MSP tends to support a tactical, controlling agenda rather than a strategic, empowering agenda."

Conclusion

MSP provides a strategic approach to structuring programmes and especially helps in delivering change programmes.

5.4 SCRUM

What is it?

SCRUM is an agile methodology that is primarily used in the IT industry for software development. SCRUM assumes that the systems development process is an unpredictable, complicated process that can only be roughly described as an overall progression.

Accordingly to (Vlaanderen et al. 2011), the brief history of SCRUM is as follows:

"The SCRUM development method was proposed in 1995 by Ken Schwaber, at a time when it became clear to most professionals that the development of software was not something that could be planned, estimated and completed successfully using the common 'heavy' methods. The SCRUM method is based on the work of Pittman and Boch, and adheres to the principles of agile software development"

SCRUM includes "inspect and adapt" cycles for methods and teamwork along with mechanisms to examine and improve the product (Derby & Larsen 2006).

SCRUM has the following key roles:

- SCRUM Master
- Product Owner
- SCRUM team

The SCRUM master is the person who acts as a mentor / coach to the SCRUM team and mainly keeps the team sheltered from external interference.

The Product Owner is the person who dictates the key functionality of the product.

How does it work?

The team work together to complete the activities associated with the product. Everyone is equal and there are no individual job titles indicatingspecialism's. The major premise of SCRUM is that the team knows what is best and they are in a better position to organise themselves in order to produce the required outputs.

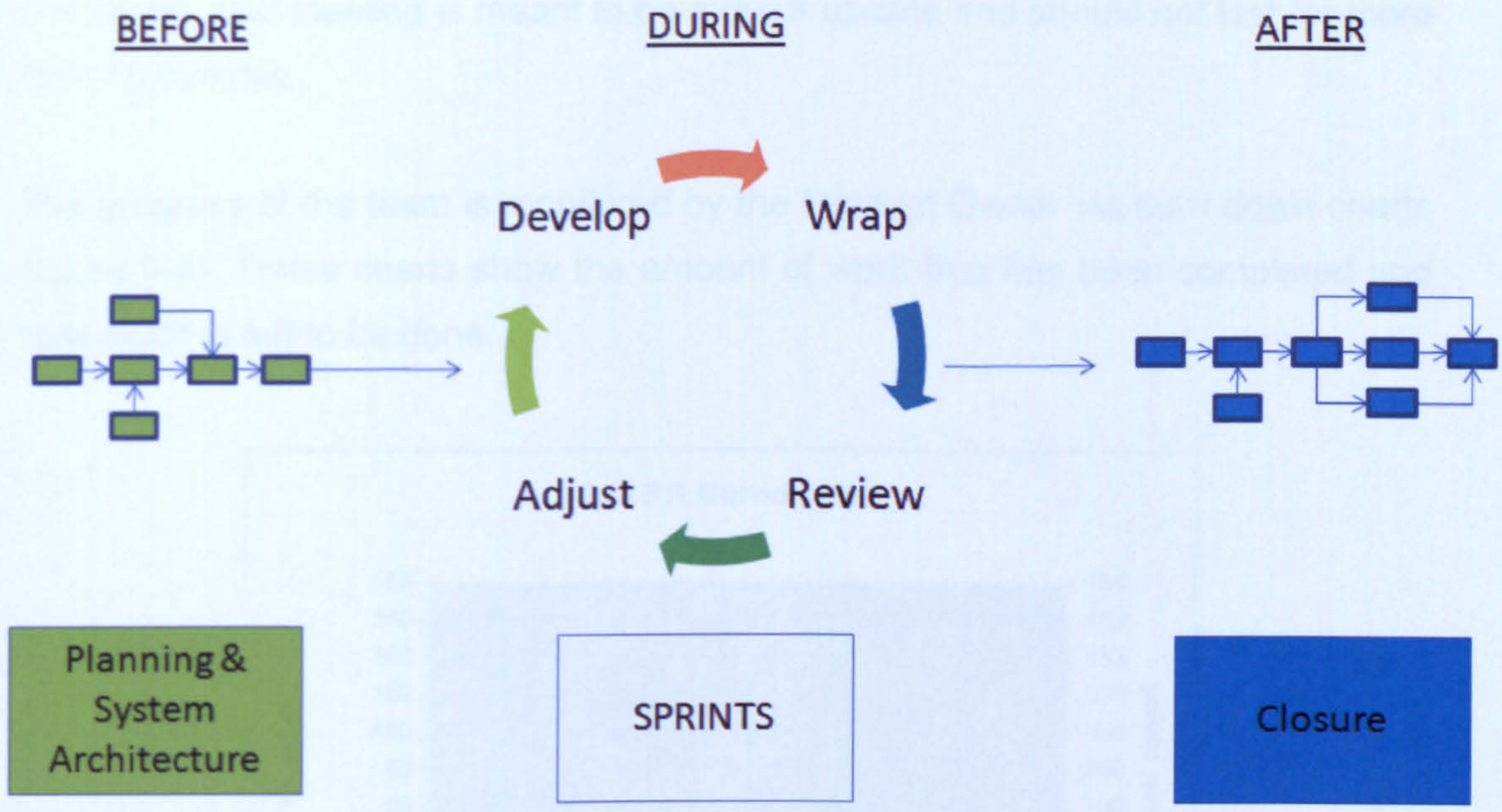


Figure 5-3 SCRUM process

The SCRUM process is shown in figure 5-3.

The Product Owner is responsible for the final functionality of the product. He or she will agree a list with the SCRUM team. This list will contain a list of functionality required from the final product. This list is known as the Product Backlog. Once the Product Backlog is produced the Product Owner is responsible for agreeing the priority of the items with the project team.

The work required to deliver the functionality as detailed in the Product backlog is conducted through a series of Sprints. Each sprint lasts for a maximum of 6 weeks and during this period the team deliver the functionality. Before each Sprint is undertaken by the team, they produce a list of activities that relate to the functionality listed in the Product Backlog. The list produced by the team is known as the Sprint Backlog.

Before the start of each Sprint, the team have one day dedicated to planning their activities and at the end of the Sprint they have a review for a day. During the Sprint, there are daily Sprint meetings at which each team member provides a quick update on what they are working on, what is next and what key issues they

are facing. The meeting is meant to be a quick update and should not last for more than 15 minutes.

The progress of the team is monitored by the Product Owner via burn down charts (figure 5-4). These charts show the amount of work that has been completed and how much is left to be done.

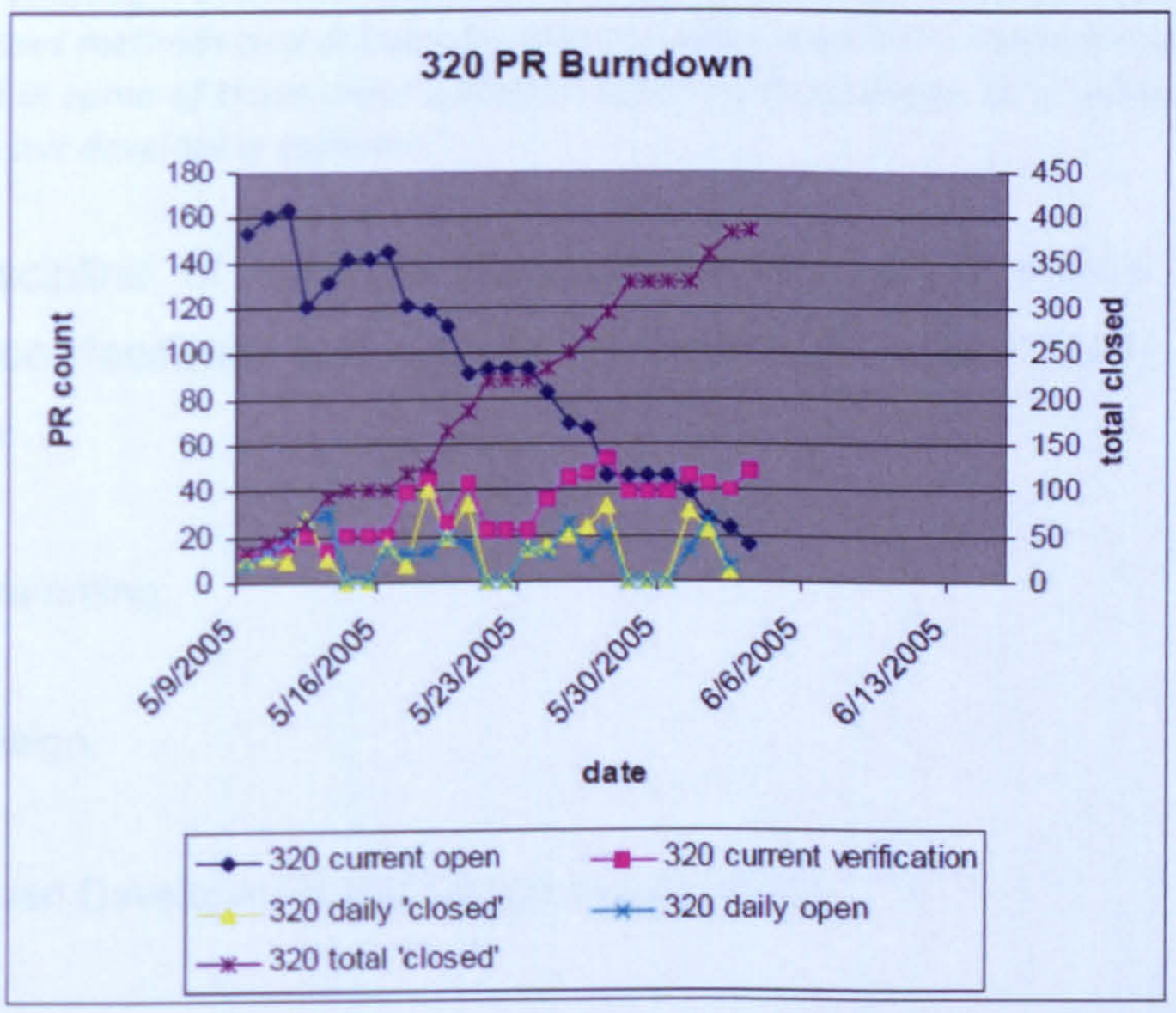


Figure 5-4 Burndown Chart (taken from Sutherland 2005)

Limitation(s)

SCRUM is a good methodology for delivering complex projects. It does rely on having high calibre resources to make key decisions and deliver the final product. The team needs to be disciplined both as a team and as individuals.

Conclusion

SCRUM is an innovative method that empowers individuals to make key decisions. It relies on minimal amount of process and procedure and uses some very basic controls for managing the team. If this methodology is implemented correctly it has the potential to provide the desired results

5.5 XP (eXtreme Programming)

What is it?

XP is a methodology for software development that is highly effective for small teams. (Blom 2010) describes the origins of XP as:

"Extreme programming is a methodology that emerged as a counter-reaction to the ever increasing focus on processes methods and documents that the older prominent methodologies developed. It almost seemed in some of these older waterfall-based methodologies as if software development was everything but developing software"

XP is a discipline of software development based on values of simplicity, communication, feedback and courage (Lindstrom & Jeffries 2004). The core XP practices are:

- Pair Programming.
- Simple Design.
- Test – Driven Development and Design Improvement.

XP uses rapid iterative planning and development cycles in order to force trade-offs and deliver the highest value features as early as possible (CCPACE 2003).

XP attempts to simplify management by empowering the Customer and Programmer to make most of the decisions regarding the project.

(Angioni et al. 2006) define XP as:

"Extreme Programming is a software development methodology which does not rely on any particular tool, but rather is based on the common understanding of fundamentals values and a disciplined application of best practices".

How does it work?

An XP project contains a coach who is instrumental in mentoring and coaching the project team. He or she will also deal with any external issues that the project team cannot deal with.

The XP process is shown in figure 5-5.

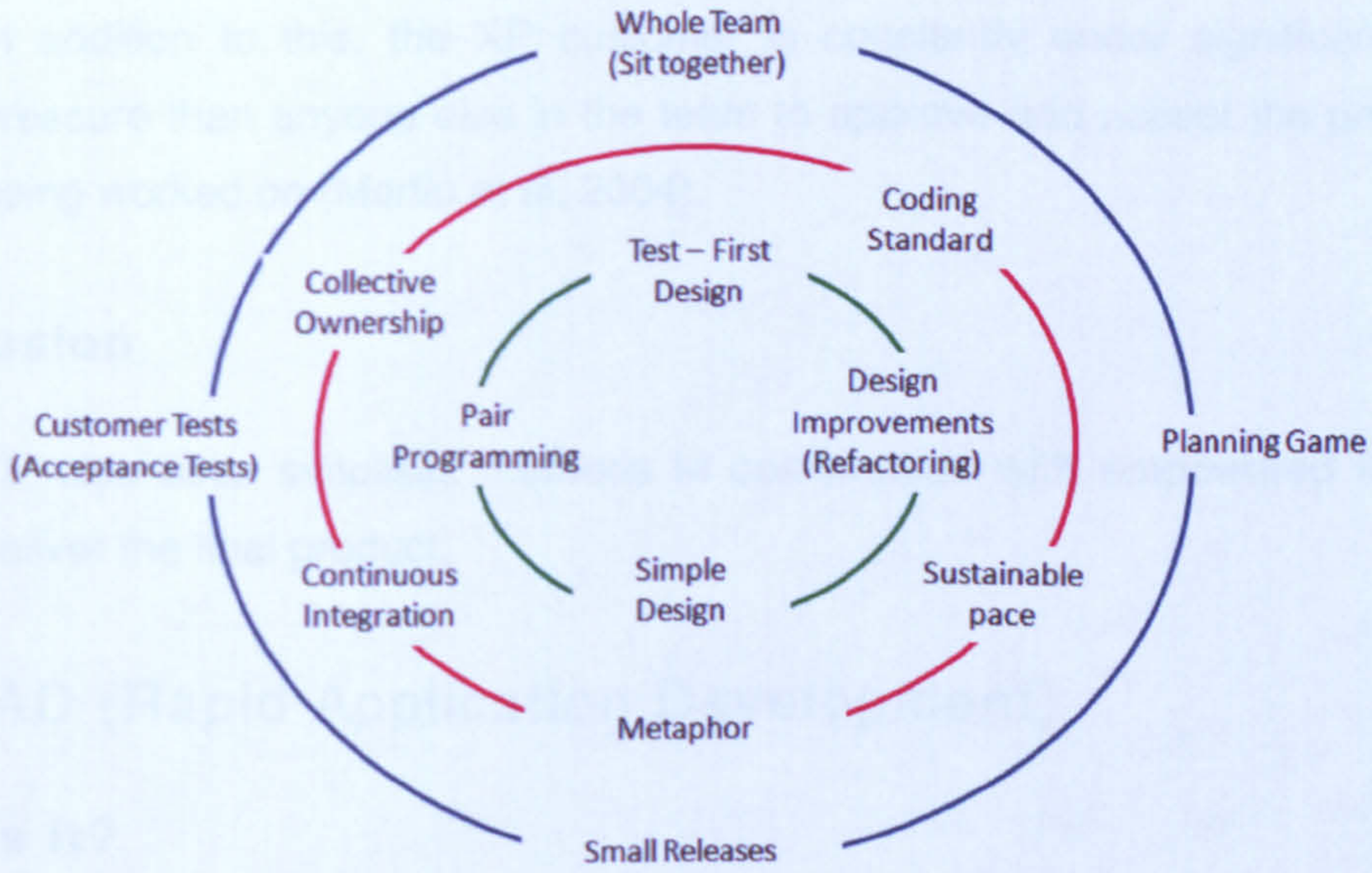


Figure 5-5 eXtreme Programming process

Quality is achieved through continuous improvements through a process called refactoring. In addition to this the project uses metaphors to describe functionality. For example,

'This program works like a hive of bees, going out for pollen and bringing it back to the hive'

Work is carried out in iterations known as 'Rhythms'. These have a maximum duration of two weeks.

The customer has a vital role in XP and according to (Chow & Cao 2008), good project management and strong customer involvement are critical for project success.

Limitation(s)

XP can be used for small project teams that do not have too many obstacles. XP practices are intended for use with a small, collocated team (Highsmith 2002).

This is further stressed by (Valkenhoef et al. 2011) who state:

"Release planning in Extreme Programming (XP) can cause prioritization stress for the customer and is impractical in larger projects"

In addition to this, the XP customer is constantly under significant amount of pressure than anyone else in the team to approve and accept the product as it is being worked on (Martin et al. 2004).

Conclusion

XP also uses simplistic methods in combination with empowered individuals to deliver the final product.

5.6 RAD (Rapid Application Development)

What is it?

RAD (Rapid Application Development) is another agile methodology used by the IT industry

How does it work?

A small and dedicated team of users and IT staff work full time over a short period of time to produce a deliverable system.

The team composition reduces the amount of documentation needed during the project. RAD has the following features:

- Prototyping is used to deliver the system
- It works best for small projects.
- Control is exercised through, Facilitated Workshops, Time-boxing and Prototyping.

Prototyping is used to confirm if the software requirements have been fully understood by the team (Clegg, Barker & Barker 1994).

(Beynon-Davies & Holmes 2002) summarise RAD as follows:

RAD is an interactive and contingent approach to interactive software development that is characterised by large amounts of user involvement, the use of incremental prototyping and product-based project management"

The need to produce result quickly within a shorter timeframe is also stressed by Tudhope et al. 2001, who state

"Time is a prominent feature of RAD. A much-quoted axiom is that 80% of a system (taken to include the system's key features) can be produced in 20% of the time required to build the complete system"

Limitation(s)

It would appear that RAD methods are best suited to smaller projects that do not have too many obstacles. It is easier to manage a small team. For a large team of many individuals it may become difficult to manage and control overall performance.

Regarding the emphasis of user and the use of prototyping in RAD, (Tudhope et al. 2001) state that

Putting this emphasis into practice, however, can pose pragmatic and organisational problems. Issues relating to user involvement, design representations and time management come to the fore in prototyping projects"

Conclusion

Like the other agile methods, RAD has been successfully used in the IT industry to deliver quick turn-around software development projects.

(Beynon-Davies & Holmes 2002) summarise the objective of RAD in one sentence as:

"The commercial need to deliver working business applications in shorter timescales and for less investment"

5.7 XPM (eXtreme Project management)

What is it?

XPM has been developed by Doug Decarlo to provide a methodology for dealing with complex projects, which are subjected to high uncertainty (DeCarlo 2004).

Linear projects are relatively easy to manage. A plan is charted out and then the project is managed in accordance with this. Nonlinear projects behave in an unpredictable manner and for these projects a much different approach is required. This is the essence of XPM.

According to DeCarlo, traditional project management is based around the Newtonian worldview. This view is based on determinism and reductionism i.e. the world can be dissected into a predictable set of cause-and-effect relationships. This is referred to as left-brain, linear and logical thinking.

According to (Hartman 2008), the left and right hand side of the brain functions can be described as follows:

"The left hemisphere of the brain is largely responsible for logical and sequential thought, our ability to interpret text, our ability to understand detail and our analytical skills."

"The right side of the brain carries contrasting functions such as our ability to think and deal with more than one matter simultaneously. It is this side of the brain that helps us comprehend context and see the big picture."

XPM is based on work derived out of the studies in quantum physics, where particles at the sub atomic level move in random fashion and are totally unpredictable. DeCarlo calls this the quantum mind-set where unlike the Newtonian world where predictability is the norm, change is the normal for eXtreme projects.

XPM encourages the individual to use the right hand side of the brain as opposed to the left hand side. In figure 5-6, is shown the human brain. The left hand side is largely analytical and the right hand side is more creative.

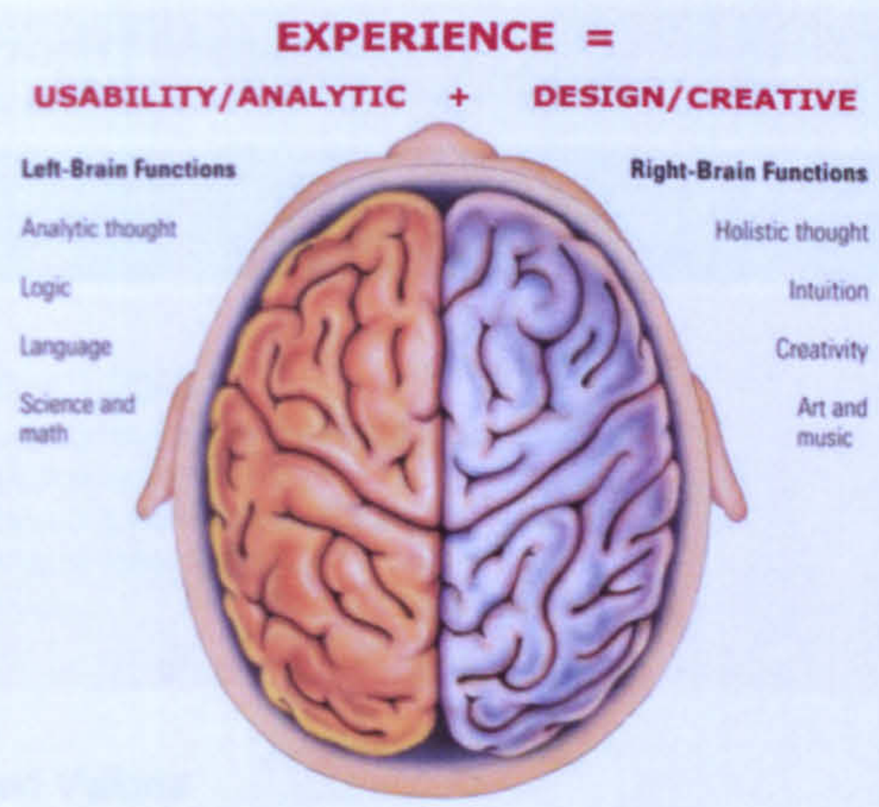


Figure 5-6 Left hand and right hand side of the brain[1]

A linear project can be like plotting the spacecraft trajectory whereas the prediction of the weather can be considered as a nonlinear example (Holden 2005).

How does it work?

XPM primarily focuses on delivering projects that are highly unpredictable and will be subject to constant change. This could emanate from changes in the technology being used to deliver the project or modifications relating to changing client requirements.

For XPM to work, the mindset to be adopted by the project manager and the team members is that change is inevitable and that there is no need to be resistant to it. Change must be embraced as soon as it occurs. This mindset is somewhat at the opposite end of thebehaviour spectrum, when compared with traditional project management.

Whilst good quality people are required on all projects regardless of project management thinking adopted, it is more so the case for XPM. The project team must have the right attributes and self-awareness in order to make a positive contribution, and deliver the final product.

DeCarlo talks about the Quantum mindset, Accelerators, Shared Value, Business Questions and Critical Success Factors, all of which are shown in figure 5-7 (DeCarlo 2004).

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[1] Image taken from http://ninespv.wordpress.com/2009/03/04/which-way-is-she-dancing/

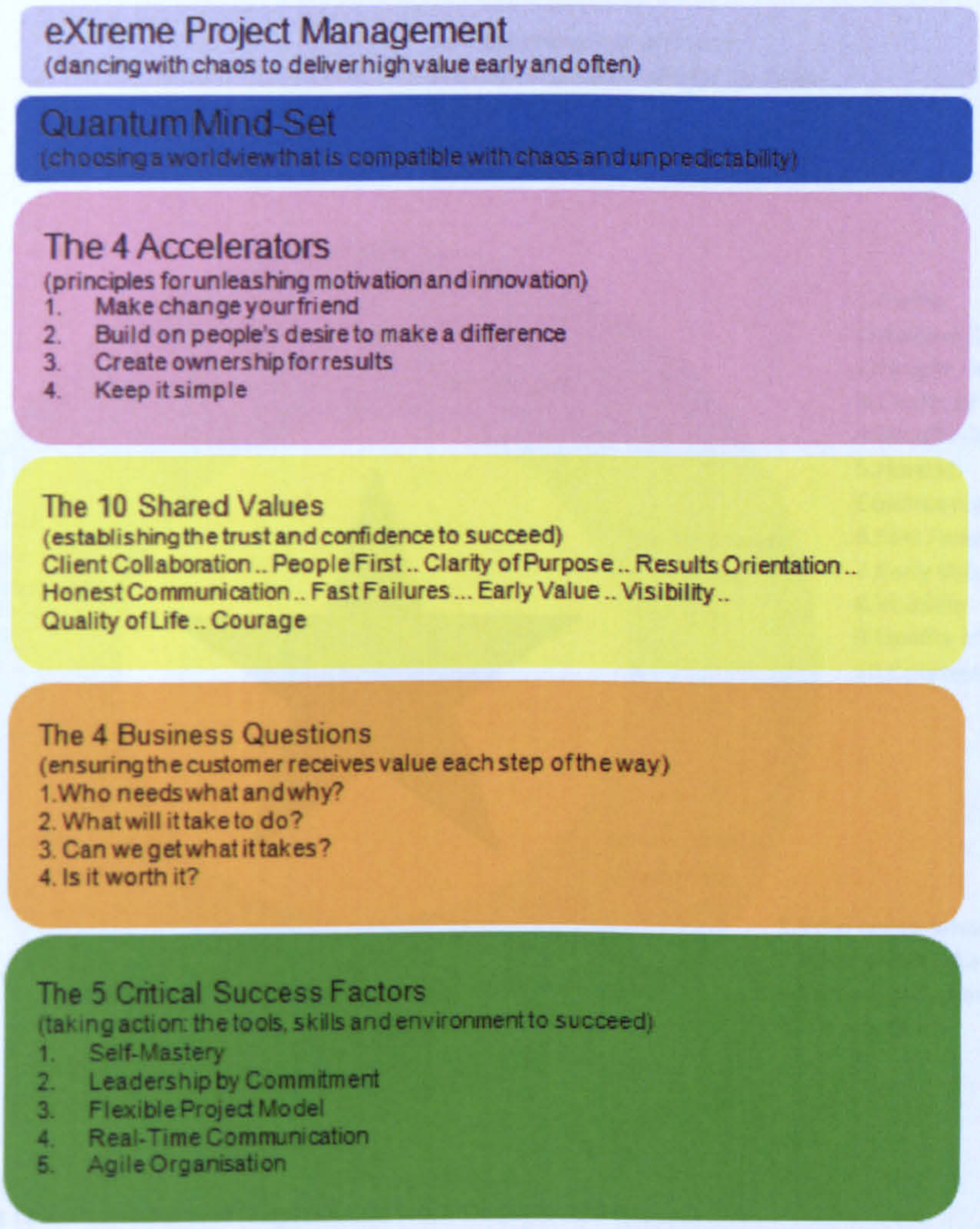


Figure 5-7 Extreme Project Management (Reproduced from DeCarlo, 2004)

According to DeCarlo, the success of XPM rests with the individual team member and the focal point of the areas that need to be taken into consideration are shown in figure 5-8.

Like most Adaptive project management methods, work is executed via a time box. The output from the time box is reviewed and depending upon the level of progress made, another time box is planned and executed. Working in this manner provides incremental progress towards the end goal and the ultimate delivery of the final product.

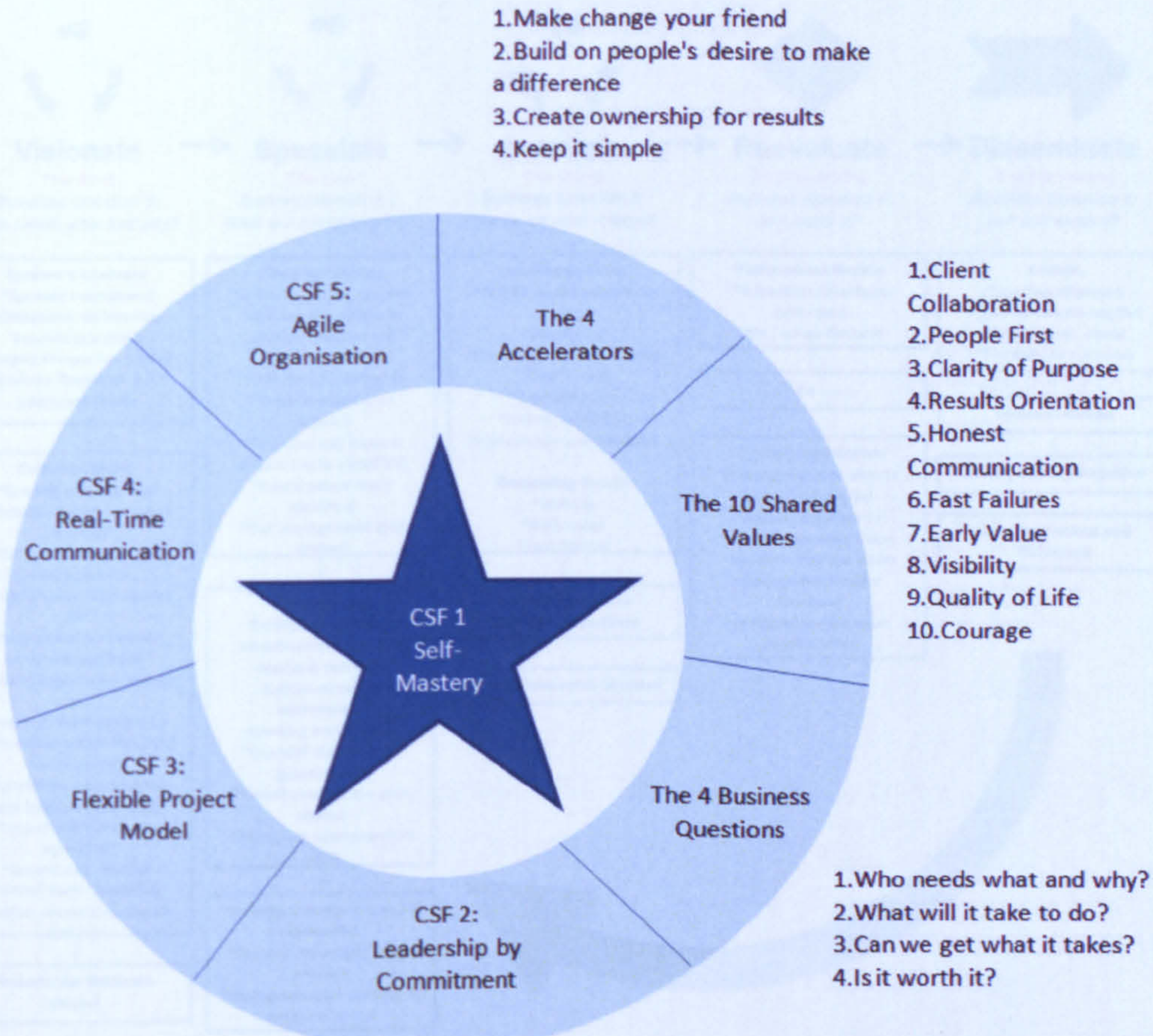


Figure 5-8The Quantum Mindset (Reproduced from DeCarlo 2004)

DeCarlo has devised a flexible project model, which has a few innovative artefacts that help the team to deliver. The flexible project model is shown in figure 5-9. These artefacts are very lean and provide just the right amount of process control without becoming a burden for the project team.

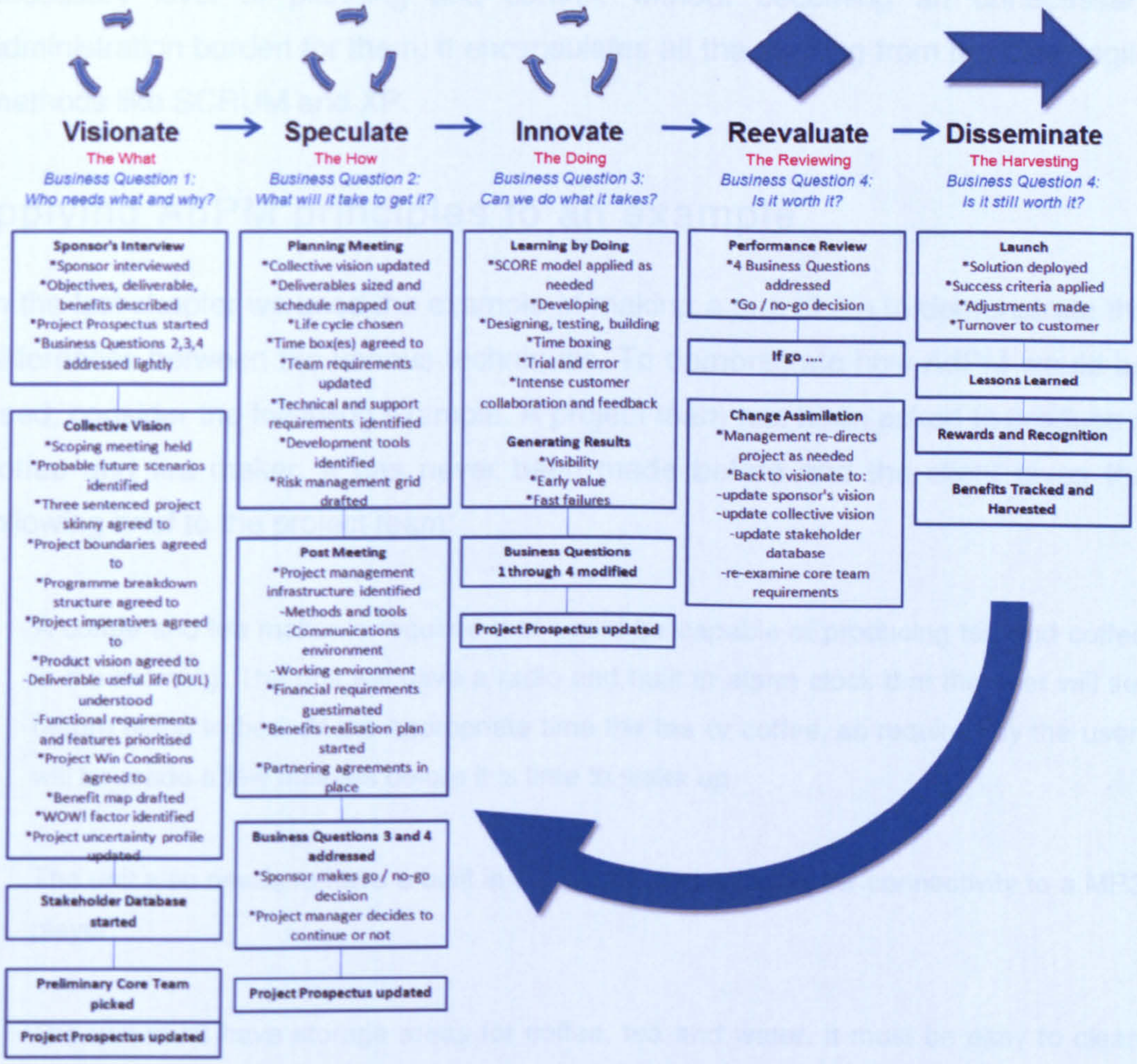


Figure 5-9 eXtreme Project Management process (Reproduced from Decarlo 2004)

Limitation(s)

DeCarlo's method is innovative andingenious. It provides a very flexible methodology for delivering complex projects. However, it does require the use of higher than usual, calibre team members. It relies less on process compliance and more on having the right people in the team who are empowered to take ownership and deliver results fast. In other words, team members must display high levels of emotional intelligence.

Conclusion

XPM is a flexible project methodology for managing complex and fast moving projects. It provides the right level of artefacts for the team to implement the

necessary level of planning and control, without becoming an unnecessary administration burden for them. It encapsulates all the thinking from the other agile methods like SCRUM and XP.

5.8 Applying AdPM principles to an example

In the last chapter we used the example of making a cup of tea to demonstrate the differences between the various techniques. To demonstrate how AdPM would be used, consider the following example. A project team has been asked to produce a coffee and tea maker. It has never been made before and the client gives the following brief to the project team:

- A coffee and tea maker is required that would be capable of producing tea and coffee in the morning. The unit will have a radio and built in alarm clock that the user will set before going to bed. At the appropriate time the tea or coffee, as required by the user, will be made a few minutes before it is time to wake up.

- The unit also needs to have a built in CD player and a facility for connectivity to a MP3 player.

- The unit must have storage areas for coffee, tea and water. It must be easy to clean and durable enough to last at least 5 years.

With this brief, the project team then 'brainstorm' the various ideas they have and how they could produce such a device. Once they have brainstormed their ideas, they prioritise them and then agree which once to pursue during a SPRINT (iteration) of two weeks duration.

At the end of each SPRINT, the project team will involve the customer in their work to gauge whether the final product will be in line with the customer's expectations. Working in this manner and following a series of SPRINTS, the final product will evolve into the finished product as shown in figure 5-10.

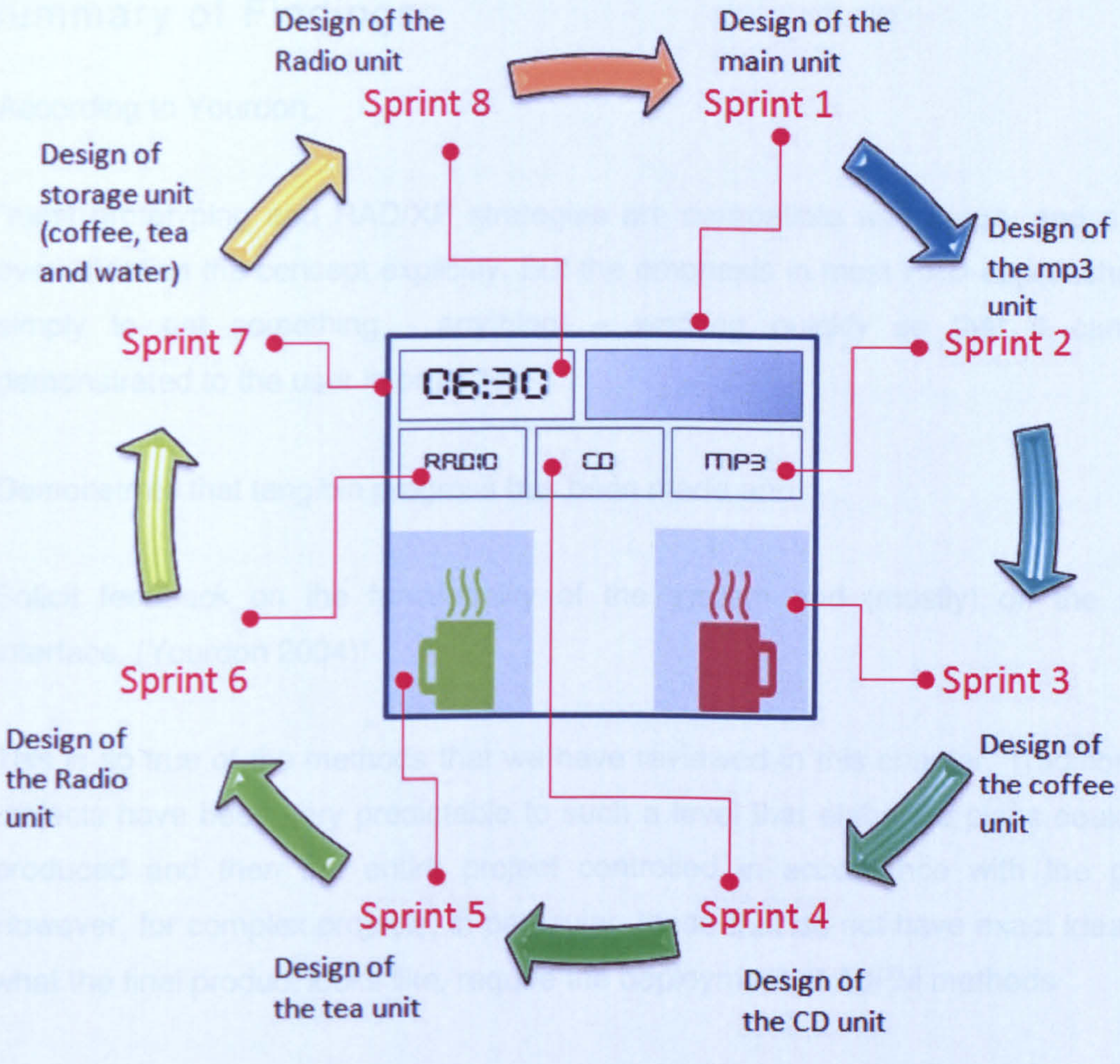


Figure 5-10 The evolution of the final product through a series of SPRINTS

The effort of the team will be monitored via the use of burn down charts as shown in figure 5 – 11.

	Hrs	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Sprint 1	100	•	•														
Sprint 2	250			•	•												
Sprint 3	140					•	•										
Sprint 4	100							•	•								
Sprint 5	150									•	•						
Sprint 6	180											•	•				
Sprint 7	200													•	•		
Sprint 8	250															•	•
	1,370																

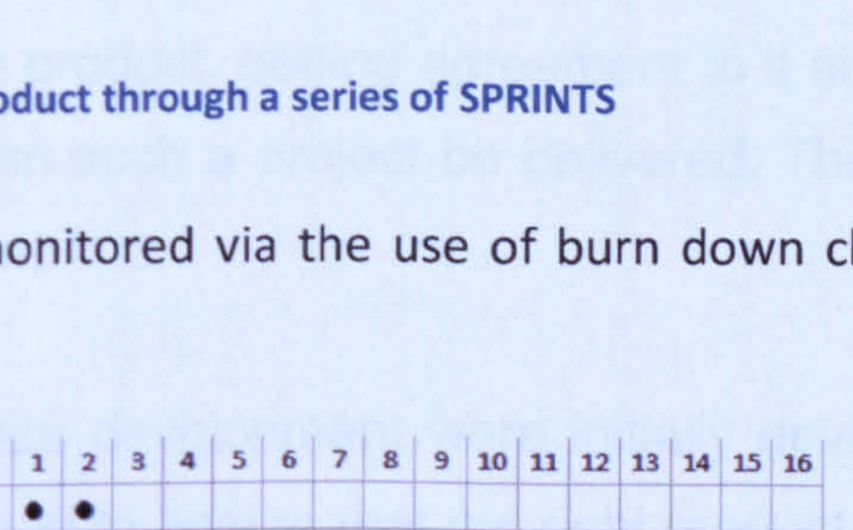


Figure 5-11 Monitoring progress using Burn down charts

5.9 Summary of Findings

According to Yourdon,

"most prototyping and RAD/XP strategies are compatible with triage, and a few even mention the concept explicitly. But the emphasis in most RAD approaches is simply to get something - anything! – working quickly so that it can be demonstrated to the user in order to:

Demonstrate that tangible progress has been made and

Solicit feedback on the functionality of the system and (mostly) on the user interface. (Yourdon 2004)"

This is so true of the methods that we have reviewed in this chapter. Traditionally projects have been very predictable to such a level that elaborate plans could be produced and then the entire project controlled in accordance with the plan. However, for complex projects, in particular, those that do not have exact ideas of what the final product looks like, require the deployment of AdPM methods

Only by testing out parts of the product, getting agreement to it and moving ahead by taking incremental steps, can such a project be delivered. This is the essence of Adaptive Project Management.

Agile methodologies for software development were initially devised to meet the changing needs of customers and to ensure that the right product was delivered to the right quality in line with customer expectations. The IT industry felt that by simply following a typical process-orientated model where there is a staged process was inefficient.

Whilst good quality resources are required on most projects, the case for quality resources is ever so stronger for AdPM projects. A major part of the success of the project is dependant and reliant on, the individual with the right skills, mental attitude and emotional intelligence. Team members must be expert in their respective fields and that they are encouraged to challenge the status quo in every

manner that allows them, and ultimately the whole team, to produce the desired end results.

Table 5-2, shows the key characteristics of the methods described in this chapter. The role of the project manager is different. First the title does not exist and secondly, the main focus is on managing external politics thus shielding the project team and mentoring / coaching them. Flexibility, face-to-face communication and minimal amount of process are all common themes of the methods reviewed.

In addition to this in figure 5-12, a summary is shown that describes how each method differs in terms of resources required to make it work and where it can be applied successfully.

	Classification				Generalised Assessment							Typical Application			
	Methodology	Technique	Approach	Best Practice	Amount of procedures	Resource requirement	Requirement for IT systems	Resource capability - Technical	Amount of Formality	Time to implement	Training required	Complex Projects	High UNCERTAINTY	High CERTAINTY	Process driven
eXtreme Project Management	X				L	L		L	L	L	L	X	X		
SCRUM	X				L	L		H	L	L	L	X	X		
MSP (Managing Successful Programmes)			X		M	L		L	L	L	L	X	X		
Rapid Application Development	X				L	L		H	L	L	L	X	X		
eXtreme Programming	X				L	L		H	L	L	L	X	X		

Figure 5-12 Summary of Adaptive Project Management Methods

In traditional projects using PPM thinking, the project team can be highly task focused. The reason is that commitments have been made to others based on the agreed schedule. For example, an engineering contractor has tendered for project work based on a schedule that was produced on known assumptions and now is working to this schedule, after winning the job.

Summary of Key Characteristics	SCRUM	XP (eXtreme Programming)	RAD (Rapid Application Development)	XPM (eXtreme Project Management)	MSP (Managing Successful Programmes)
Key Roles	SCRUM Master	XP Coach	Facilitator	eXtreme Project Manager	Senior Responsible Owner
	Product Owner	Customer	Programmers	Team Members	Programme Manager
	Team member(s)	Programmers			Business Change Manager
					Team Members
Planning / Work Cycle	SPRINTS	Rhythms	Iterations	Time boxing	Tranches
Key Artefacts	Product Backlog			Project Prospectus	Benefits Profile
	SPRINT Backlog			Three Sentence Project Skinny	Benefits Realisation Plan
				Benefits Map	Blueprint
				Project Uncertainty Profile	Communications Plan
				Stakeholder Database	Issue Log
				SCORE Model	Programme Brief
					Programme Mandate
					Programme Plan
					Quality Management Strategy
					Resource Management Strategy
					Risk Log
					Stakeholder Management Strategy
					Stakeholder Map
					Vision Statement
Control of team output	Burn down Charts	Pair programming	Results of prototyping		Via the artefacts
	Daily SPRINT briefings	Continuous design			
Escalation of issues	SCRUM Master	XP Coach	Facilitator	eXtreme Project Manager	Senior Responsible Owner
Team Calibre	High	High	High	High	High
Client Involvement	High	High	High	High	Medium

Table 5-2 Summary of Key Characteristics AdPM methods

The project schedule then becomes a contractual document because it clearly defines who is to perform which work. The success or failure of individuals is measured by how much of the tasks they have completed on the agreed schedule. If there are any changes then these are resisted as they could demonstrate that the team has not achieved their goals. So the mindset of the team, under these conditions, is to resist change.

On projects adopting AdPM thinking, the attitudes of the project team are such that changing requirements can be accommodated easily and assimilated into the scope of work. This is due to the fact that the team isn't working with 100% detailed plans and also due to the fact that they are 'feature' driven as opposed to 'plan' driven.

Navigating through the project towards the end goal is made easier via iterations or time boxes. These are a way of testing to see if the team have not only fully understood the project requirements but also to validate if the end product will be achievable and workable.

Progress in AdPM projects is made incrementally through validation of the tasks undertaken by the project team.

In addition to this, constant feedback helps reassure the project team that they are making the right level of progress or need to modify their tasks if they are not achieving the desired results. Real time and accurate communication is a must and the minimal adoption of formal procedures helps in encouraging more dialogue between team members.

The client or customer is also part of the project team. This helps in gaining approvals faster and reduces formality, whilst confirming that the client / customer is happy with progress made by the project team.

AdPM ensures that the end product is produced faster when there is a lot of complexity and changing client requirements. It is used for software development projects where the final product is delivered by agreeing which 'features' would satisfy the required 'functionality'. Hence AdPM projects are also known as 'feature driven'.

6 COMPARISON OF PREDICTIVE & ADAPTIVE PROJECT MANAGEMENT

6.1 Introduction

Chapters 4 and 5 have provided an insight into the respective methodologies, methods, tools and techniques that fall under Predictive and Adaptive project management thinking. This Chapter will now focus on the main similarities and differences and provides further discussion.

AdPM and PPM differ from each other in the following aspects:

- The view of the project life cycle i.e. waterfall or spiral.
- The calibre of people employed.
- The ability to handle changes to the project scope.
- The level of process compliance imposed on the team.
- The time required to deliver the final product.
- The need to comply with other aspects, i.e. Quality, Health & Safety and Environmental Management.

6.2 Waterfall or Spiral, which is best?

The project life cycle normally used in traditional project management is termed the waterfall model. A number of similar and relevant activities are grouped together to form a stage or phase. When one of these stages or phases is completed the project proceeds to the next one. Sometimes for added governance and control of the phases there may be 'gates' in between. These gates are key milestones whereby someone external to the project performs a quick review to check that all is in order before the project is permitted to proceed to the next phase.

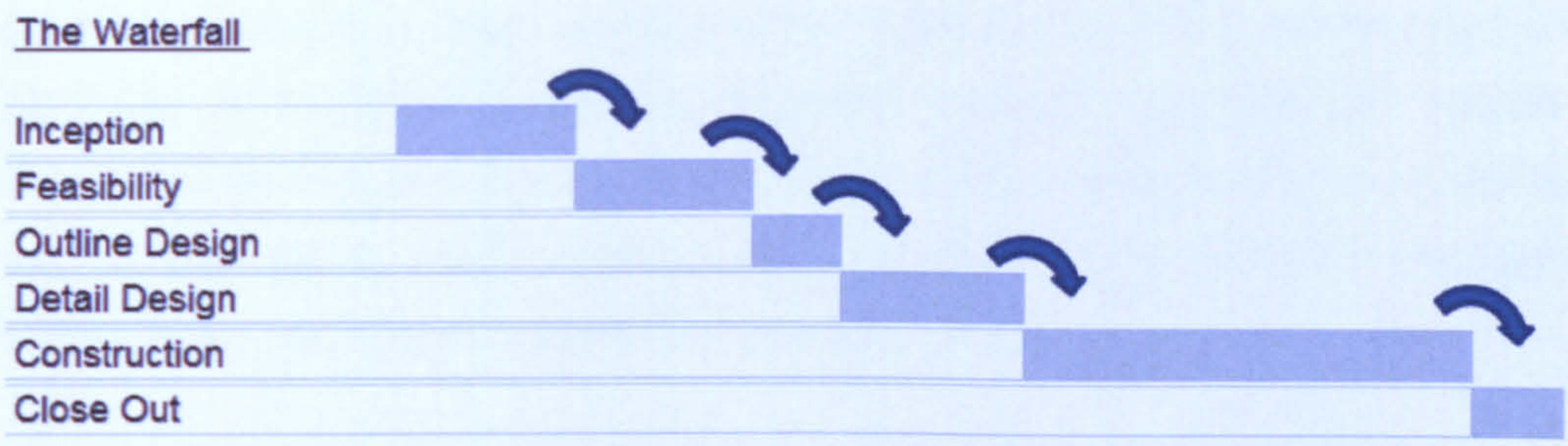


Figure 6-1 Waterfall and Spiral project approaches

Figure 6-1, shows a conventional waterfall model used in traditional project management and then the same phases are also shown as a spiral.

The spiral is often found in Adaptive methodologies and allows for the project to move between all aspects multiple times until the product is finally delivered.

Both models are equally useful as a lot depends upon the use to which it is being put and the type of project being undertaken. The spiral model is used by designers when they are responding to a client brief to provide a solution to a

unique requirement. It may not be entirely appropriate for the construction of a bridge due to the level of detail and compliance with legislation like Health & safety, Environment and Quality. In the bridge example the project team will also have to maintain a certain momentum otherwise details may be overlooked resulting in serious health & safety and risk implications.

6.3 Battling with the future

Trying to predict what is going to happen in the future is the biggest challenge for human kind. In business we rely on making judgements about the future. In projects we have to plan our way ahead and make our plans based on assumptions of what, we believe, will be future events and scenarios.

However when the future arrives we find ourselves unable to control the events not shown on our plans. This is the dilemma for most managers today (Stacey, Griffin & Shaw 2006).

PPM tries to 'predict' the future by encouraging the use of elaborate plans whereas AdPM relies on minimal level of planning and focuses more of working through to a workable solution that ultimately delivers the final product.

6.4 Formality versus speed trade-off

Another difference between AdPM and PPM is compromising formality of process versus producing quick results.

This can be explained with reference to figure 6-2.

PPM projects are very deterministic in their approach. They consist of projects where the team knows what is exactly required and the route to take in order to deliver the project.

Because there is so much certainty regarding the final product, the team can produce detailed plans. Once the detail plans are produced they are ready to implement and move ahead in accordance with what they have predicted on the plan. Working in this manner will result in a successfully delivered project.

The effectiveness of the team is measured against the original plan and the project team is focused on completing all the activities originally identified by them.

Techniques like Earned Value Analysis can be utilised to report on project progress.

If there are changes to the plan as the project is implemented then these are added to the scope of work and the plan is adjusted accordingly. The mindset of the typical team is such that they are focused on completing what they originally set out to do and as a result of this they can be viewed to be hesitant to accepting changes to the project scope.

With regards to AdPM projects, the team don't have a detailed idea of what the final product or result will look like but have a good idea of what features it should contain. The features are normally agreed in collaboration between project team and client.

It is for this reason that sometimes AdPM projects are also known as 'feature driven' projects.

The project team sets about trying to define a list of functions the final product would have and from this list, the best ones are selected and subjected to a series of short duration 'iterations'.

The project team are given the authority and empowerment to make decisions as they face challenges and the results of their efforts in each iteration is reviewed. The customer, who also forms part of the team, is asked to check and approve what has been produced after each iteration.

As the output is verified, further iterations are planned and progressively the final product is assembled in this manner.

If the client or customer does not like what is being produced, he or she has the ability to cancel the project altogether rather than have a team produce something that is not value adding.

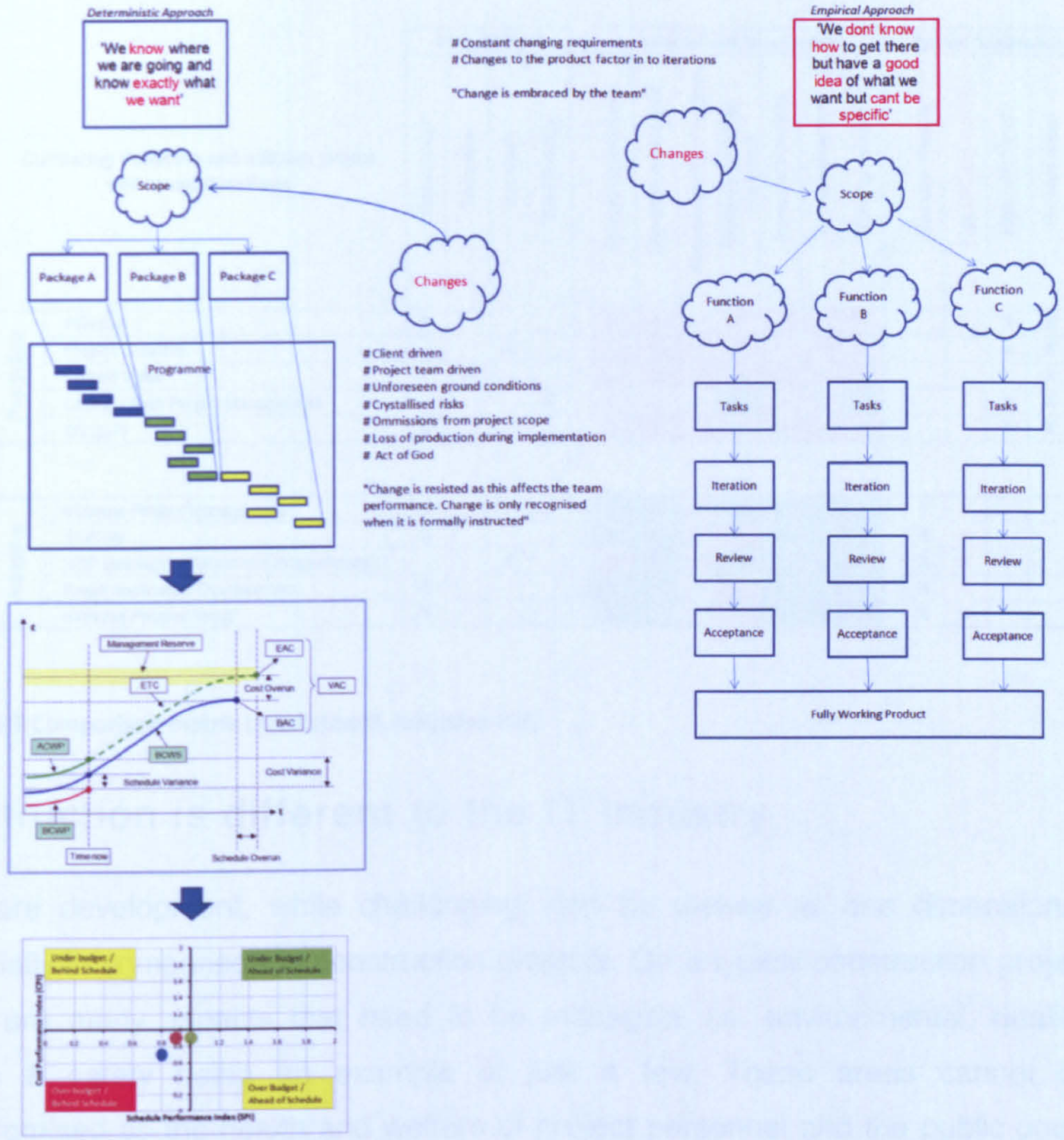


Figure 6-2 Differences between PPM and AdPM thinking

Figure 6-3 shows a matrix of the methodologies, methods, tools, techniques that have been reviewed in previous chapters. It provides a high level summary of which category they belong to, and what will be required in order to implement them effectively on projects.

Comparing Predictive and adaptive project management methods			Classification				Generalised Assessment							Typical Application			
			Methodology	Technique	Approach	Best Practice	Amount of procedures	Resource requirement	Requirement for IT systems	Resource capability - Technical	Amount of Formality	Time to implement	Training required	Complex Projects	High UNCERTAINTY	High CERTAINTY	Process driven
Project Management Categories	Predictive	PRINCE 2	X				H	H		H	H	H	H			X	X
		Project Controls			X		H	H	H	H	H	H	H			X	X
		Earned Value		X			H	H	H	H	H	H	H			X	X
		Critical Chain Project Management				X	M	M		L	M	M	L			X	X
		BS 6079	X				M	H	H	M	M	H	H			X	X
	Adaptive	eXtreme Project Management	X				L	L		L	L	L	L	X	X		
		SCRUM	X				L	L		H	L	L	L	X	X		
		MSP (Managing Successful Programmes)			X		M	L		L	L	L	L	X	X		
		Rapid Application Development	X				L	L		H	L	L	L	X	X		
		eXtreme Programming	X				L	L		H	L	L	L	X	X		

Figure 6-3 Comparison matrix (Predictive & Adaptive PM)

6.5 Construction is different to the IT industry

Software development, while challenging, can be viewed as one dimensional, especially in comparison to construction projects. On a typical construction project there are many aspects that need to be managed, i.e. environmental, quality, health & safety being an example of just a few. These areas cannot be compromised as the health and welfare of project personnel and the public could bejeopardised. These are over and above the management issues that a typical project manager is likely to face. There are too many subjects or areas that need to be managed collectively in order to have a successful project.

For example, on a project involving the construction of a bridge, the team cannot make up the solution as they go along. There is a need to move forward through a series of carefully calculated sequences of rational judgements based upon tried and tested methods. Working in this manner ensures that all aspects of quality, environmental and health & safety are taken into consideration. Construction projects are not just delivery focused. They also have to provide the Client / Promoter with technical documentation so that this can be relied upon by future users.This is sometimes a legal or contractual requirement, for example, it is normal to provide an Operations & Maintenance manual for an asset by the contractor once a facility is constructed.

The principles of AdPM can however be used on a smaller scale within project teams rather than use it as a replacement for the more traditional project management methods currently in place in the construction industry.

Projects are delivered by people, regardless of project type and the methodology followed. If people are not motivated and energised to perform better, then that in itself provides the biggest risk to any project.

In an industry like construction that is heavily process driven a certain level of behaviour can manifest in itself. People are likely to be conditioned to work in a manner whereby they don't challenge what they are doing and merely follow the process so the sake of doing so. They feel hesitant to deviate from the process for fear of beingcriticisedfor not following instructions by sticking to the process. An astute project manager needs to watch out for this and intervene as and when considered necessary. He or she must be ready to ensure that the team can see the wood from the trees and make common sense judgements when the appropriate time arises.

AdPM principles can be used for the design process during the construction stage thus ensuring that an effective solution has been arrived at so that the next stages of production can be planned appropriately.

AdPM does involve the Client or Promoter in the process and this helps in shortening the communication chain between the two parties. It also reduces formality and lessens the reliance on paperwork.

The client on an AdPM project needs to be fully aware of their role and that fast and effective decisions must be made otherwise this could hold up progress.

6.6 Project size

The size of the project is also an important factor in determining which type of project management thinking should be adopted. A large project must be broken down into sub projects or work packages in order to exercise effective management and control.

XP, SCRUM and RAD methods are easily manageable when implemented in smaller project teams. However, the sheer management of very large teams could prove to be a challenge for the project manager, using these methods.

6.7 The level of knowns and unknowns

Regardless of project management thinking adopted, all projects contain a certain level of unknowns. The amount of unknowns prevalent on a project is also one of the determining factors for deciding to use a Predictive or Adaptive approach.

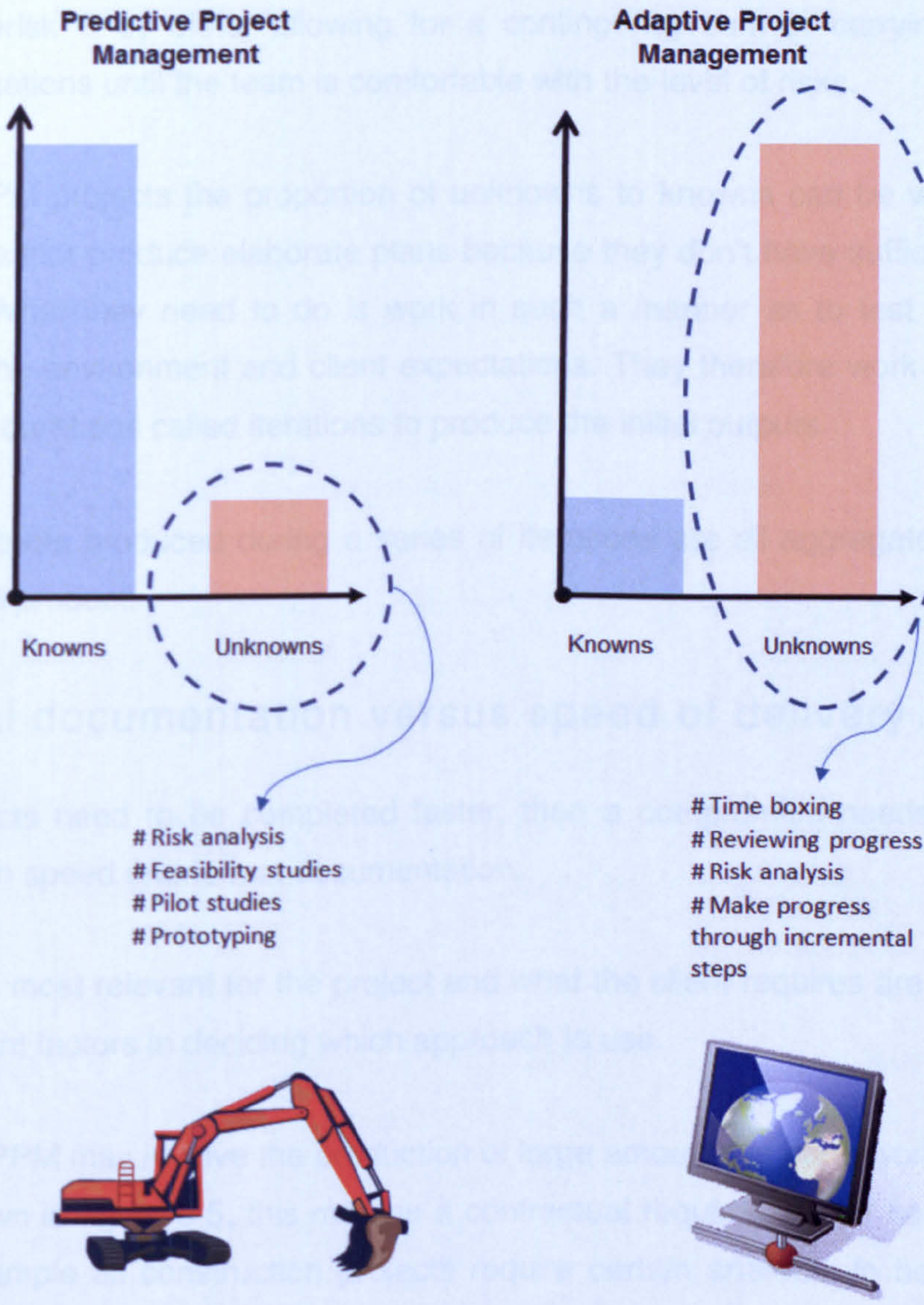


Figure 6-4 The level of Knowns & Unknowns

In figure 6-4 we show the two projects being considered, one is a construction project and the other involves an IT project.

In the context of a construction project, we may be very confident of say 80% of the project as we can prepare details of future activities that are likely to be encountered. There will be some unknowns such as ground conditions which cannot be predicted with sufficient ease and the exact state of the ground will not be known until excavation begins.

When faced with such unknowns that pose a risk to the project, the project team can 'derisk' it by either allowing for a contingency sum or carrying out further investigations until the team is comfortable with the level of risks.

On AdPM projects the proportion of unknowns to knowns can be very high. The team cannot produce elaborate plans because they don't have sufficient details at hand. What they need to do is work in such a manner as to test their theories about the environment and client expectations. They therefore work in a series of shorter durations called iterations to produce the initial outputs.

The outputs produced during a series of iterations are all aggregated to produce the final product.

6.8 Formal documentation versus speed of delivery

If projects need to be completed faster, then a compromise needs to be made between speed and formal documentation.

What is most relevant for the project and what the client requires are the two most important factors in deciding which approach to use.

Whilst PPM may involve the production of large amounts of paperwork or artefacts, as shown in figure 6-5, this may be a contractual requirement for certain projects. For example all construction projects require certain artefacts to be produced in order to comply with legal requirements.

A decision cannot be made to adopt AdPM principles without fully understanding the impact such a decision will have on a construction project.

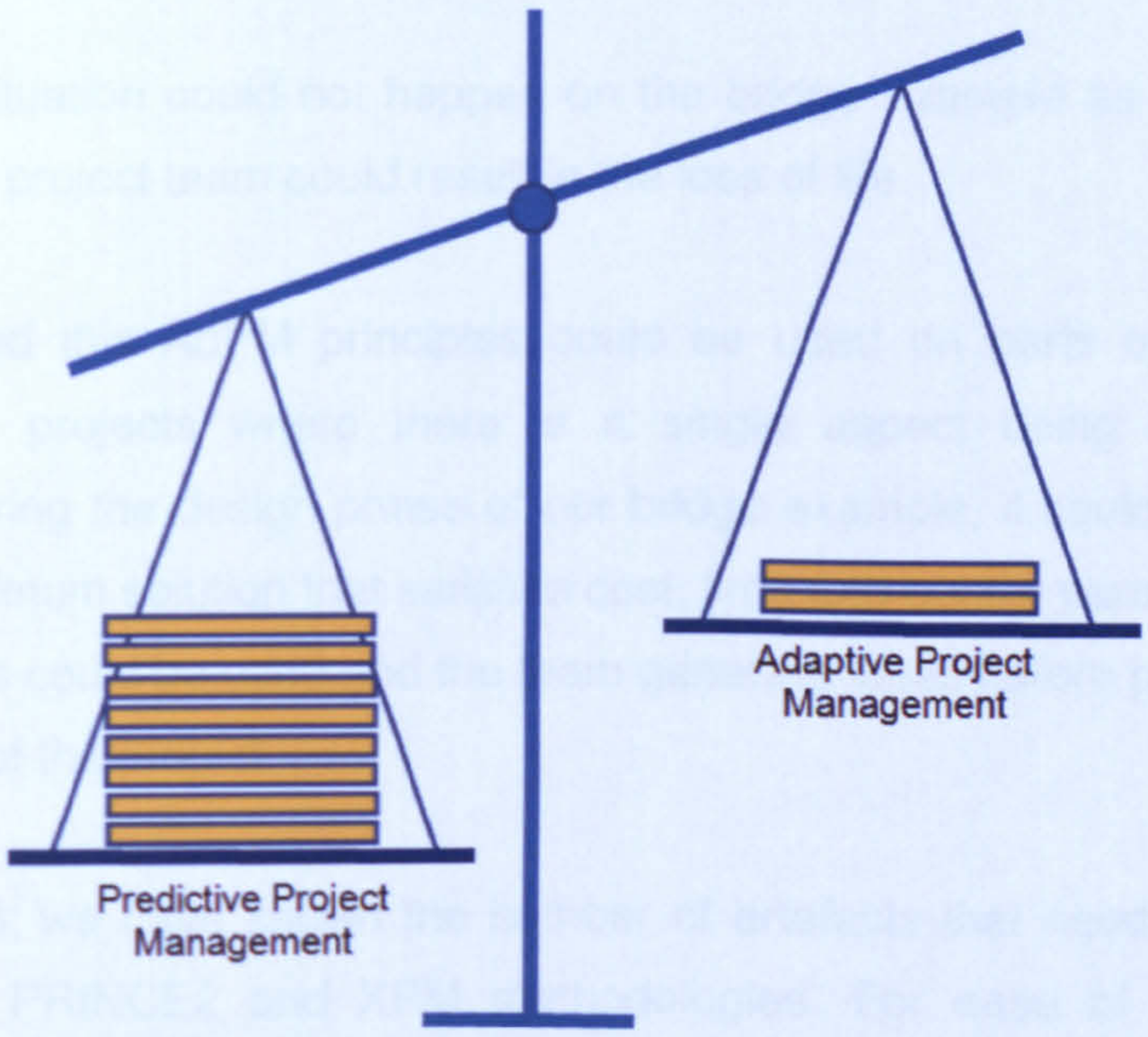


Figure 6-5 Documentation Vs Speed trade-off (PPM and AdPM)

The important point to note is that with AdPM projects there is less time spent in producing detailed plans and more emphasis on producing some tangible output very early on. This is remarkably different to a typical construction project where a lot of time at the front end is spent on planning in comparison to the actual time spent in construction.

When a Client or Promoter is thinking about having a bridge built, he or she will commission consultants to prepare feasibility studies to validate the idea of the new bridge.

Only when the feasibility stages are complete, budgets will be prepared and the Client will be in a position to confirm and formally launch the project. Once this is started then there is no stopping until the end is achieved. Only extreme cases of gross error or an act of God can cause the project to be terminated or cancelled.

On the other hand, the AdPM methods involve the development of software projects, which can progress from an idea to implementation very quickly. The actions of the team will not have any consequences on health & safety and

therefore can proceed at break neck speed. If the idea does not work out there is no loss of human life just the fees for the team that need to be paid for by the client.

The same situation could not happen on the bridge example as any oversight of behalf of the project team could result in the loss of life.

Having stated this AdPM principles could be used on parts of Engineering & Construction projects where there is a single aspect being considered. For example, during the design phase of our bridge example, it could be used to find the most optimum solution that satisfies cost, time and quality parameters. A series of time boxes could be used and the team generate ideas before proceeding to the next stages of the project.

In Figure 6-6, we have shown the number of artefacts that need to be produced when using PRINCE2 and XPM methodologies. For ease of comparison the stages of each of these has been compared to the PMI Process Group classification. The number of times the artefacts require updating has not been shown as this will largely depend upon the type of project being delivered. What is shown is at which stage a particular artefact needs to be developed. PRINCE2 has 41 artefacts in comparison to XPM, which has 8. This highlights the fact that Predictive Project Management methods require a lot more administration when compared to Adaptive Project Management methods.

PMI Process Group Classification	PRINCE2 Stages	Artefacts		XPM Stages	Artefacts	
Initiating	Starting up a Project	Project Mandate Project Manager Job Description Project Management Team Structure Draft Job Descriptions Project Brief Risk Log Daily Log Project Approach	8	Visionate	Project Prospectus Three sentence Project skinny Benefits Map Project Uncertainty Profile Stakeholder Database	5
Planning	Initiating a Project	Quality Log Project Quality Plan Business Case Project Controls Communication Plan Configuration Management Issue Log Lessons Learnt Log Project Tolerances	9	Speculate	Financial requirements Benefits Realisation Plan	2
	Planning					
Monitoring	Managing Stage	Current stage Plan	1	Innovate	SCORE Model	1
	Managing Product					
	Directing a Plan					
Controlling	Controlling a Stage	Authorisation to Proceed Product Checklist Configuration Item Records Checkpoint Report Team Plan	5	Reevaluate		
	Directing a Project	Project Start-Up Notification Project Initiation Document End Stage Report Request for Authorisation to Proceed Next Stage Plan Exception Plan Trigger for Premature Close Progress Information Higlight Reports Management Reports Exception Plan Request New Project Issues Operational Maintenance & Customer Acceptance Project Closure Recommendation Follow-on Action Recommendations Post Project Review Plan Lessons Learnt Report End Project Report	18			
Close Out	Closing a Project			Disseminate		
		41				8

Figure 6-6 The number of artefacts in PRINCE2 and XPM

6.9 How PPM and AdPM relates to the PMI PMBoK?

In Table 6-1, we have shown how the various methods, methodologies, tools and techniques that comprise PPM and AdPM thinking compare with the PMIBoK subjects. The left hand side column shows the sub topics for the PMIBoK with Construction Extension.

A subjective assessment is made as to how closely each method satisfies the PMBoK requirements by indicating Full, Partial or No Compliance.

PMI Bok with Construction Extension	SCRUM	XP	RAD	XPM	MSP	Earned Value	PRINCE2	Project Controls
1 Project Environmental Management	NC	NC	NC	NC	PC	NC	NC	NC
2 Project Financial Management	NC	NC	NC	NC	PC	FC	FC	FC
3 Project Claim Management	NC	NC	NC	NC	PC	FC	NC	FC
4 Project Integration Management	PC	PC	PC	FC	FC	FC	FC	FC
5 Project Time Management	FC	FC	FC	FC	FC	FC	FC	FC
6 Project Cost Management	NC	NC	NC	NC	PC	FC	FC	FC
7 Project Scope Management	FC	FC	FC	FC	FC	FC	FC	FC
8 Project Quality Management	PC	PC	PC	PC	PC	NC	FC	NC
9 Project Human Resource Management	PC	PC	PC	PC	PC	NC	FC	NC
10 Project Communication Management	FC	FC	FC	FC	FC	NC	FC	NC
11 Project Risk Management	PC	PC	PC	FC	FC	FC	FC	FC
12 Project Procurement Management	NC	NC	NC	NC	PC	FC	NC	FC
13 Project Safety Management	NC	NC	NC	NC	PC	NC	NC	NC
Industry								
Software Development / IT	●	●	●	●			●	
Engineering & Construction					●	●		●

LEGEND

Full Compliance	FC
Partial Compliance	PC
Not Considered	NC

Table 6-1 Table showing which areas of the PMI BoK are covered by the various PM methods

As we are comparing this to a construction version of the BoK it is for this reason that there is no compliance with the requirements of Safety, Procurement, claims and environmental subject areas for the AdPM methods.

6.10 Progressive elaboration

Project management also involves creative problem solving by the project team. The project team needs to arrive at a solution to a project problem through a series of carefully thought through ideas.

Each idea is selected, tested and validated before it proceeds to the next level of scrutiny. This can be compared to the analogy of placing marbles through a funnel that has a filter at various stages as depicted in figure 6-7.

There are many ways to reach the same objective and the project team must be focused on how to achieve this with the resources at their disposal.

Using a typical project life cycle, some of the ideas will be accepted whilst others will be rejected. A process of filtering occurs as the ideas are pushed through to the next stages. Ultimately the idea that stands the test of these filters will be the one that will be implemented in order to deliver the end result.

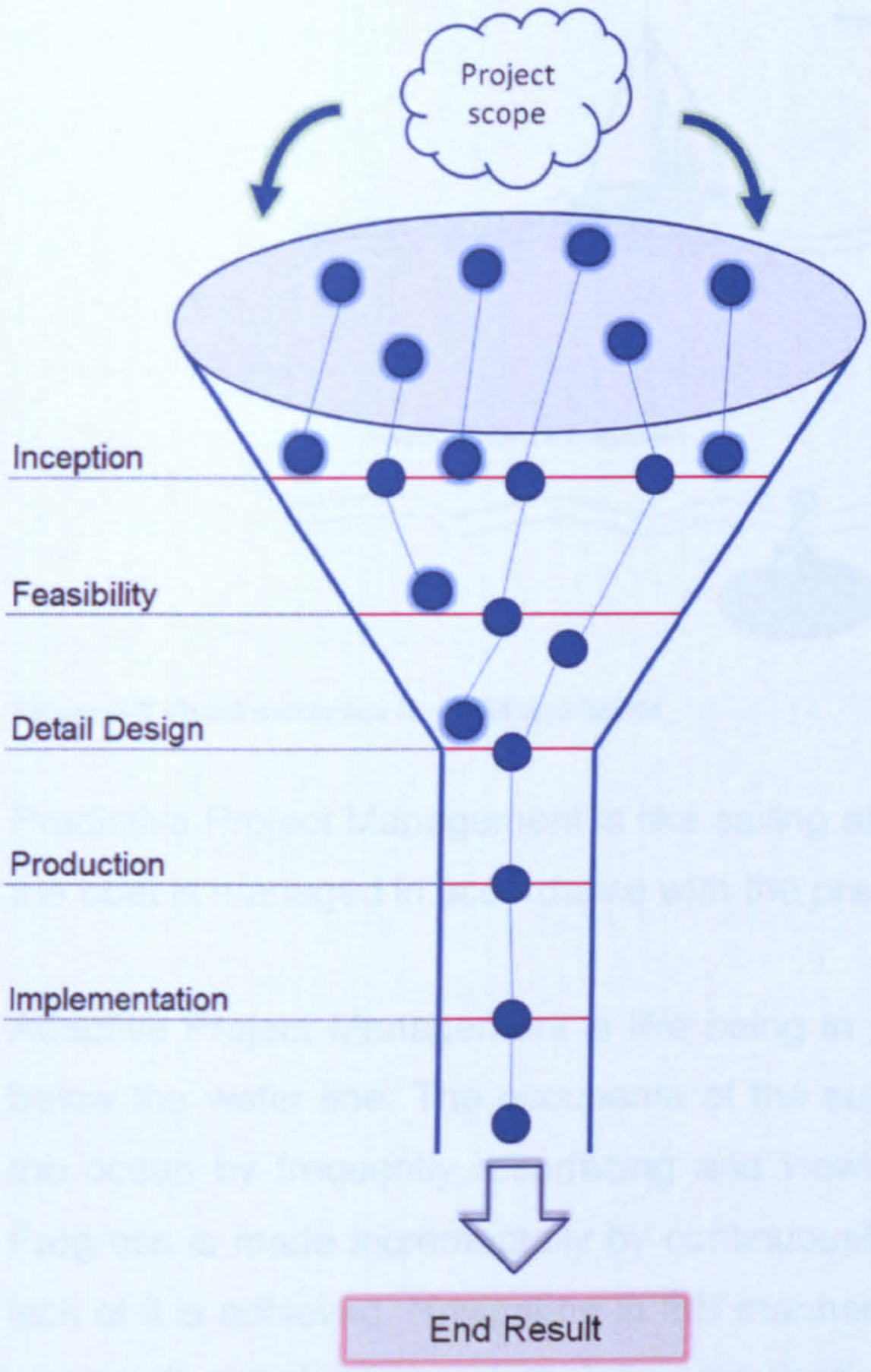


Figure 6-7 Filtering and funnelling ideas

Both PPM and AdPM methods strive to achieve this through the adoption of their respective ideologies.

6.11 Visual metaphor for PPM and AdPM

Both project management-thinking types have different approaches and perceptions of their project environment. One way to describe the differences is to consider the visual metaphor as depicted in figure 6-8.

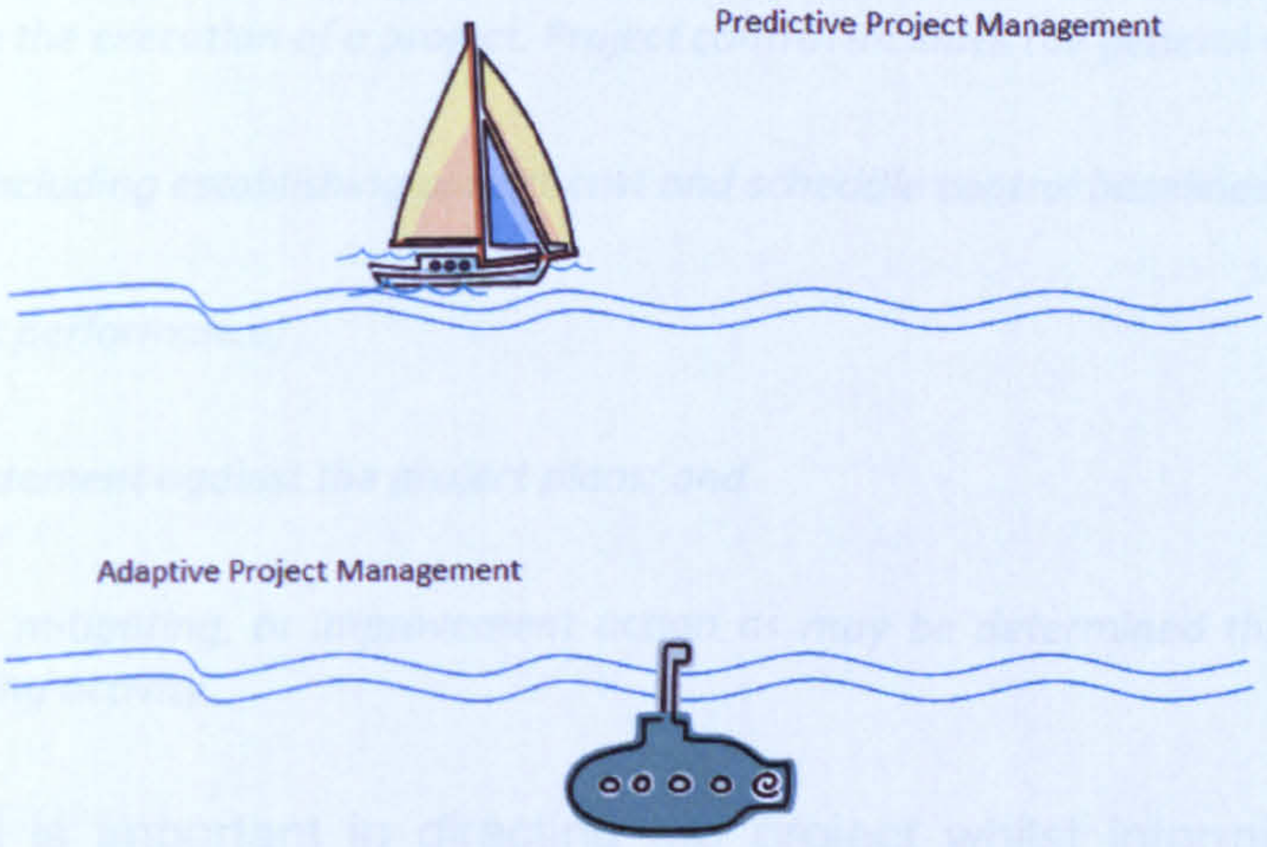


Figure 6-8 Visual metaphor for PPM and AdPM

Predictive Project Management is like sailing above water. Once the course is set, the boat is managed in accordance with the predetermined plan (course).

Adaptive Project Management is like being in a submarine, which normally stays below the water line. The occupants of the submarine can only navigate through the ocean by frequently resurfacing and viewing their progress via a periscope. Progress is made incrementally by continuously reviewing how much progress or lack of it is achieved. Navigating in this manner helps the crew of each watercraft, as, mentioned above, reach their final destination.

Both project management-thinking types require constant feedback in order to navigate towards the end goal. In this example the boat relies on the visual status in reference to its position from the end destination and the submarine navigates via the periscope when resurfacing.

6.12 Project Control

The Association of Cost Engineers ACostE defines project control as:

"the proactive setting and monitoring of targets, analysis of performance, identification and anticipation of inefficiencies and implementation of preventive and remedial actions (ACostE 2000)"

The Association for the Advancement of Cost Engineering (AACE) defines project control as:

A management process for controlling the investment of resources in an asset where investments are made through the execution of a project. Project control includes the general steps of:

Project planning including establishing project cost and schedule control baselines;

Measuring project performance;

Comparing measurement against the project plans; and

Taking corrective, mitigating, or improvement action as may be determined through forecasting and further planning activity.

Project Control is important in directing the project whilst informing the project manager of the level of progress being achieved. On smaller projects, this function can be performed by the project manager but on larger projects, a separate function of Project Control Manager may exist. This incumbent will be responsible for providing the project manager with the hard data to allow the project manager to make informed decisions.

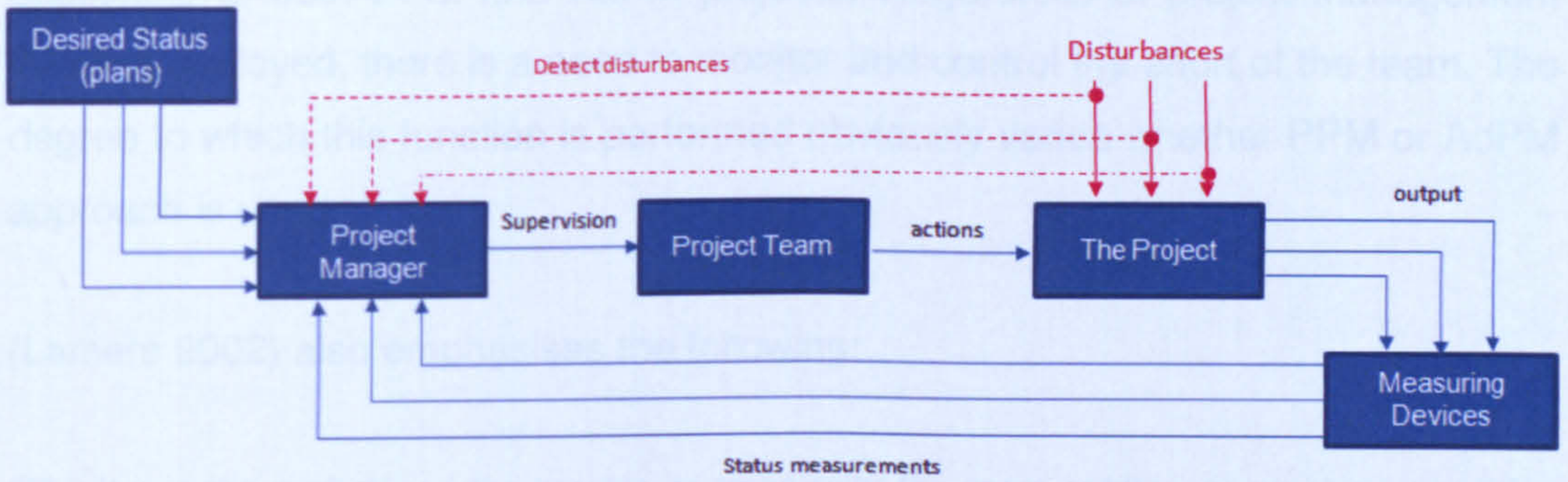


Figure 6-9 The project control loop (adapted from Field & Keller 1998)

In figure 6-9, the project manager detects disturbances from the project environment and makes timely decisions based on the status measurements received from measuring devices.

Before taking any action the project manager must compare the 'desired' and 'actual' states. The control loop cannot work unless the project manager knows both these quantities (Field & Keller 1998).

Measuring devices in this regard can be project reports.

The project controlling process is an evaluative process whereby deviations from planned events are reported and probable causes are assessed (Kezsbom, Schilling & Edward 1988). It is the 'performance measurement' process by which corrective action is taken to alleviate the impact of these deviations and other unfavourable trends on project schedules, budgets, resources or staffing levels.

(Weiss & Wysocki 1992) go on to confirm that there are three reasons for using controls these are:

- To track progress
- To detect variance from plan
- To take corrective action

Project Control is an important element of project management and equally applicable to both PPM and AdPM projects. Regardless of project management thinking deployed, there is a need to monitor and control the effort of the team. The degree to which this function is performed obviously varies whether PPM or AdPM approach is used.

(Lamers 2002) also emphasises the following:

"The larger the project and the greater its complexity the more entities, parameters, variables, must be used for explicit control of the project."

Therefore, the goal of project control is to obtain the information on performance measurement as soon as possible to allow for the most effective corrective action (Hemsath 2002).

eXtreme Project Management principles as advocated by Doug Decarlo provides an ideal range of methods to exercise effective and proper project control. This is done via the use of the Flexible Project Model and the following artefacts:

- Project Prospectus
- Stakeholder database

- Sponsor's questions
- Three-sentence project skinny
- Project Uncertainty Profile
- Benefits Map
- SCORE model

Doug Decarlo has clearly demonstrated that by using focused, simple and effective tools proper project control can be achieved for eXtreme projects. These principles can be used elsewhere as they will help to ensure that the administration burden associated with processing large amounts of paper is kept to the most optimum level. (DeCarlo 2004)

6.13 How much process is sufficient?

There needs to be a sensible balance between the level of process and the extent to which project team members are empowered to make their own decisions. Too much emphasis on prescriptive processes and compliance will take away some of the individuals own thinking ability. Team members can become conditioned to not using or relying on their own initiative.

At the same time, it is important to ensure that everyone is following some consistent rules and not causing unnecessary havoc. As working in such an unstructured manner could be a major risk to the project.

Consider the following analogy taken from everyday life regarding driving as shown in figure 6-10.

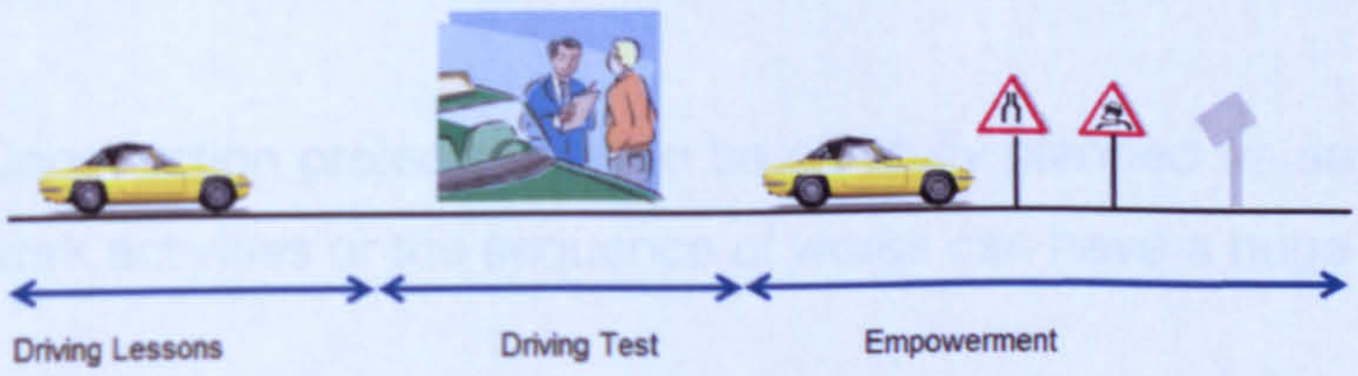


Figure 6-10 The driving test and empowerment of drivers

An individual wishing to learn to drive would normally take lessons from a qualified instructor. After receiving hands on practical instruction, it's time for the driving test where the new driver's capabilities will be tested. If the driver can demonstrate confidence in driving, then a 'pass' will be granted by the examiner.

Having passed the test there is no direct involvement of the driving instructor or the examiner. The individual is free to drive however they may wish. They must comply with the traffic rules and on the extensive training they have received from the driving instructor. Non-compliance with the traffic rules will result in fines or even imprisonment.

After passing the test, it would be impossible to write a process manual for the driver on how to cope with all the possible road traffic situations and scenarios that the driver will encounter. The ability to make sensible decisions, based upon the situation being faced, is left to the individual.

Likewise with projects, individuals can be inducted and given the orientation on how to behave and what rules to obey before they are considered part of the project team.

Once inducted, they must be encouraged to do the right thing without prescribing to them exactly how to deal with every future eventuality. This is not only a waste of time but serves little purpose.

6.14 Can AdPM be used on Construction Projects?

The method of procurement of construction projects is vastly different to that of the projects undertaken in the IT industry. There is a longer time period allowed for feasibility studies before major projects are launched. This is necessary because once a project is initiated large amounts of investments could beat stake. Once a project has started it is difficult to terminate it unless a serious error has occurred.

Construction projects need to be carefully planned as any error or omission in the work activities or the sequence of works can have a huge impact on human life.

There are many dimensions of construction projects that are not considered by IT projects i.e. Health & Safety, Environment and Sustainability as demonstrated in section 6.9.

Having stated this, elements of construction work can benefit from AdPM thinking. One particular area can be where construction teams are involved in selecting options that they can work in short iterations to determine practical solutions by thinking in terms of 'functional' requirements.

The UK Construction Industry is slowly but gradually changing and is constantly trying out new ideas. The recent completion of Terminal 5 had used an innovative contract called the 'T5 Agreement' which was instrumental in changing the traditional behavior of construction teams as reported by (Brady & Davies 2009).

In addition to this, the introduction and use of the NEC Engineering Construction Contract (ECC) suite of contracts is a catalyst to developing good practice project management solutions on construction projects (NEC 2005). Evidence from the use of this contract in New Zealand has shown great benefits over traditional forms of contracting to deliver projects (Wright & Fergusson 2009).

The adoption and use of innovative contracts will promote better use of project management principles.

Clients like BAA, Yorkshire Water, The Royal Hong Kong Jockey Club, South African electricity utility company (ESKOM) and the Overseas Development Administration have provided input into the development of the ECC (Broome 1999).

Project partnering is another area where there is a real opportunity to use better project management thinking in order to deliver projects more successfully than in the past. The CIOB have produced a code of partnering for strategic collaborative working in the Construction Industry (Bennett & Peace 2006). If implemented correctly traditional behaviours displayed by construction teams can be modified.

(Walker & Wilkie 2002) suggest that the partnering agenda is focused around the achievement of Egan's 'Rethinking Construction' agenda, which sets out to achieve the following:

- Focus on the customer.
- Quality-driven agenda.
- Committed leadership.
- Commitment to people.
- Integrated process and team.

By adopting Adaptive Project Management principles, the construction industry could strive towards achieving these objectives and making it a reality rather than a theoretical construct.

6.15 Physical well-being of the project team

Projects would not be able to function without the enthusiastic input of all individuals within a project team.

One of the major benefits of the AdPM approach is that the project team can pace themselves and solve the project challenges at a pace that suits them. This not only improves engagement at the individual level but also ensures that individuals are sufficiently energised and not worn out by the constant pressure placed upon them.

Individuals working on projects like those utilising PPM thinking can be under pressure to deliver to the original baseline schedule. This could be due to the fact that if the baseline schedule is not maintained the project would be delayed leading to contractual damages and ultimately a loss for the organisation which the project team may belong to.

In this scenario, team members are under constant strain and stress to work to the deadline. They may become disengaged and demoralised. Working in this manner

can drain energy leading to team members ultimately leaving the project altogether.

Team members have a different mindset when working on AdPM projects. They are solving their own problems and are empowered to make decisions. Enjoying their work and making tangible progress creates greater job satisfaction and enhances creativity levels.

6.16 Conclusion

This chapter described the main differences between PPM and AdPM methods and these are summarised in figure 6-11.

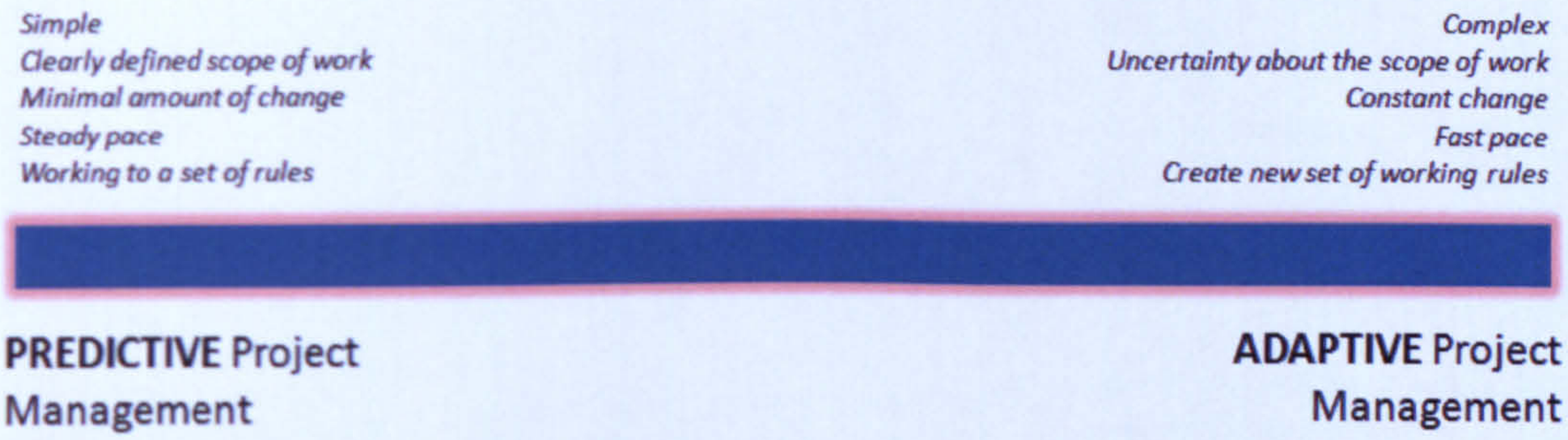


Figure 6-11 Similarities between PPM and AdPM

Projects are dynamic and constantly changing endeavours of human effort. They can be subject to change as the slightest movement in the surrounding environment and therefore requires a flexible approach.

The project manager must constantly assess what is considered the most appropriate method for his or her project. The answer does not lie in selecting the thinking, implementing the process and sitting back and waiting for the project to reach the end. The project manager must be proactive in his or her approach and anticipate shifts in the project environment and take the necessary action when it is considered important to do so.

There is no doubt that both PPM and AdPM require good quality people. However AdPM methods place a much higher emphasis on the calibre of project personnel. On AdPM projects the individuals are empowered to make project critical decisions

and the project manager is reduced to motivating, mentoring, coaching and dealing with the external politics.

In table 6-2, we conclude this chapter by summarising the similarities and differences between PPM and AdPM thinking.

Main Heading	Predictive PM	Adaptive PM
What is it?	'Plan driven' or 'linear'	'Feature driven' or 'non linear'
Final Product	'Have an exact idea of what it will look like'	'Have a good idea of what is required but don't know what it looks like'
Process & Procedures	High level of process	Emphasis on frameworks, not too prescriptive when it comes to process and procedure
People	Good quality people required	Requires high calibre individuals and relies on their judgement to solve project challenges
Planning	A timeline is produced for the entire project. Activity durations are estimated on known production rates. Assumptions are made for any unknowns.	The scope is broken down into functional requirements. Tasks are then decided which become subject of 'iterations'
Execution of work	The on site work is monitored against a baseline timeline.	After each iteration, the solution is checked, reviewed and accepted by the client.
Dealing with changes to the project scope	A formal arrangement is put in place whereby each change is assessed and instructed after it is agreed with the client.	Changes to the project scope are dealt with as part of the work routine.
Progress	Measured against the baseline plan.	Measured against the ability to provide the necessary functionality.
Mentality of project team	To deliver the requirements of the agreed plan.	To deliver the functional requirements of the software.
Success of the project	Is view against the ability of the project team to deliver.	Is view against the ability of the project team to deliver the right solution.

Table 6-2 Comparison table PPM & AdPM

7 CURRENT PERCEPTIONS / TRENDS

7.1 Introduction

This chapter looks at the perceptions and trends in project management. This was conducted via a questionnaire survey carried out in 2008. The objective of the survey was to ascertain the views of project management practitioners and academics and to understand what issues they were facing when engaged in project management activity. The survey was also considered essential to test not only the well-known but also new perceptions about project management practices.

7.2 Methodology

Respondents came from a variety of background and organisation types. To ensure that a wider range of respondents were targeted with the survey, the authors deployed the following means:

- Survey was posted on the Association for Project Management (APM) website
- Respondents were chosen from the Royal Institution of Chartered Surveyors (RICS) members directory
- Academic contacts
- Professional contacts associated with construction projects in the UK and internationally

7.3 Questionnaire Survey

A questionnaire survey was undertaken between 7th Jan 2008 and 29th Feb 2008. 131 emails containing a link to an online questionnaire survey website were sent to a variety of individuals engaged in construction activity. 70 surveys were completed in total, generating a response rate of 53%, as shown in figure 7-1.

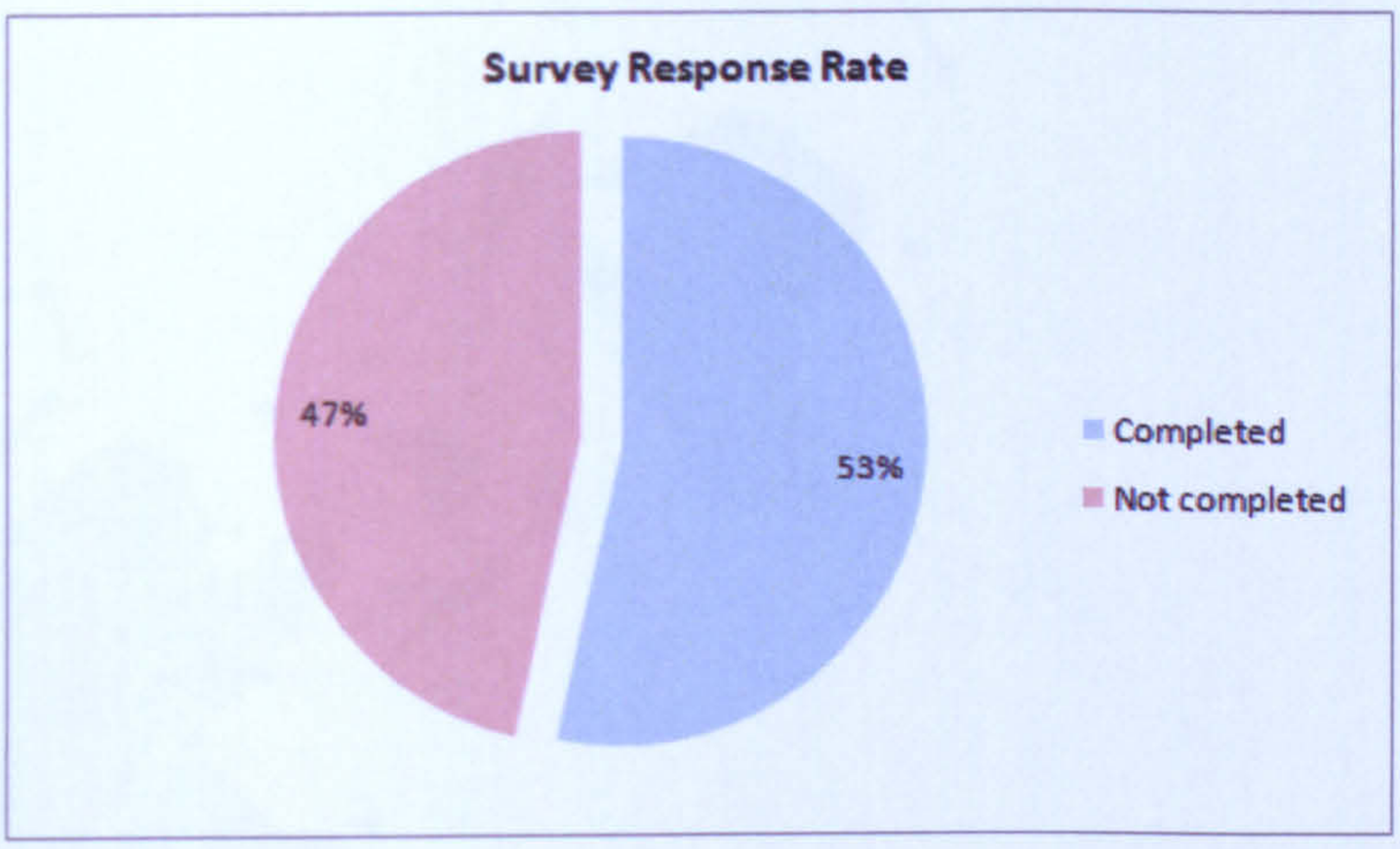
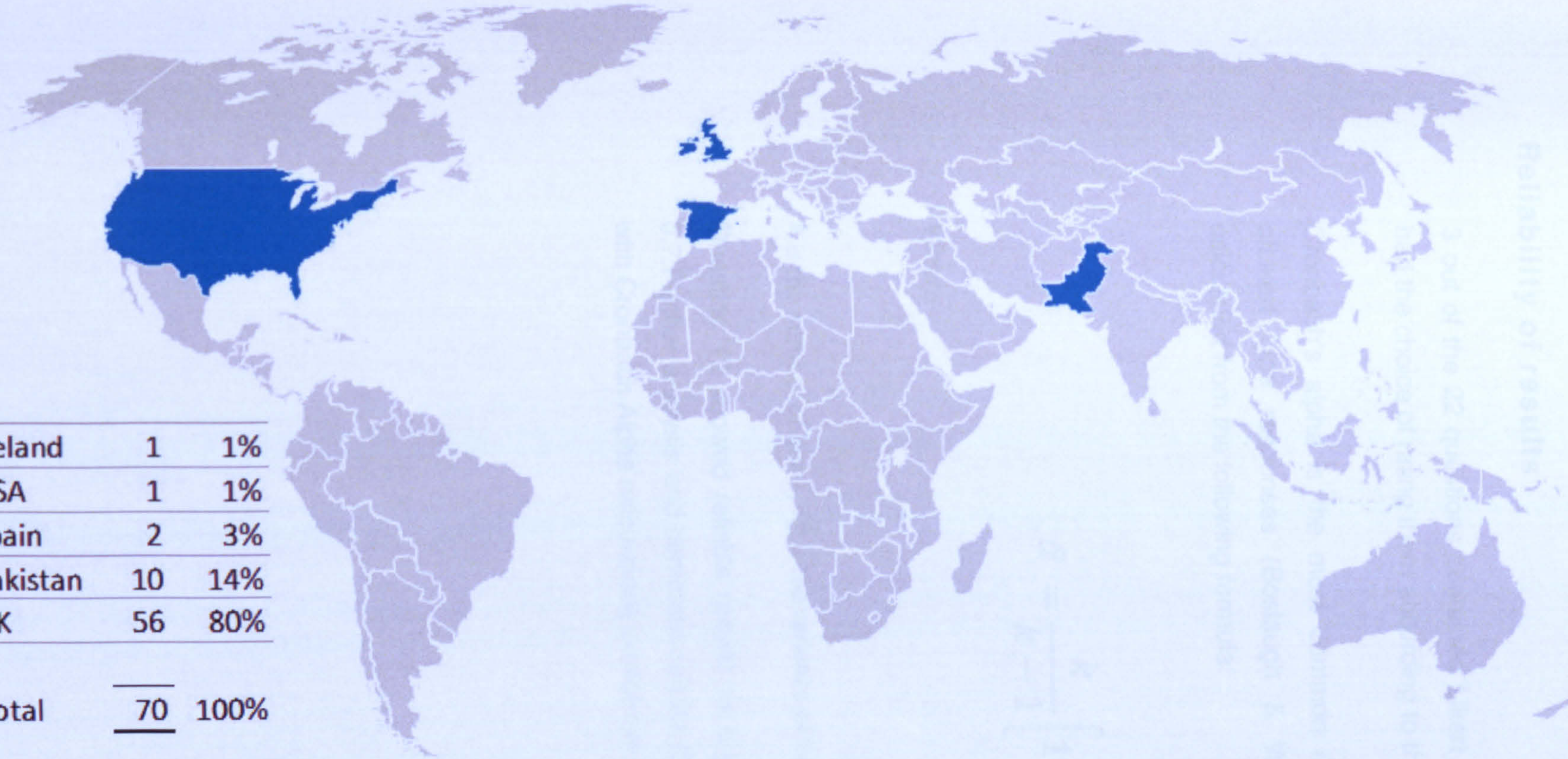


Figure 7-1 Response Rate, Questionnaire Survey

There were 22 questions in total and these ranged from open questions, Likert-type questions and responses to some more general statements. An overview of the structure of the questionnaire and the type of question asked is shown in Table 7-1.

Geographical spread

Whilst the majority of respondents mainly resided in the UK, there were a few from Ireland, USA, Spain and Pakistan. The number and location of respondents can be seen in figure 7-2.



Ireland	1	1%
USA	1	1%
Spain	2	3%
Pakistan	10	14%
UK	56	80%
Total	70	100%

Figure 7-2 Geographic spread of survey respondents

Reliability of results

3 out of the 22 questions contained Likert type responses to which respondents had the choice of rating them according to their experiences.

Cronbach's alpha is the most common method for determining the reliability ofLikert type responses (Boslaugh & Watters 2008). Cronbach's alpha is calculated from the following formula:

$$\hat{\alpha} = \frac{k}{k-1}\left[1 - \frac{\sum \hat{\sigma}_i^2}{\hat{\sigma}_x^2}\right]$$

Where

k is the number of items, $\hat{\sigma}_i^2$ is the variance of items and $\hat{\sigma}_x^2$ is the total test variance.

Question 19 showed reliable results as it just met the threshold of reliability of 0.7.Further analysis and comment can be found in the proceeding sections along with Cronbach Alpha calculations contained within Appendix A5.

Nr	Question Aim	Question type: Single Item	Multiple items / single selection	Multiple Items / multiple selection	Open ended	Multiple statement(s) / Likert type selection
1	Name	●				
2	Organisation	●				
3	Department details	●				
4	Employees		●			
5	Turnover		●			
6	Organisation classification		●			
7	Type of work undertaken			●		
8	Professional institutes			●		
9	Use of project management software			●		
10	Project management ideology followed			●		
11	Do you have a programme office?		●			
12	How often does your organisation review its project management procedures?		●			
13	5 statements relating to project management issues					●
14	What do you consider to be the common symptoms of project failure ?			●		
15	What are the main reasons why organisations follow a project management process ?			●		
16	How were your project management procedures developed ?			●		
17	Have you undertaken a project management maturity assessment of your organisation ?		●			
18	Which project management ideology / methods are you familiar with ?			●		
19	Preferences regarding 8 most common methods / project management thinking					●
20	7 statements relating to project management issues					●
21	How satisfied are you with your organisations project management procedures?		●			
22	Improvements they would like to see				●	
	Totals	3	7	8	1	3

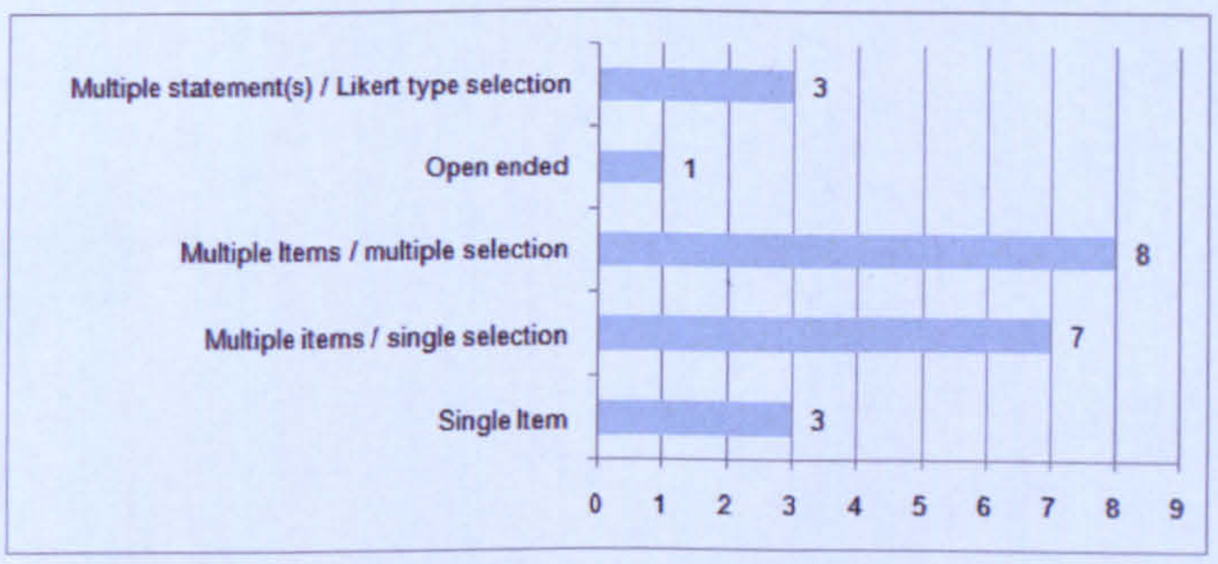


Table 7-1Structure of the Questionnaire Survey

Format for the analysis of survey results

In order to provide a better insight into the results obtained, the results have been further analysed by groups. There are seven groups of respondents, these are:

- Project manager
- Management Consultant
- Engineering Consultant
- Contractor
- Client
- Architect
- Other

Therefore the format for the analysis of each question will be to provide an overall view of the statistical numbers, comment on the highest occurring value, provide a breakdown of these by group and where relevant, show further statistical analysis using Chi Square. The Chi square measure is represented by the following equation:

$$x^2 = \sum \frac{(fo - fe)2}{fe}$$

Where

f_o is the observed frequency

f_e is the expected (null-hypothetical) frequency

The Chi Square test was considered as the suitable method to test the hypothesis of some questions in the survey that had categorical variables.

Some results from the questionnaire survey were analysed using the Chi square measure however some modifications needed to be made to the Likert-type questions. In order for Chi square results to be meaningful, the following points were considered (Welkowitz, Cohen & Ewen 2006):

- Observations must be independent
- Any subject must fall in one category
- Sum of observed frequencies must equal expected frequencies

For this reason, the results of questions that contained Strongly Agree, Agree, Neither Agree or Disagree, Disagree and Strongly Disagree were changed to Agree, No Idea and Disagree.

Software used for data analysis

An online tool was used to collect the survey results from respondents. The complete set of results were then imported in Microsoft Excel and the data was cleansed before any analysis was carried out.

As the vast majority of the survey contained category variables, Microsoft Excel was considered the most flexible tool for analysis and final presentation of the data. Chi Square calculations were easily performed using Excel and it also allowed each step of the calculation to be clearly demonstrated.

In addition to this, pivot tables were produced from the survey data and then presented in accordance with the six categories i.e., Architect, Client, Contractor, Engineering Consultant, Management Consultant, Other and Project Manager.

Chi Square Test

The Chi Square test for independence was used where this was considered appropriate for some questions in the survey. It was considered appropriate

because all observations were independent and the categories were mutually exclusive and exhaustive.

Limitations of the Chi Square test

According to (Boslaugh & Watters 2008), the following assumptions have been taken into account when conducting the chi square test:

- No cell has an expected cell value less than 1
- No more than 20% of the cells have an expected value less than 5
- Chi square is an asymptotic test and may not be valid for sparse data.

Testing a Hypothesis

There are four stages of testing a hypothesis (Graham 2020) and these will be followed to differentiate between the Null Hypothesis (H_0) and the Alternative Hypothesis (H_1). This is shown in figure 7-3.

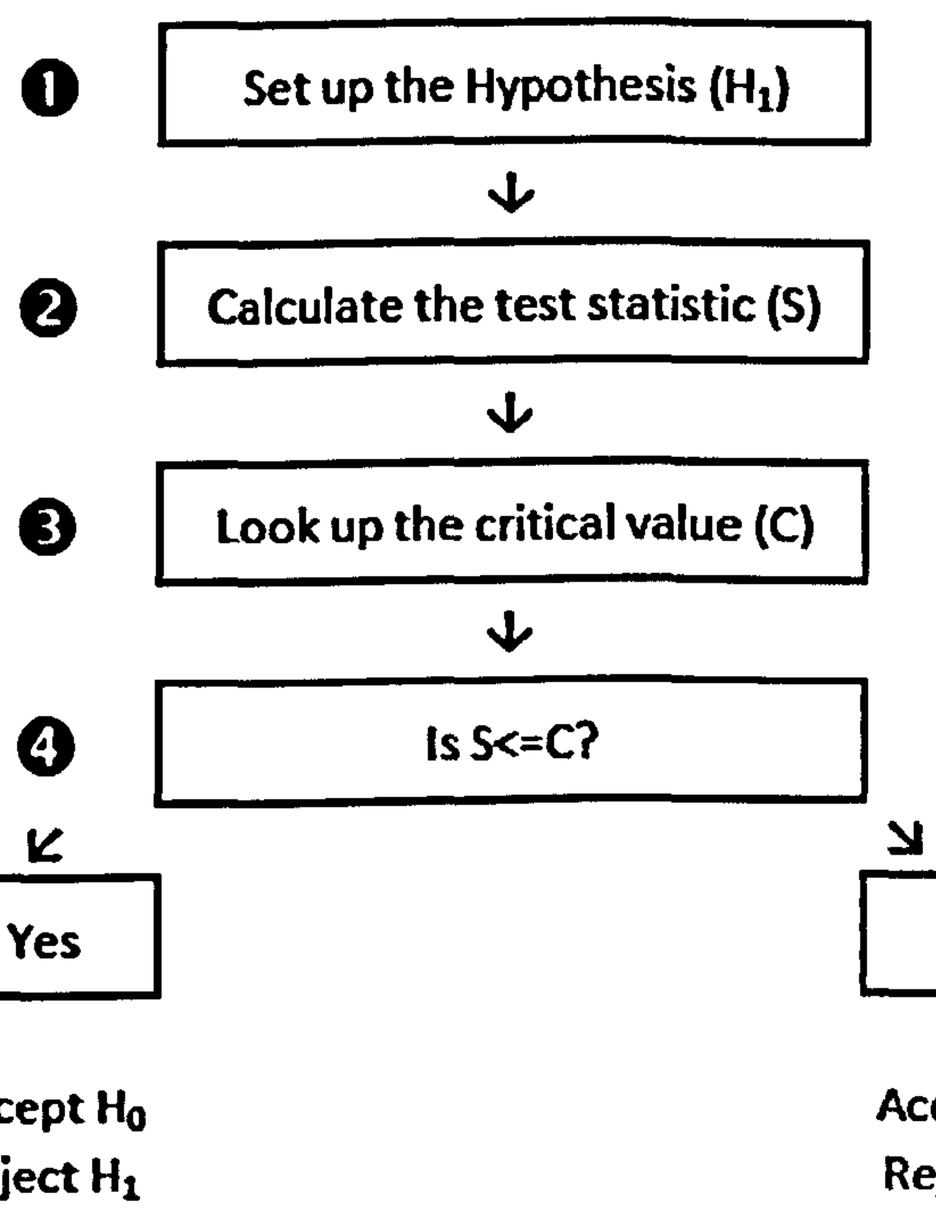


Figure 7-3, 4 stages of Hypothesis testing (taken from Graham 2010)

Survey Results

Question 4

Please indicate the approximate number of employees in your organisation

Question type

Multiple items presented / single selection by the respondent.

Results

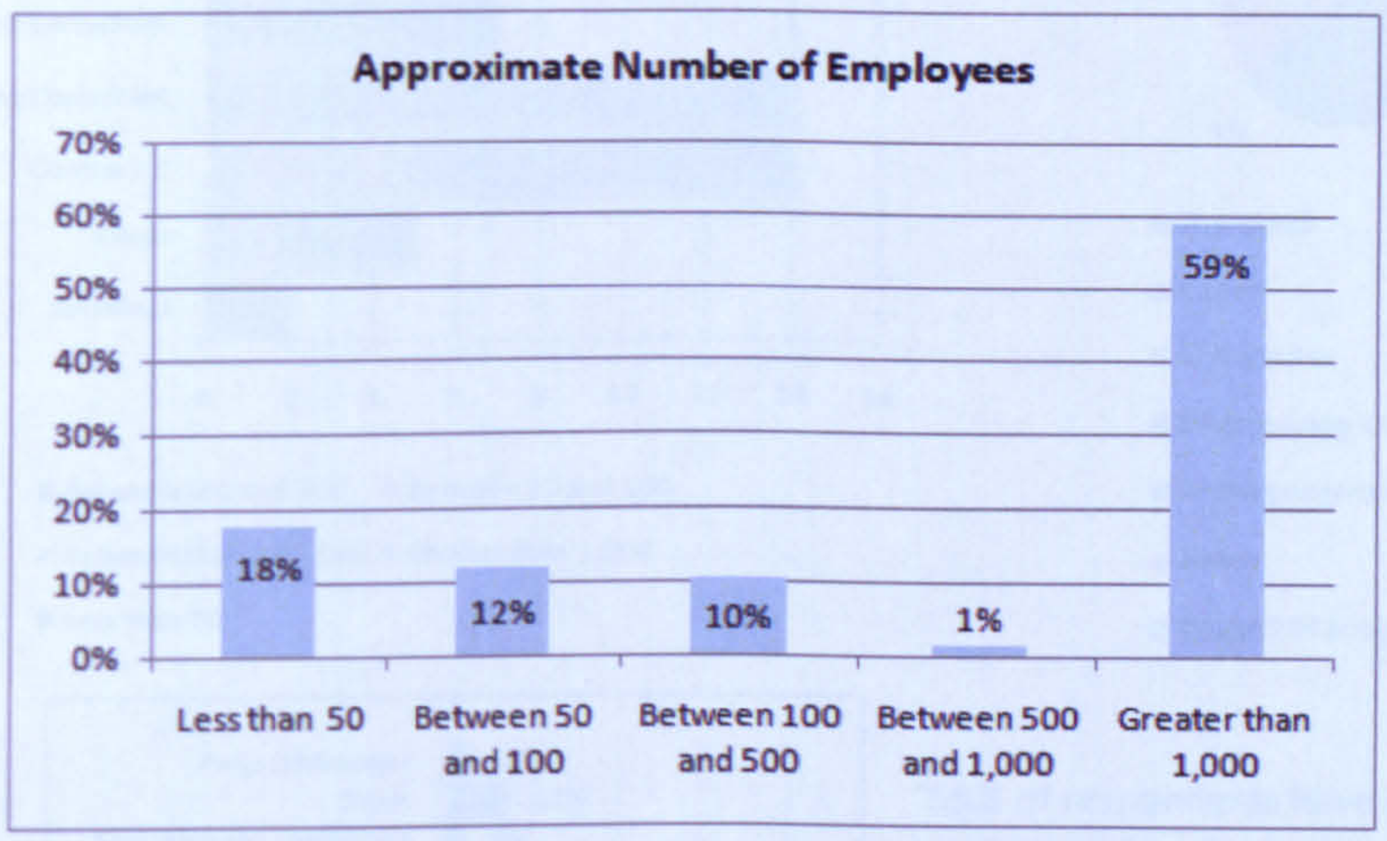
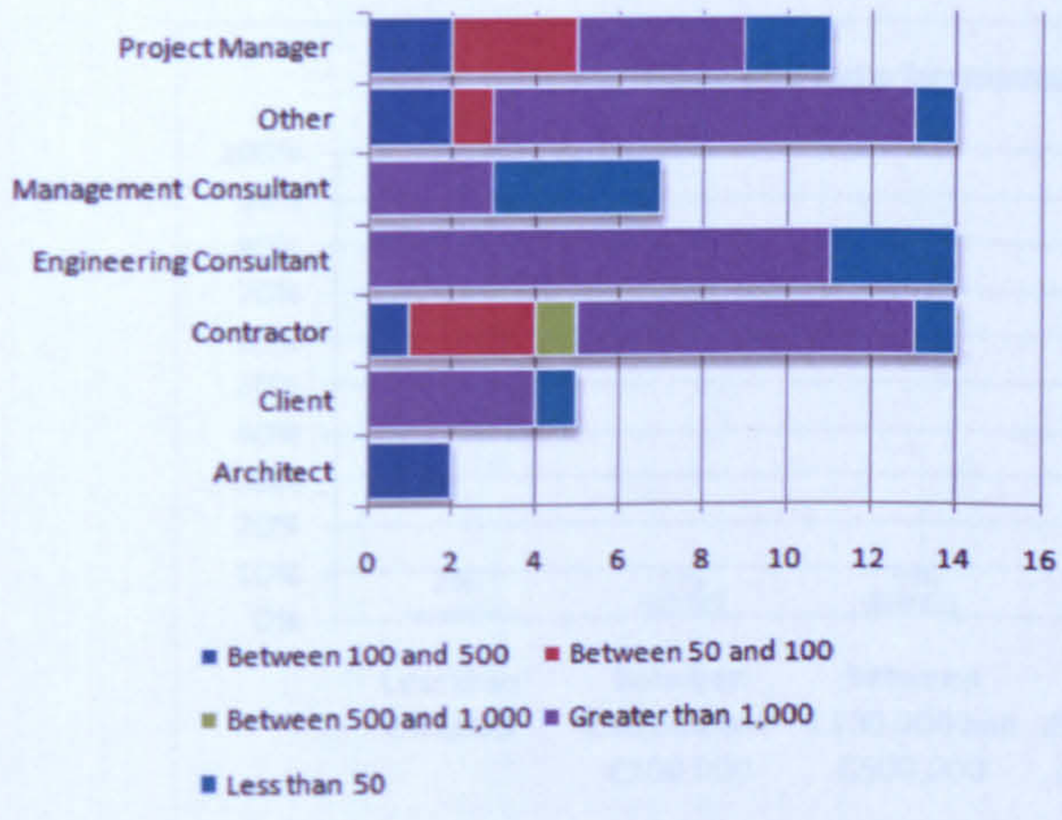


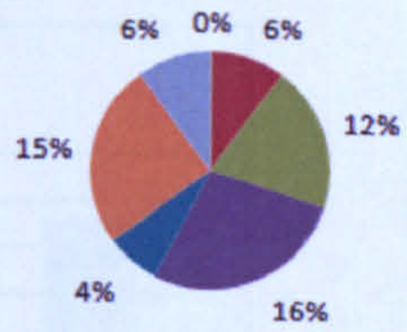
Figure 7-4 Question 4, Questionnaire Survey results

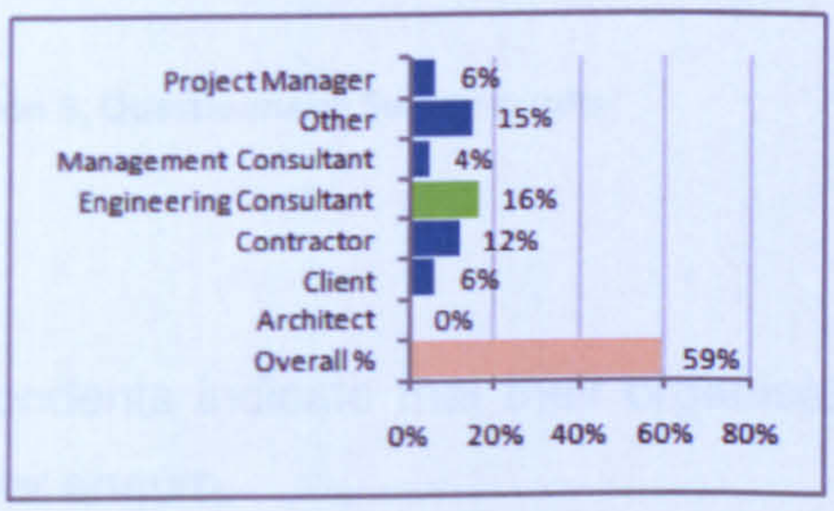
Analysis

59% of respondents work for an organisation that employs more than 1,000 employees.

# 4.0 Please indicate the approximate number of employees in your organisation Row Labels	Column Labels Between 100 and 500	Between 50 and 100	Between 500 and 1,000	Greater than 1,000	Less than 50	Grand Total
Architect	2					2
Client				4	1	5
Contractor	1	3	1	8	1	14
Engineering Consultant				11	3	14
Management Consultant				3	4	7
Other	2	1		10	1	14
Project Manager	2	3		4	2	11
Grand Total	**7**	**7**	**1**	**40**	**12**	**67**







"59% of respondents have over 1,000 employees working in their organisation. Engineering Consultant (16%) represents the largest group from this sample (n=67)."

Figure 7-5 Detailed analysis of Question 4

Interpretation

From the 59% of respondents that have over 1,000 employees working for them the largest group from this sample is that of the Engineering Consultant.

Question 5

Please indicate the approximate turnover of your organisation

Question type

Multiple items presented / single selection by the respondent.

Results

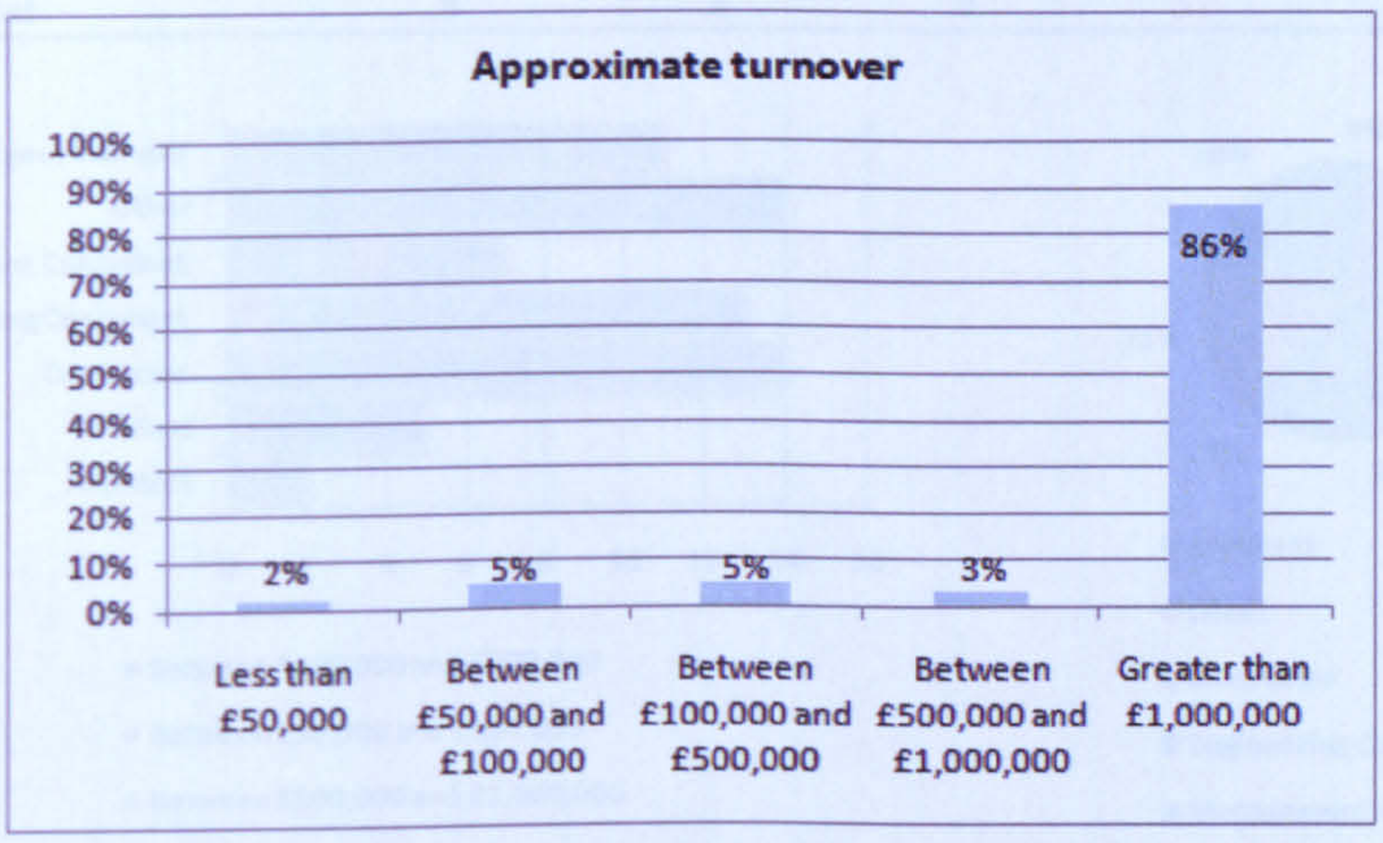
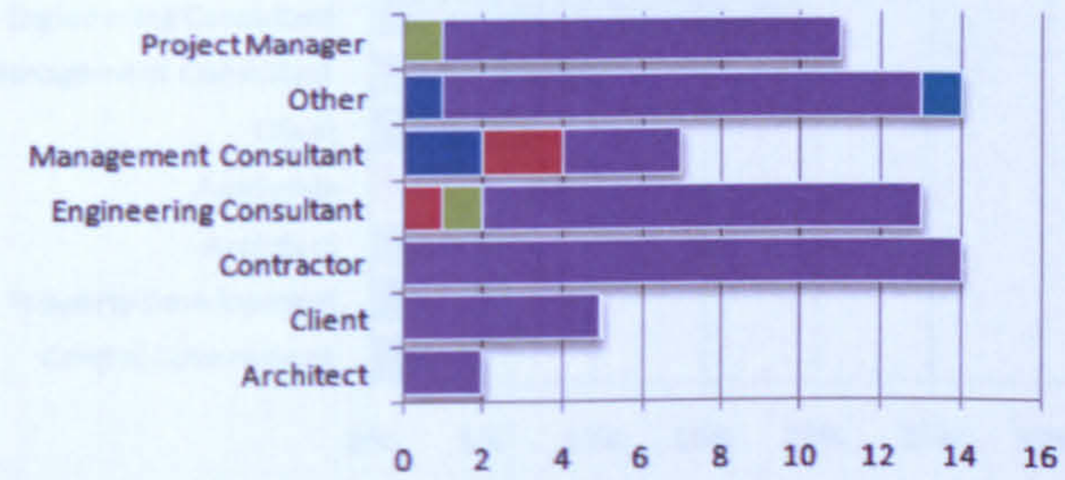


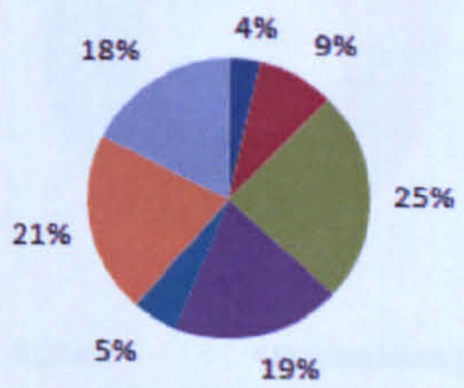
Figure 7-6 Question 5, Questionnaire Survey results

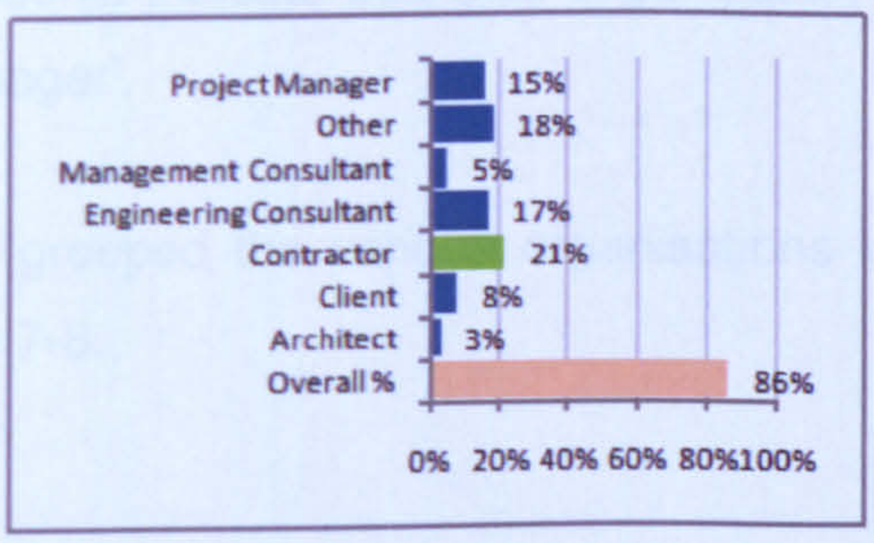
Analysis

86% of respondents indicate that their organisation has a turnover of more than £1,000,000 per annum.

#5.0 Please indicate the approximate turnover of your organisation	Column Labels					
Row Labels	Between £100,000 and £500,000	Between £50,000 and £100,000	Between £500,000 and £1,000,000	Greater than £1,000,000	Less than £50,000	Grand Total
Architect				2		2
Client				5		5
Contractor				14		14
Engineering Consultant		1	1	11		13
Management Consultant	2	2		3		7
Other	1			12	1	14
Project Manager			1	10		11
Grand Total	**3**	**3**	**2**	**57**	**1**	**66**







"86% of respondents have a turnover greater than £1,000,000. Contractor (21%) represents the largest group from this sample (n=66)."

Figure 7-7 Detailed analysis of Question 5

Interpretation

From the 86% response, the largest group from the sample is that of the Contractor.

Question 6

Which classification best describes your organisation?

Question type

Multiple items presented / single selection by the respondent.

Results

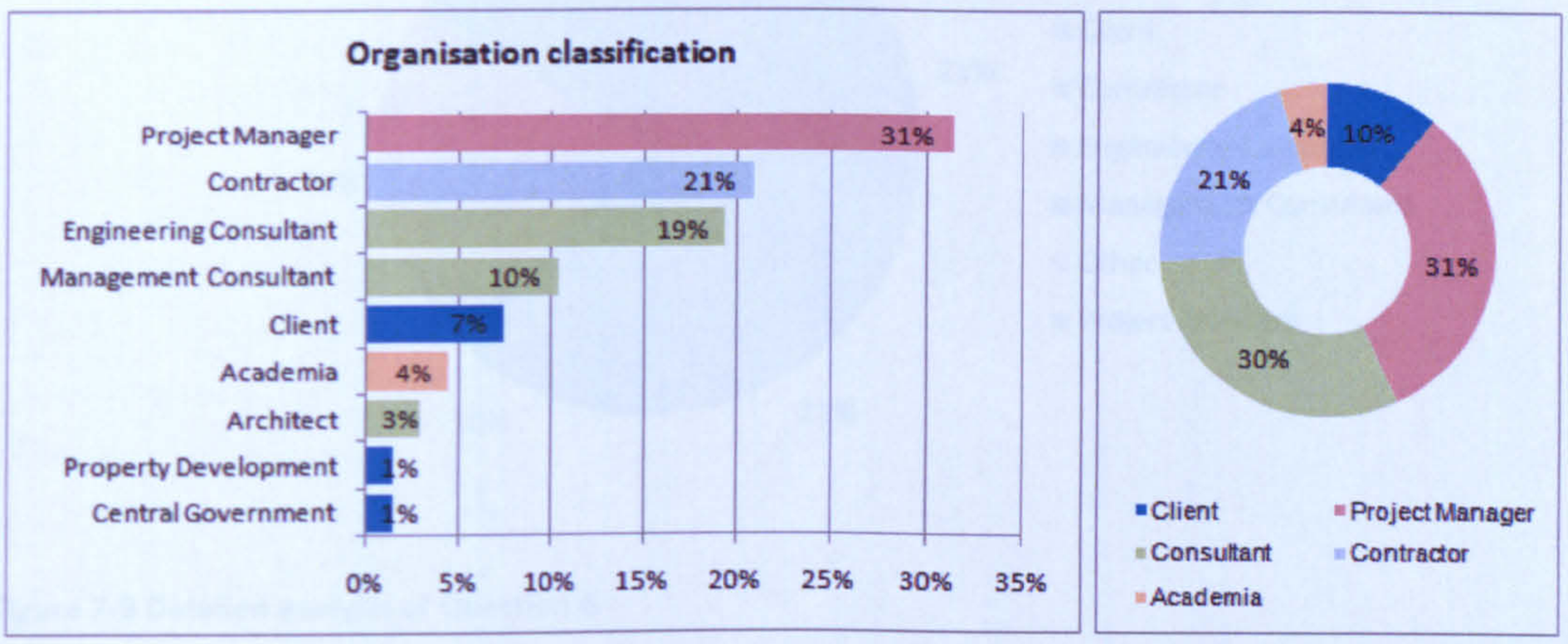


Figure 7-8 Question 6, Questionnaire Survey results

Analysis

31% of respondents indicate that their organisation is mainly involved in projects as 'project manager'.

We have then grouped the various organisations into classifications, which are shown in figure 7-8.

	Column Labels							
	Architect	Client	Contractor	Engineering Consultant	Management Consultant	Other	Project Manager	Grand Total
# Which classification best describes your organisation?	2	5	14	14	7	14	11	67

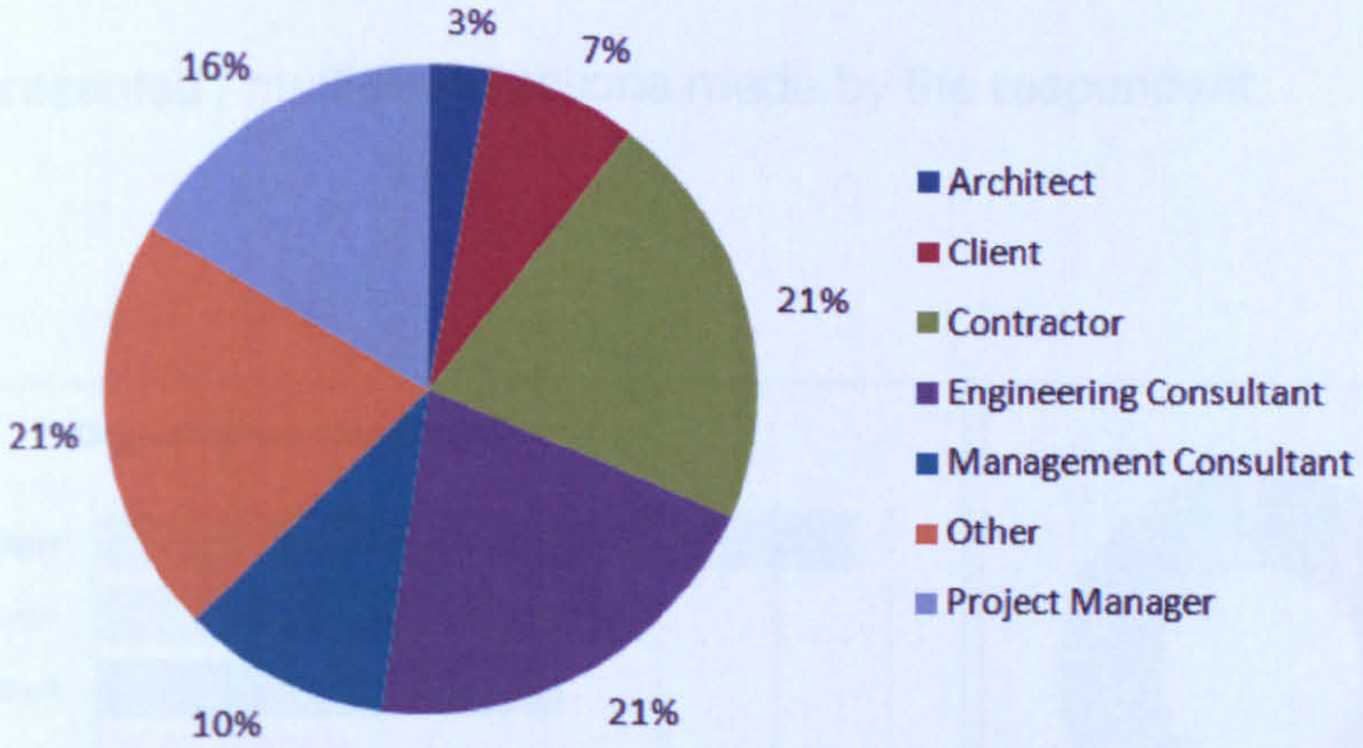


Figure 7-9 Detailed analysis of Question 6

Interpretation

Overall, there is a good spread of respondent profiles representing a full range of professions associated with construction project management.

Question 7

What type of work are you normally involved in?

Question type

Multiple items presented / multiple selections made by the respondent.

Results

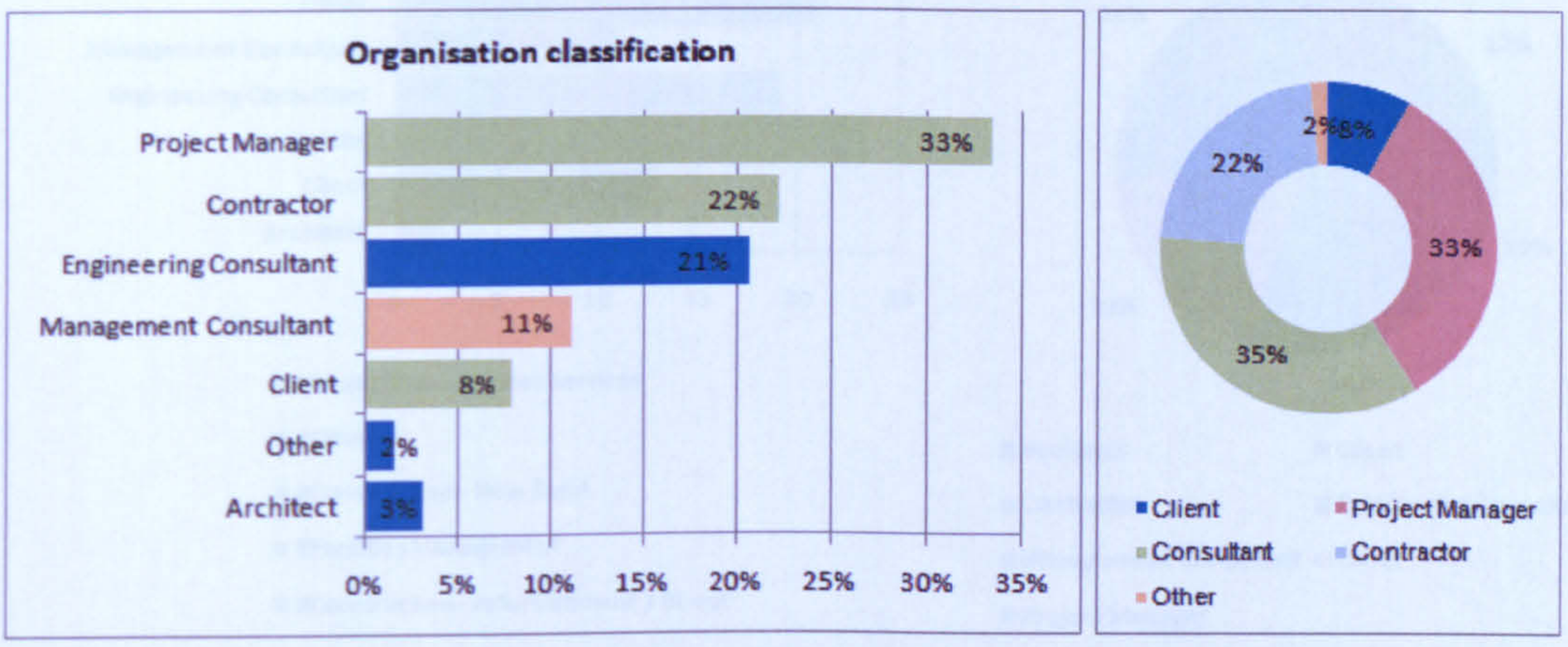


Figure 7-10 Question 7, Questionnaire Survey results

Analysis

33% of responses received indicate that the respondents undertook project management services as part of their regular service offering.

Row Labels	Values #Project management services	#Other	#Construction - New Build	#Facilities Management	#Construction - refurbishment / fit-out
Architect	0	1	1	0	0
Client	4	0	4	1	4
Contractor	5	1	11	0	6
Engineering Consultant	8	4	4	0	3
Management Consultant	6	4	0	1	0
Other	8	6	1	2	4
Project Manager	11	2	3	2	3
Grand Total	**42**	**18**	**24**	**6**	**20**

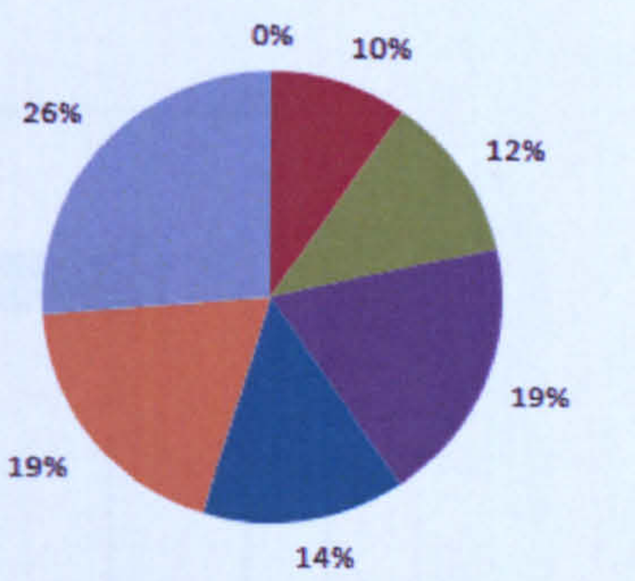


Figure 7-11 detailed analysis of Question 7

Interpretation

Project management work is undertaken by most of the group in this sample. Architects within the sample are more involved in new build or property development projects.

Question 8

To which professional institutes do you personally belong to:

Question type

Multiple items presented / multiple selections made by the respondent.

Results

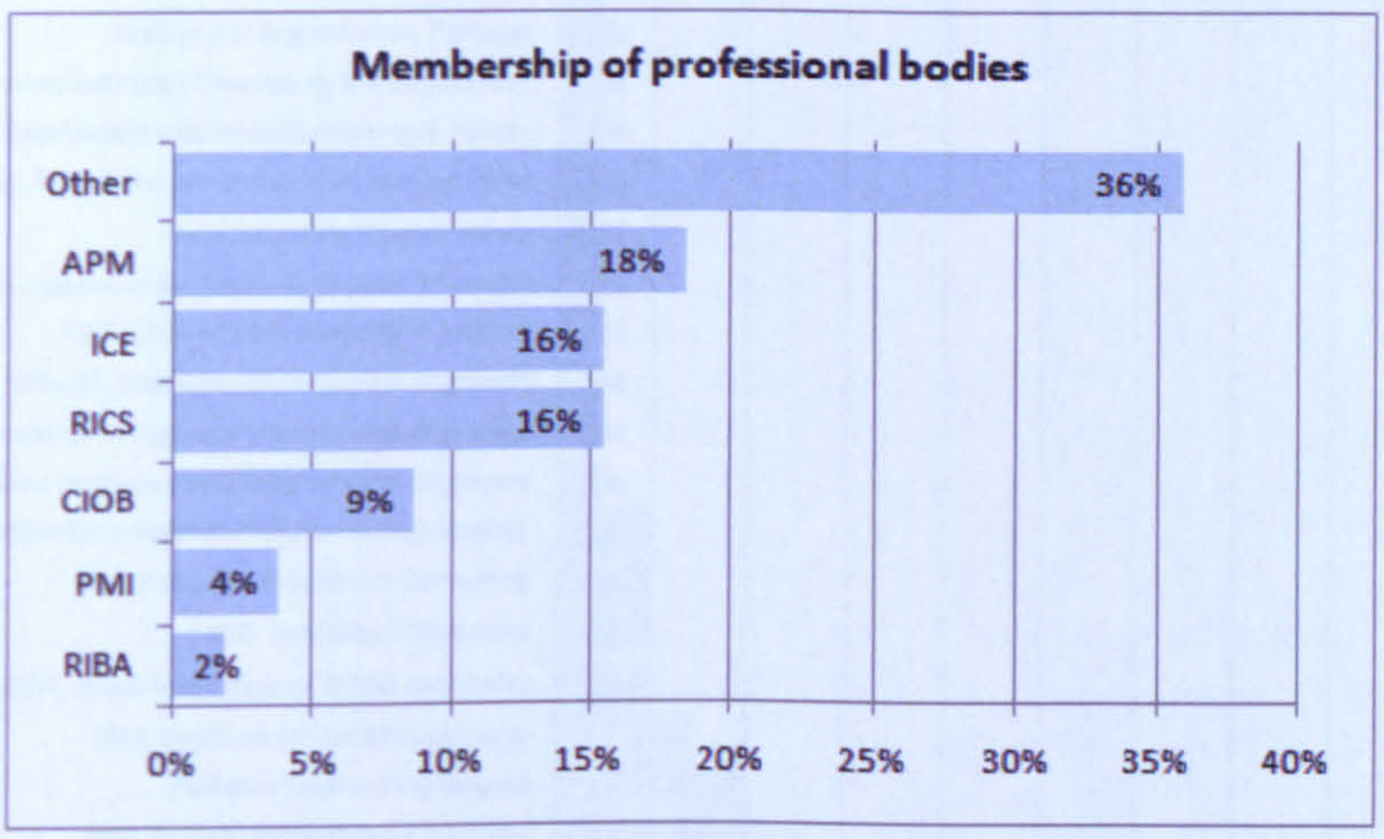


Figure 7-12 Question 8, Questionnaire Survey results

Analysis

From the choice of options provided 36% of responses were recorded under the 'other' option. Due to the high percentage of the 'other' category a further breakdown of the results was undertaken. This is shown in figure 7-12.

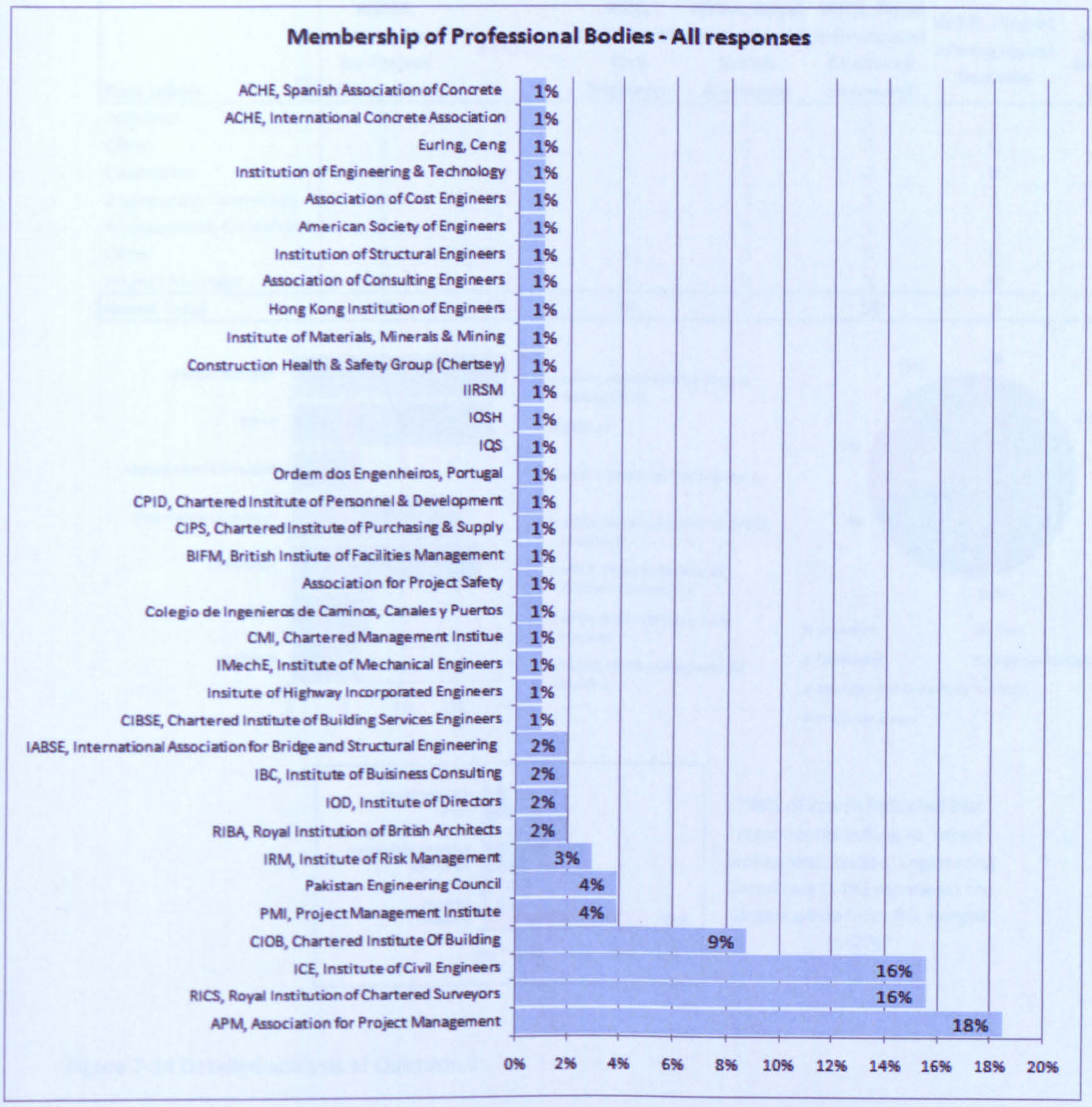
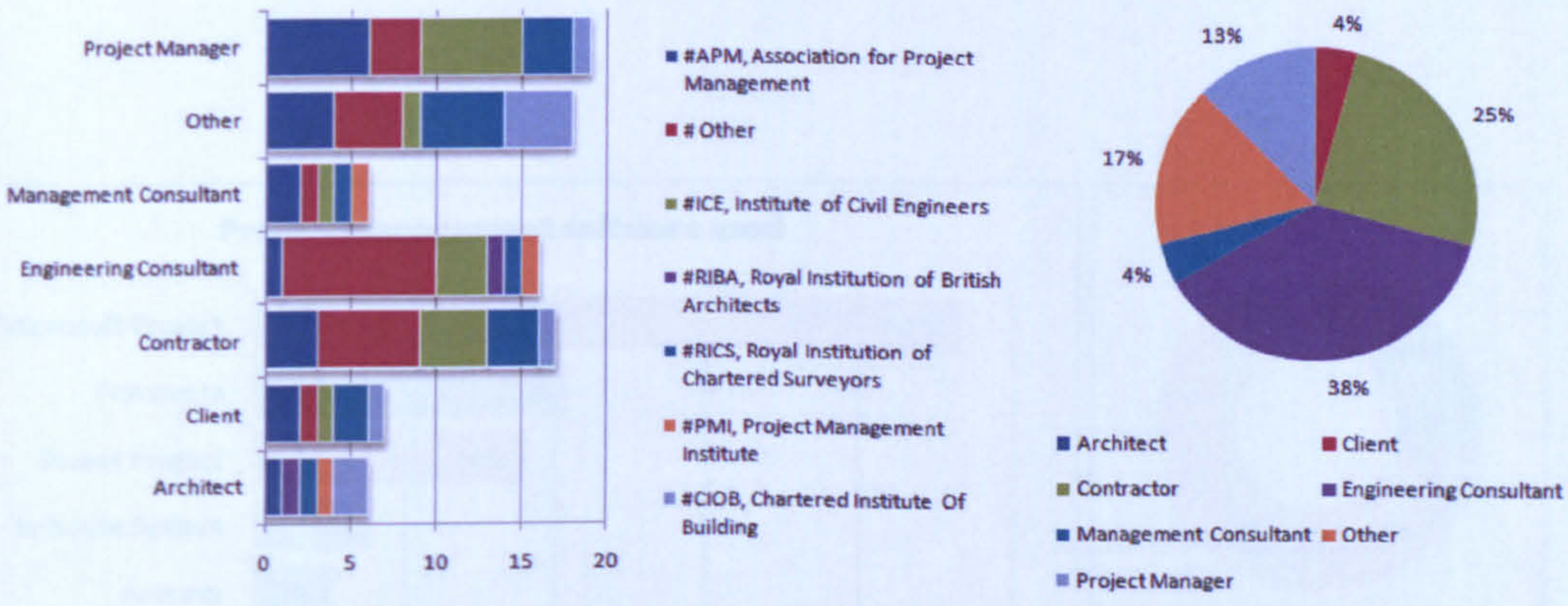
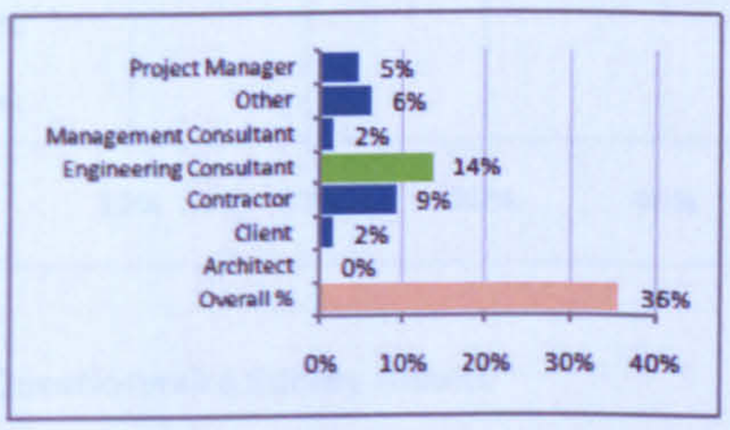


Figure 7-13 Further breakdown of all responses for Question 8

From the further analysis of responses, it can be seen that 18% of the total responses received relate to membership of the UK's Association for Project Management (APM).

Row Labels	Values #APM, Association for Project Management	# Other	#ICE, Institute of Civil Engineers	#RIBA, Royal Institution of British Architects	#RICS, Royal Institution of Chartered Surveyors	#PMI, Project Management Institute	#CIOB, Chartered Institute Of Building
Architect	1	0	0	1	1	1	2
Client	2	1	1	0	2	0	1
Contractor	3	6	4	0	3	0	1
Engineering Consultant	1	9	3	1	1	1	0
Management Consultant	2	1	1	0	1	1	0
Other	4	4	1	0	5	0	4
Project Manager	6	3	6	0	3	0	1
Grand Total	**19**	**24**	**16**	**2**	**16**	**3**	**9**





"36% of scores indicated that respondents belong to 'other' professional bodies. Engineering Consultant (14%) represents the largest group from this sample (n=70)."

Figure 7-14 Detailed analysis of Question 8

Interpretation

36% of scores were recorded against the 'other' category. From this sample, Engineering Consultant group had the largest number i.e. 14%. This could be due to the fact that there are many specialisms within the Engineering sector and this merely reflects this composition.

Question 9

What project management software does your firm use?

Question type

Multiple items presented / multiple selections made by the respondent.

Results

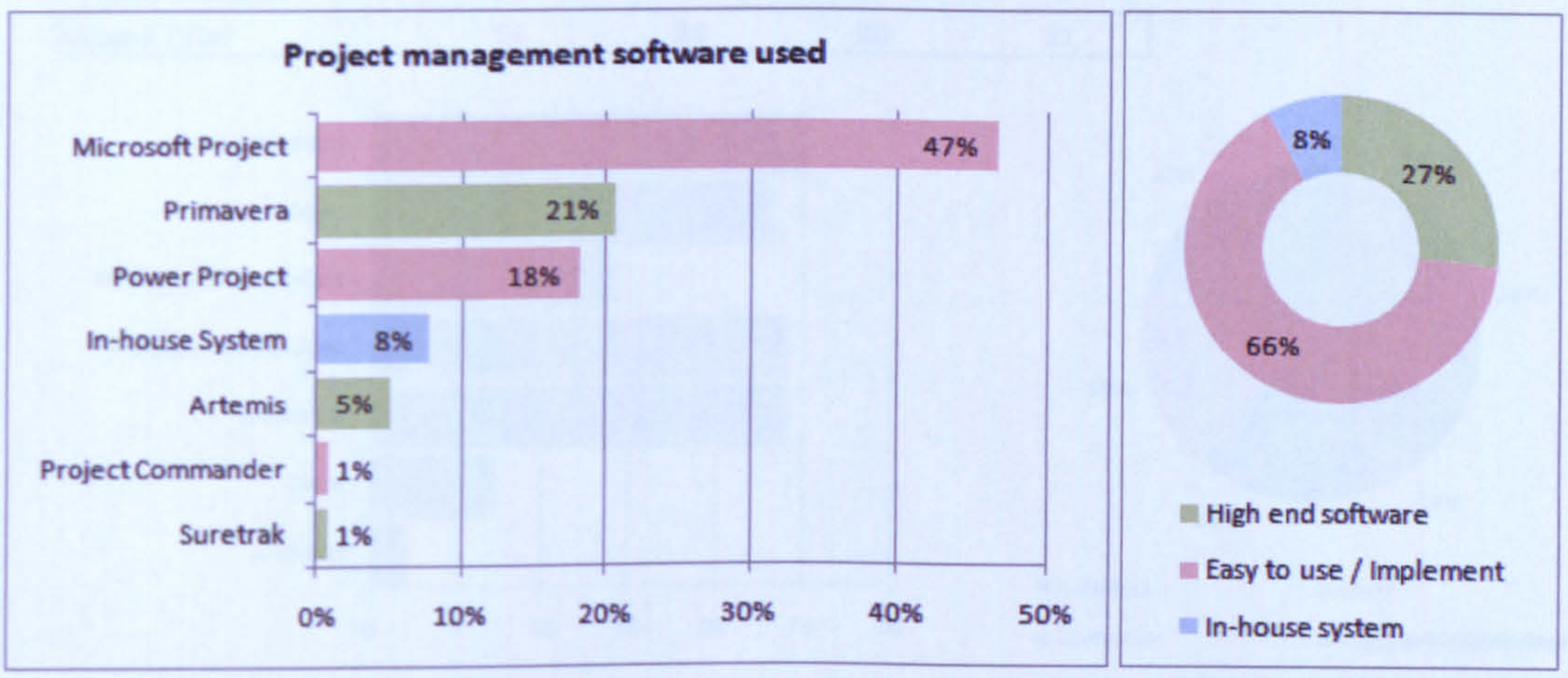


Figure 7-15 Question 9, Questionnaire Survey results

Analysis

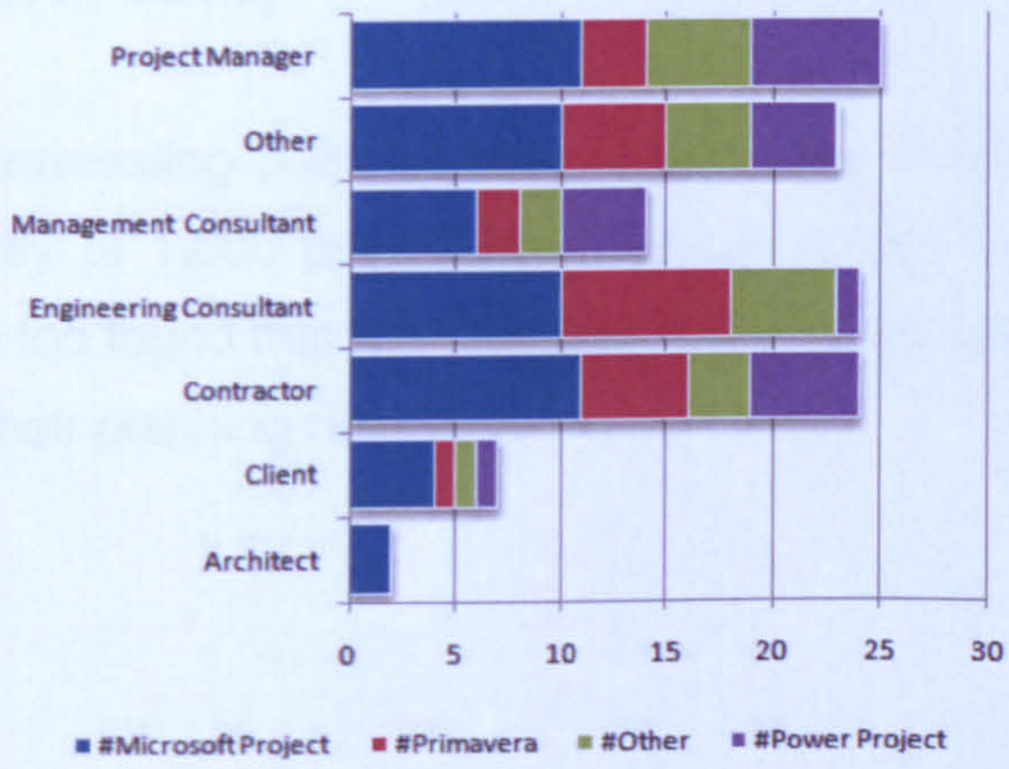
For this question, the respondents had many options to choose from. Of all the responses received, 47% of these are recorded against the use of Microsoft Project.

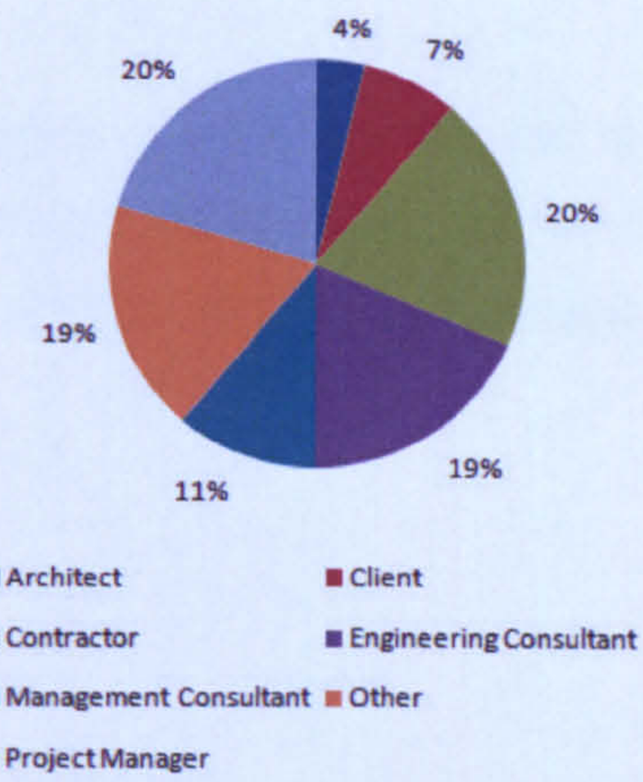
We have then grouped the software into three categories; High end, easy to use /implement and in-house systems.

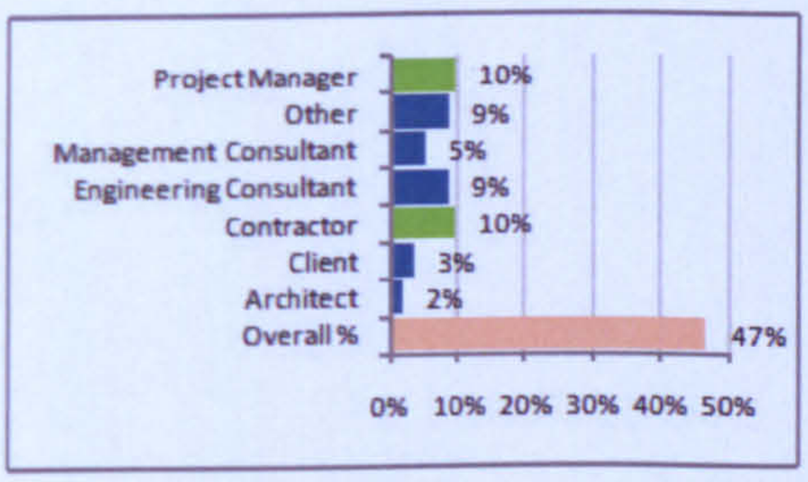
Microsoft Project, Project Commander and Power Project are relating easy to use and implement. Hence they are the project management software most in use.

Primavera and Artemis require careful implementation and are very useful for large, complex and capital intensive projects. They often require more consultancy and take time to implement properly into an organisation wishing to use it.

Row Labels	Values #Microsoft Project	#Primavera	#Other	#Power Project
Architect	2	0	0	0
Client	4	1	1	1
Contractor	11	5	3	5
Engineering Consultant	10	8	5	1
Management Consultant	6	2	2	4
Other	10	5	4	4
Project Manager	11	3	5	6
Grand Total	**54**	**24**	**20**	**21**







"47% of scores indicate that respondents use Microsoft Project. Both Contractor (10%) and Project Manager (10%) represents the largest groups from this sample (n=70)."

Figure 7-16 Detailed analysis of Question 9

Interpretation

Both contractors and project managers use Microsoft Project for their planning needs (i.e. 10% of the 47% score recorded). This could be attributable to the fact that MS Project is relatively cheap in comparison to high end project management software (Artemis and Primavera), thatalmost require more effort in their implementation.

Then there is also a training element to this as well. MS Project is also easy to use by most construction professional and a simple schedule can be produced relatively quickly.

An interesting point to note is that (Fox & Wayne Spence 1998) carried out a survey of 1,000 project managers from different industries across the USA and they too found that the vast majority of respondents (48.4%) used Microsoft Project for their planning needs.

Question 10

Which project management ideology does your organisation follow?

Question type

Multiple items presented / multiple selections made by the respondent.

Results

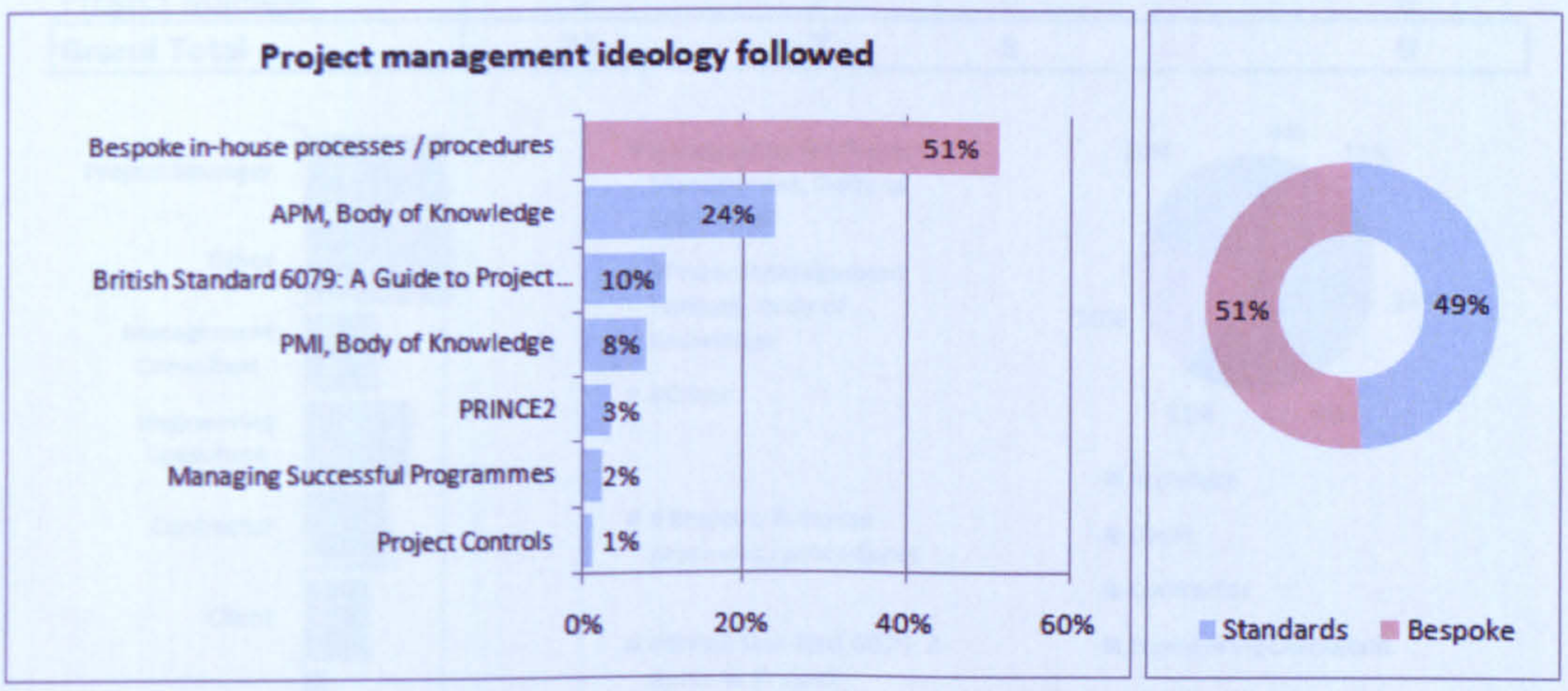
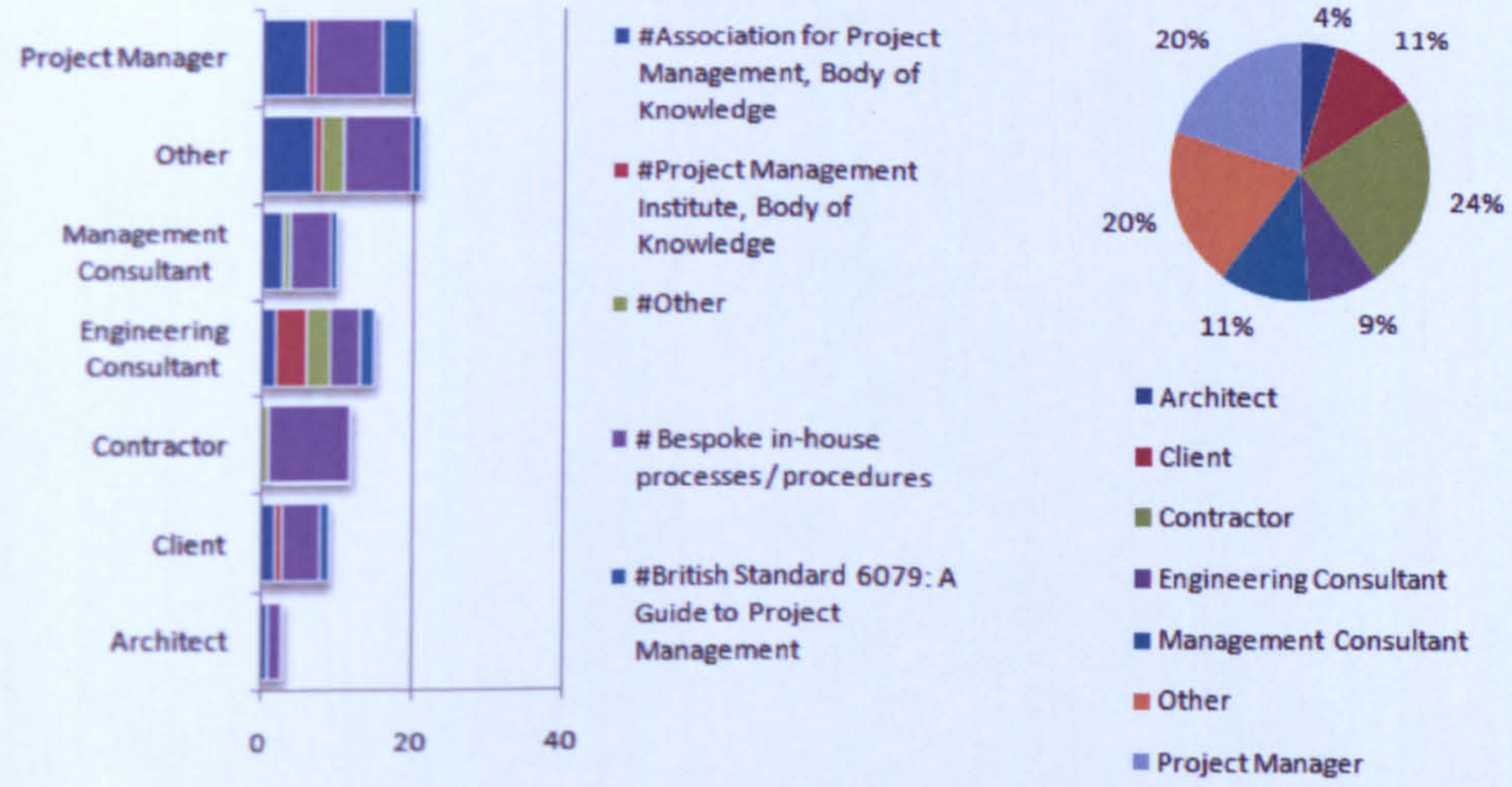


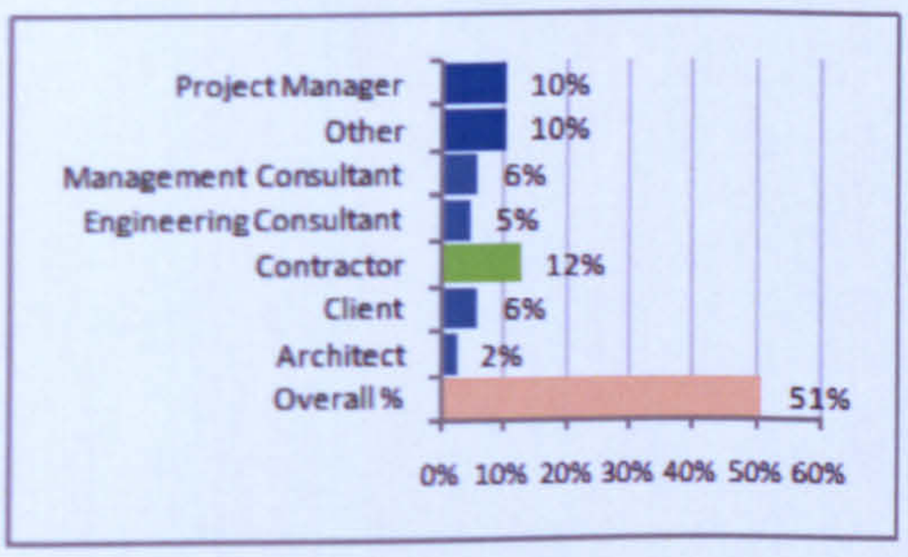
Figure 7-17 Question 10, Questionnaire Survey results

Analysis

51% of responses recorded against the use of in-house processed / procedures for their project management needs.

Row Labels	Values #Association for Project Management, Body of Knowledge	#Project Management Institute, Body of Knowledge	#Other	# Bespoke in-house processes / procedures	#British Standard 6079: A Guide to Project Management
Architect	1	0	0	2	0
Client	2	1	0	5	1
Contractor	0	0	1	11	0
Engineering Consultant	2	4	3	4	2
Management Consultant	3	0	1	5	1
Other	7	1	3	9	1
Project Manager	6	1	0	9	4
Grand Total	**21**	**7**	**8**	**45**	**9**





"51% of scores indicated that respondents follow bespoke in-house processes / procedures. Contractor (12%) represents the largest group from this sample (n=70)."

Figure 7-18 Detailed analysis of Question 10

Interpretation

Contractors tend to follow more in-house developed processes (i.e. 12% of the 51% scores recorded). This could be due to the fact that they are under a lot of pressure to build and deliver their projects in the most efficient and effective manner that also provides them with a healthy profit. They also have a very transient workforce and it is important that they have very detailed processes and procedures to ensure that everyone complies accordingly.

Question 11

Do you have a programme office within your organisation?

Question type

Multiple items presented / single response by the respondent.

Results

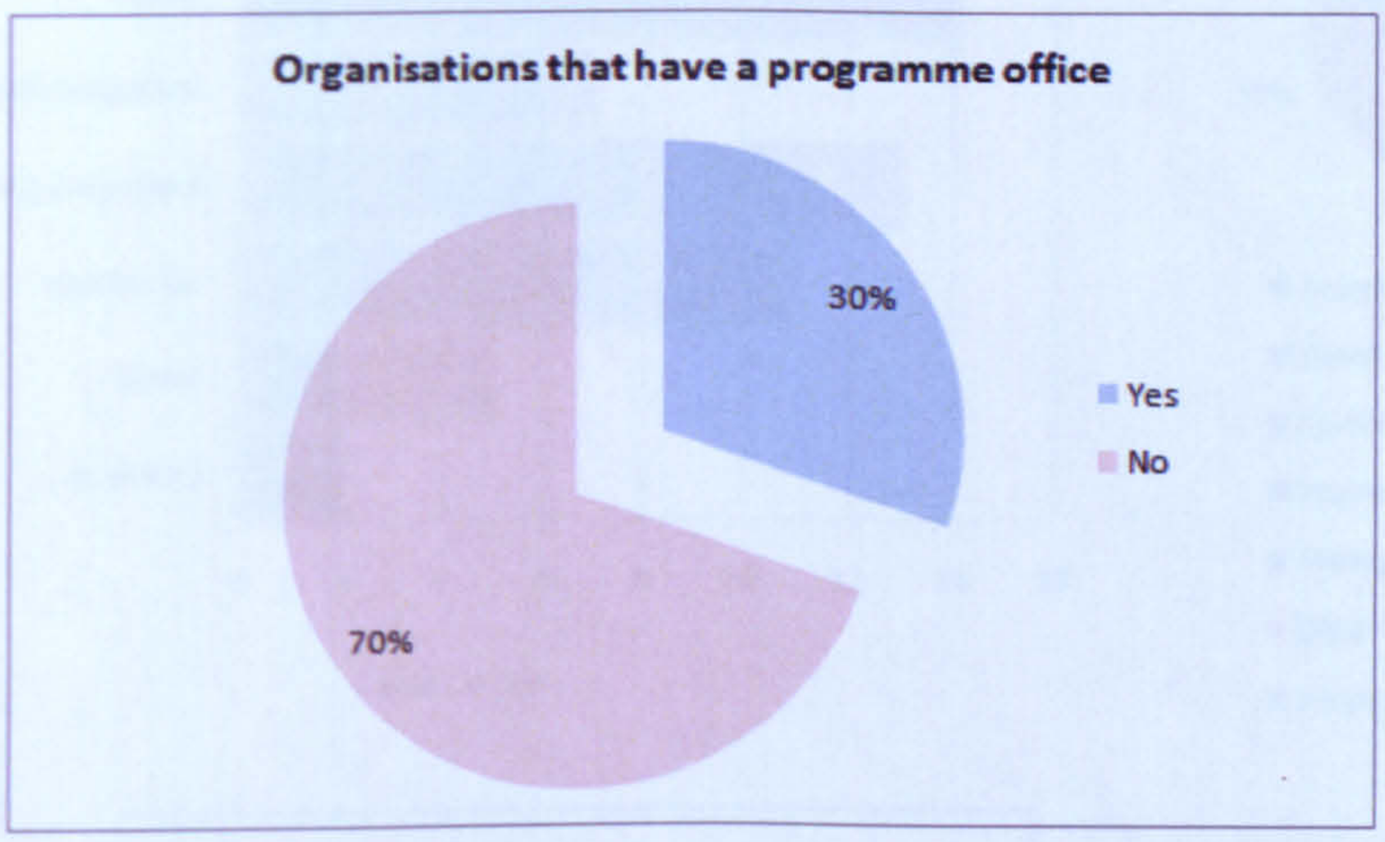


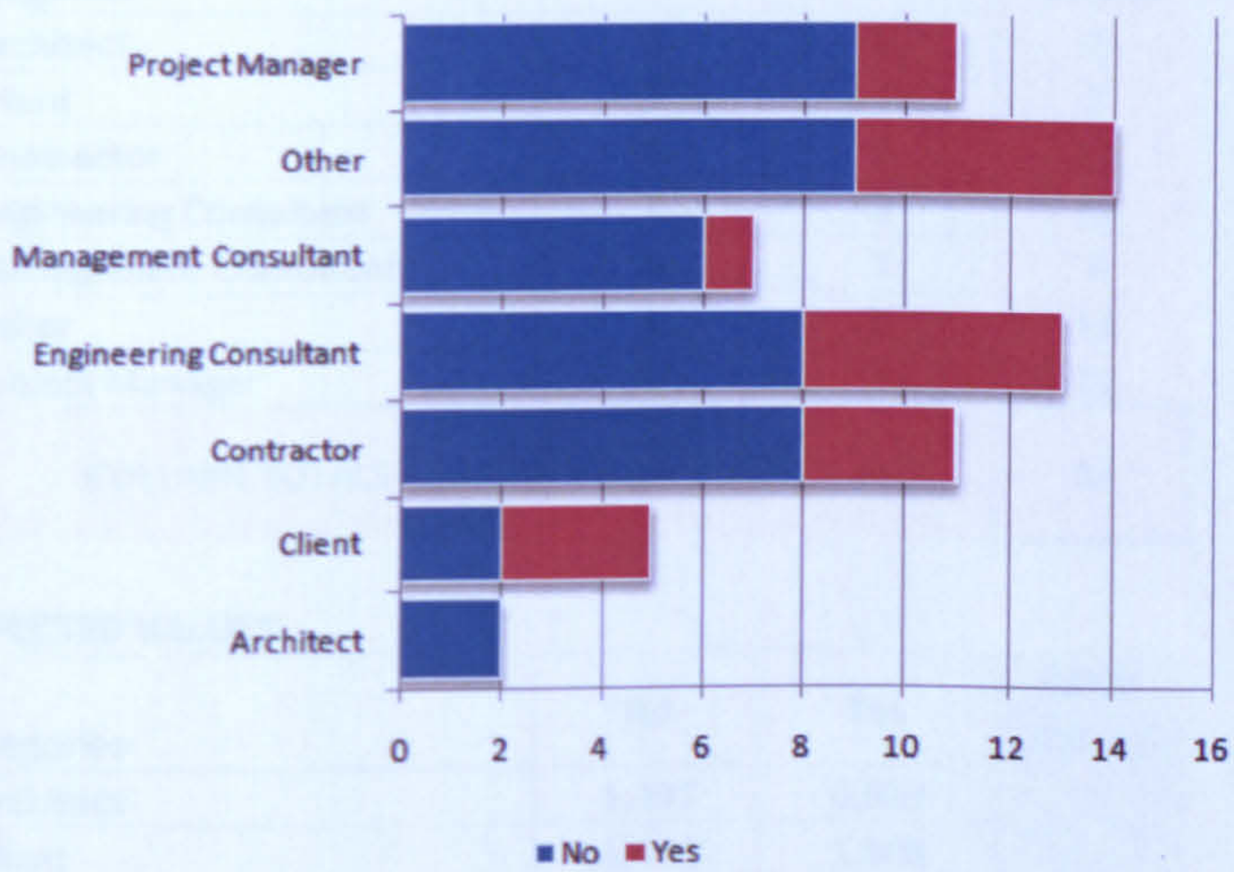
Figure 7-19 Question 11, Questionnaire Survey results

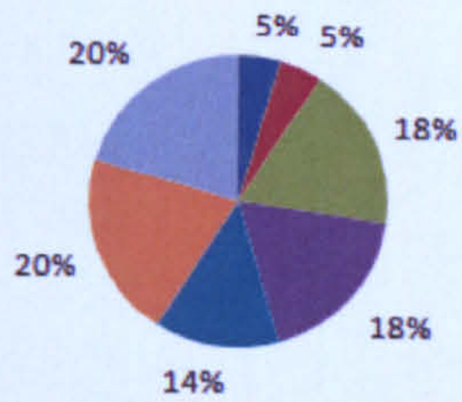
Analysis

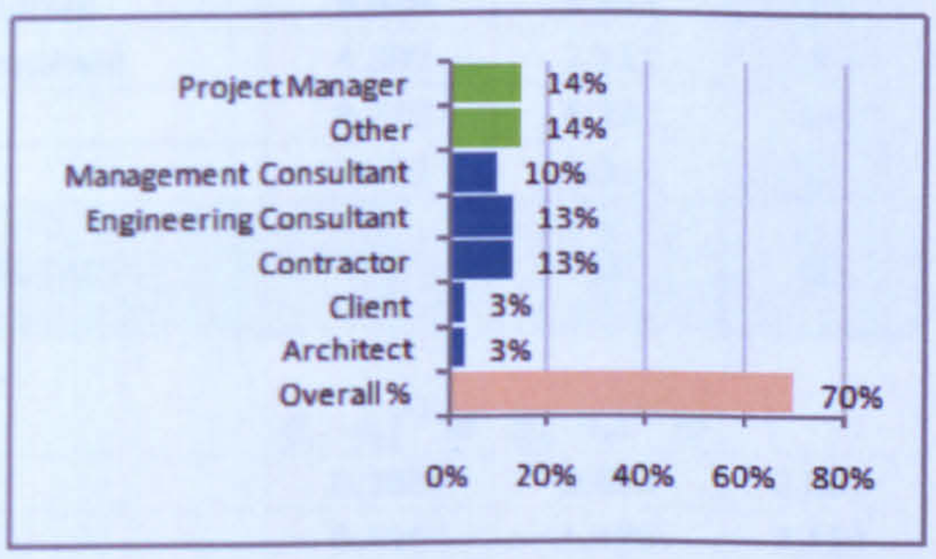
30% of respondents indicate that they have a programme office within their organisation.

Respondents that responded positively are either in the business of promoting projects as part of capital works or provided specialist project management services to their clients who have large capital intensive programmes of work.

#11.0 Do you have a programme officewithin your organisation? Row Labels	Column No	Yes	Grand Total
Architect	2		2
Client	2	3	5
Contractor	8	3	11
Engineering Consultant	8	5	13
Management Consultant	6	1	7
Other	9	5	14
Project Manager	9	2	11
Grand Total	**44**	**19**	**63**







"70% of respondents stated that they DO NOT have a programme office within their organisation. Project Manager (14%) and Other (14%) represents the largest groups from this sample (n=63)."

Figure 7-20 Detailed analysis of Question 11

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 11

H_o *Most organisation do NOT have a Programme Management Office*

H_1 Most organisations have a Programme Management Office

OBSERVED VALUES

Categories	No	Yes	ROW TOTALS
Architect	2	0	2
Client	2	3	5
Contractor	8	3	11
Engineering Consultant	8	5	13
Management Consultant	6	1	7
Other	9	5	14
Project Manager	9	2	11
COLUMN TOTALS	44	19	63

EXPECTED VALUES

Categories	No	Yes	ROW TOTALS
Architect	1.397	0.603	2
Client	3.492	1.508	5
Contractor	7.683	3.317	11
Engineering Consultant	9.079	3.921	13
Management Consultant	4.889	2.111	7
Other	9.778	4.222	14
Project Manager	7.683	3.317	11
COLUMN TOTALS	44	19	63

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.260	0.603	0.864
Client	0.638	1.476	2.114
Contractor	0.013	0.030	0.043
Engineering Consultant	0.128	0.297	0.425
Management Consultant	0.253	0.585	0.837
Other	0.062	0.143	0.205
Project Manager	0.226	0.523	0.749
			5.238

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(2-1)

5*1

5

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_o is **ACCEPTED**

Interpretation

70% of respondents indicated that they do not have a programme management office within their organisation. The reason for such a high percentage could be due to the fact that the groups from this sample tend to work for Clients and it is merely Client organisations that have a huge capital projects programme that tend to have a programme office. The programme office in such a context is used for coordinating project activity across the organisation, sharing best practice and the provision of specialist project management advice to the project community within such an organisation.

Organisations like BAA, Thames Water, and London Underground to name a few tend to have programme offices for this very purpose.

Question 12

How often does your organisation review its project management procedures?

Question type

Multiple items presented / single response by the respondent.

Results

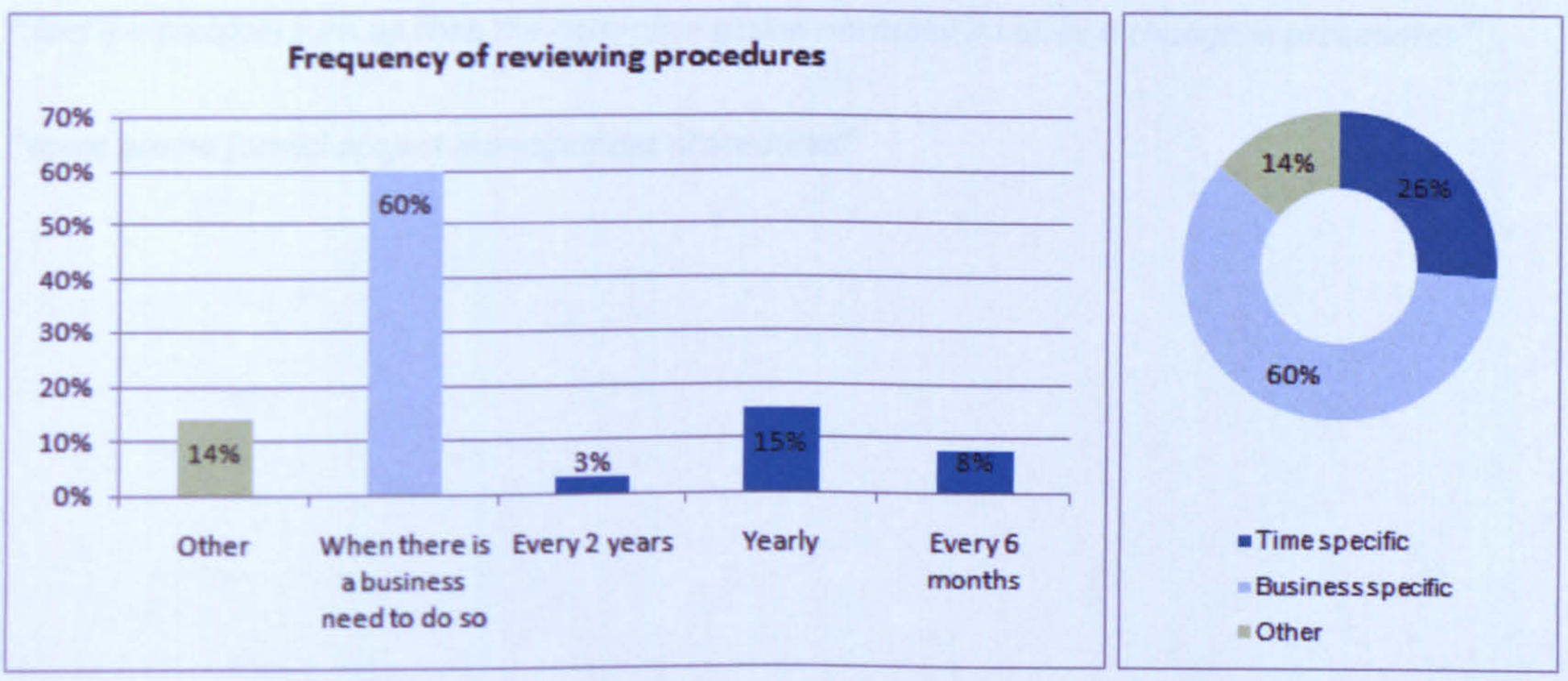


Figure 7-21 Question 12, Questionnaire Survey

Analysis/ discussion

60% of respondents indicate that they only review their process and procedures when there is a business need to do so.

This is as expected. Project management is closely aligned to the requirements of a business, when the business requirements change then this will impact the project management requirements as well.

14% of responses are recorded against the 'other' category and the breakdown of comments received is as follows:

"We act in a client advisory role"

"We have a Service Excellence Group who meet monthly and have an ongoing remit to review procedures"

"This is an ongoing process within EC Harris to ensure that the current best practices/procedures are adhered to by the Project Managers in delivering best value to their Clients"

"At the moment, continuously..."

"Our project management processes are constantly being reviewed. Small changes are introduced as and when necessary. Major changes are introduced less frequently, approx. every 2 years"

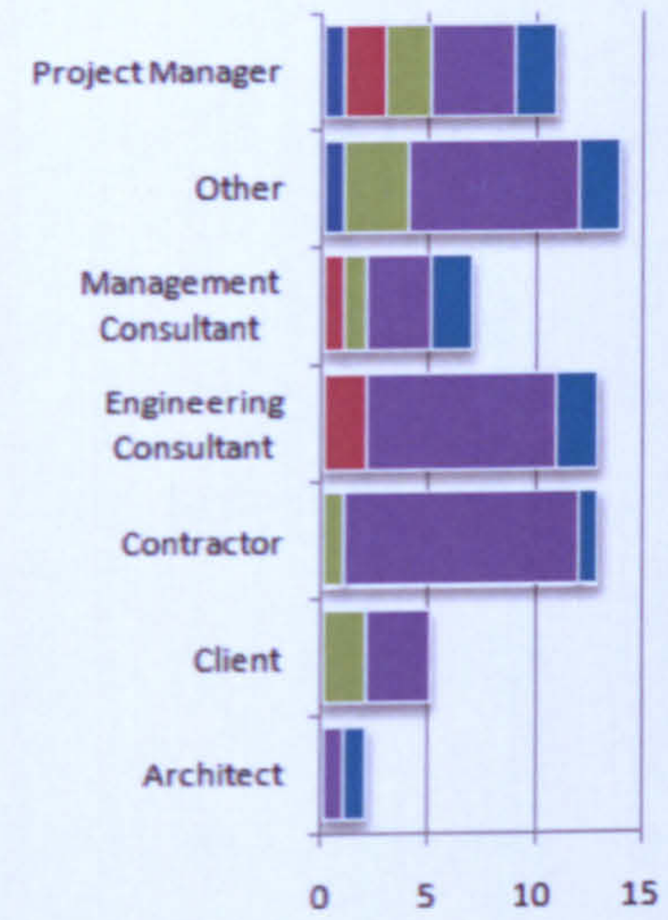
"As and when fundamental or very significant issues arise"

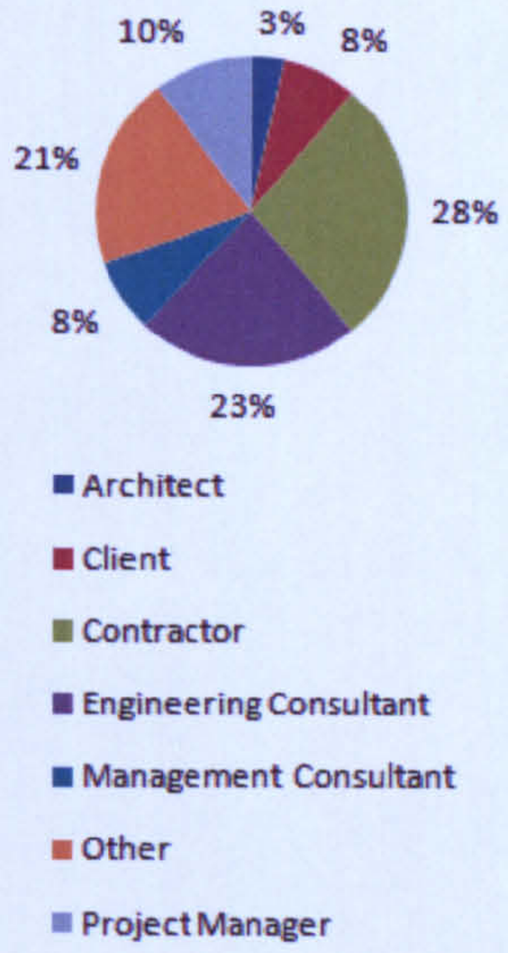
"When there is a business need to do so but at least yearly"

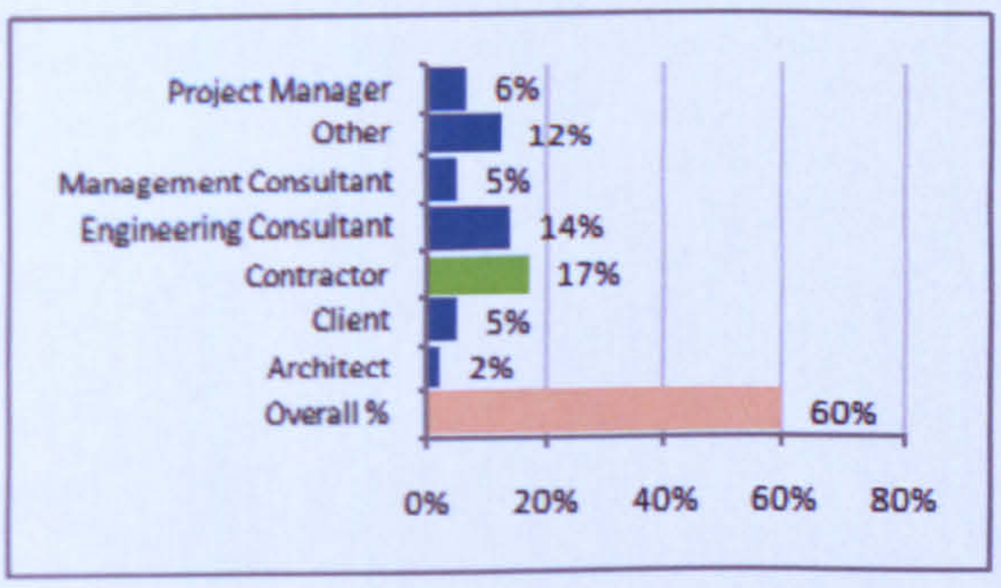
"And if a problem turn up then the corrective action normally involves a change in procedures"

"there are no formal project management procedures"

# How often does your organisation review its project management procedures?	Column Labels					
Row Labels	Every 2 years	Every 6 Months	Other	When there is a business need to do so	Yearly	Grand Total
Architect				1	1	2
Client			2	3		5
Contractor			1	11	1	13
Engineering Consultant		2		9	2	13
Management Consultant		1	1	3	2	7
Other	1		3	8	2	14
Project Manager	1	2	2	4	2	11
Grand Total	**2**	**5**	**9**	**39**	**10**	**65**







"60% of respondents stated that they only review their procedures when there is a business need to do so. Contractor (17%) represents the largest group from this sample (n=65)."

Figure 7-22 Detailed analysis of Question 12

Interpretation

Contractors indicated that they review their procedures when there is a business need to do so (i.e. 17% of the 67% response rate). Again the contracting business is extremely competitive and as the business environment places further burdens on contractors they need to modify their processes accordingly.

Question 13

What is important when you are managing projects?

Question type

Multiple statements presented / Likert-type selection made per statement by the respondent.

Analysis

This question was not answered properly and the Cronbach Coefficient of 0.326 indicated that the data was not reliable.

The two statements that were NOT answered correctly are:

- Developing a high performance team (58% disagree)
- Having the right caliber of staff (58% disagree)

The two statements that WERE correctly answered are:

- 79% of respondents agreeing to having the right balance between process and project administration.
- 93% of respondents agreeing to the fact that managing the client's expectations is important.

Results

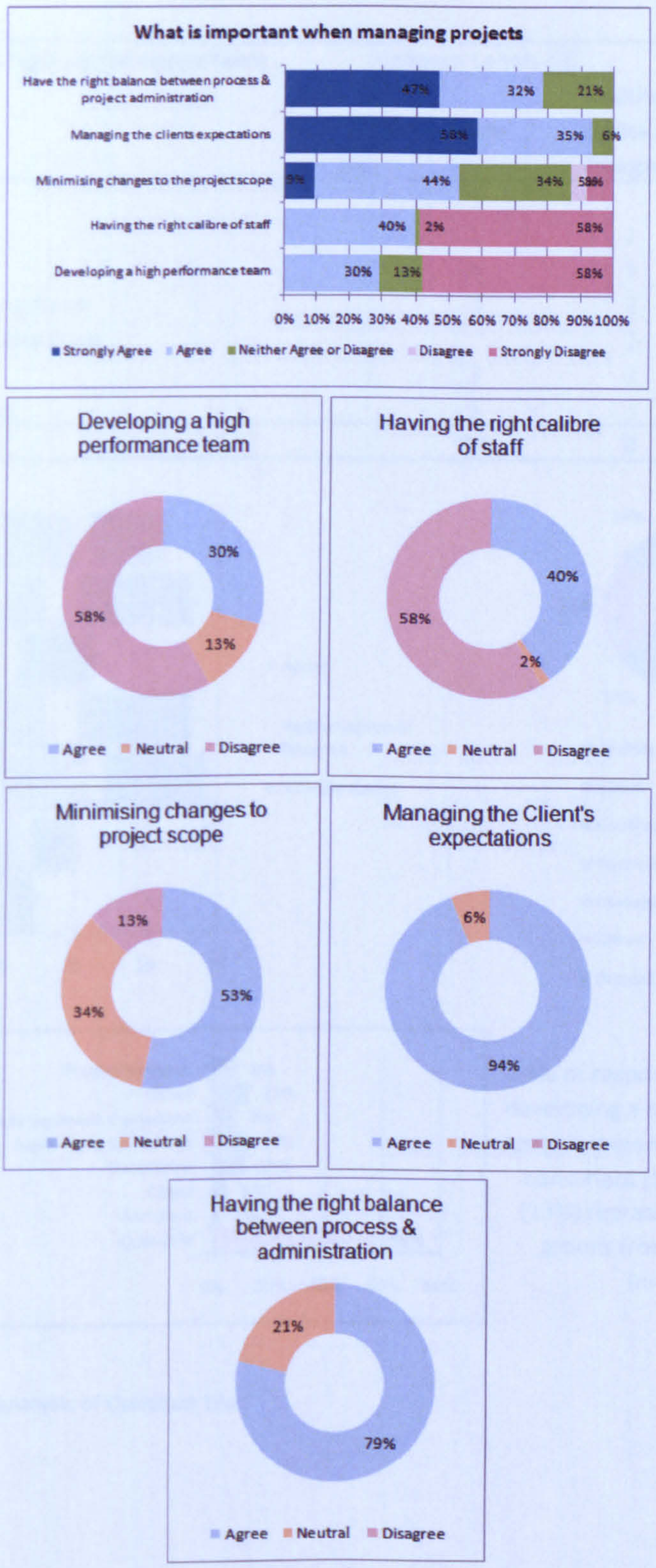
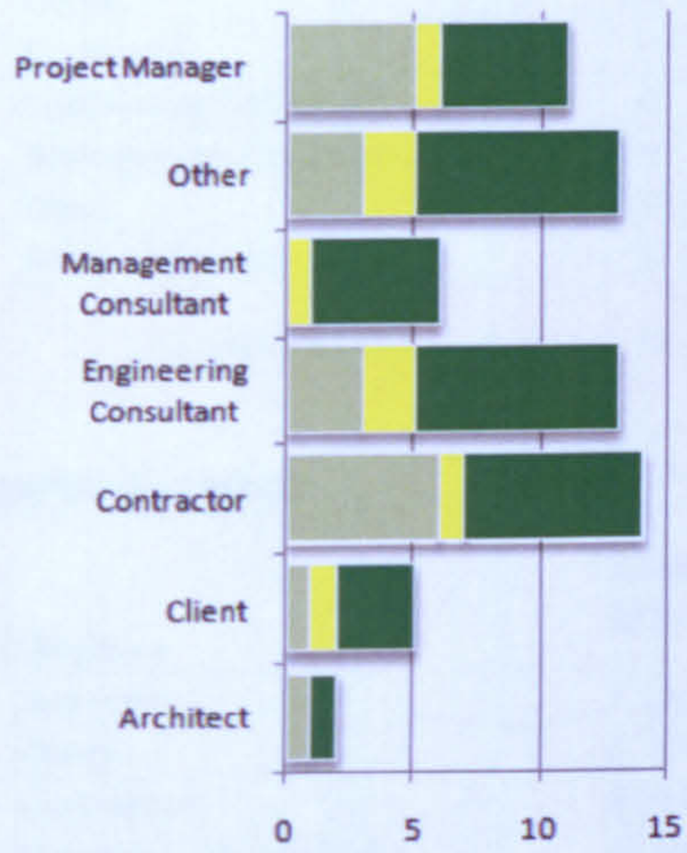
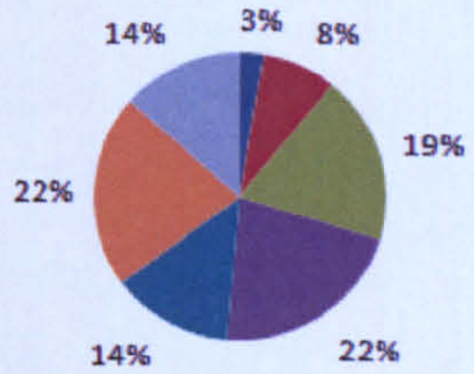


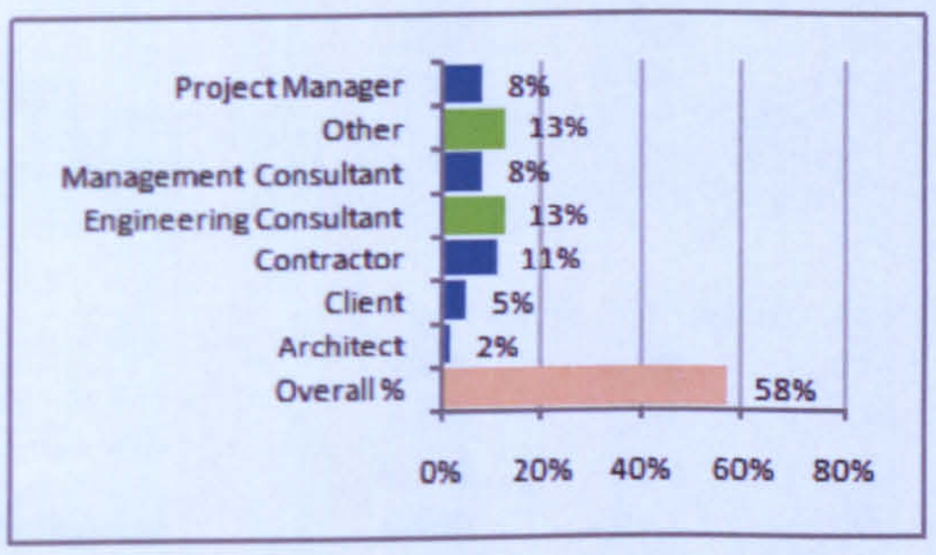
Figure 7-23 Question 13, Questionnaire Survey results

Question 13a

# Developing a high performance team Row Labels	Column Labels Agree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect	1		1	2
Client	1	1	3	5
Contractor	6	1	7	14
Engineering Consultant	3	2	8	13
Management Consultant		1	5	6
Other	3	2	8	13
Project Manager	5	1	5	11
Grand Total	**19**	**8**	**37**	**64**







"58% of respondents agree that developing a high performance team is important. Engineering consultant (13%) and Other (13%) represents the largest groups from this sample (n=64)."

Figure 7-24 Detailed analysis of Question 13a

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 13a

H_o *Developing a high performance team is NOT important*

H_1 Developing a high performance team is important

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	1	1	0	2
Client	3	1	1	5
Contractor	7	6	1	14
Engineering Consultant	8	3	2	13
Management Consultant	5	0	1	6
Other	8	3	2	13
Project Manager	5	5	1	11
COLUMN TOTALS	37	19	8	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	1.156	0.594	0.250	2
Client	2.891	1.484	0.625	5
Contractor	8.094	4.156	1.750	14
Engineering Consultant	7.516	3.859	1.625	13
Management Consultant	3.469	1.781	0.750	6
Other	7.516	3.859	1.625	13
Project Manager	6.359	3.266	1.375	11
COLUMN TOTALS	37	19	8	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.021	0.278	0.250	0.528
Client	0.004	0.158	0.225	0.383
Contractor	0.148	0.818	0.321	1.139
Engineering Consultant	0.031	0.191	0.087	0.278
Management Consultant	0.676	1.781	0.083	1.865
Other	0.031	0.191	0.087	0.278
Project Manager	0.291	0.921	0.102	1.023
				5.494

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(3-1)

5*2

10

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00

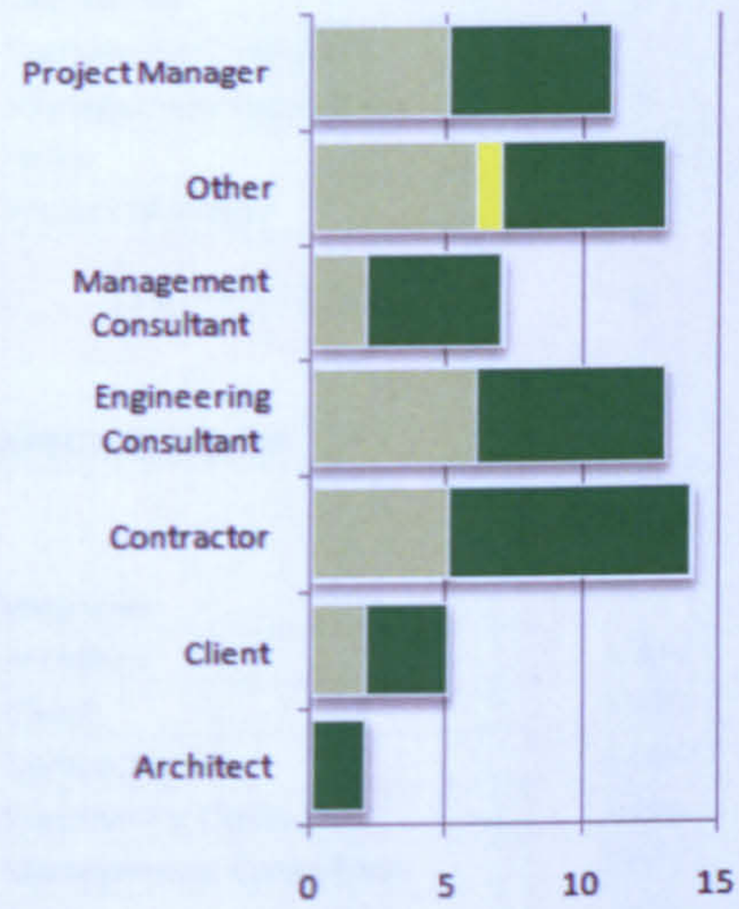
Therefore H_o is **ACCEPTED**

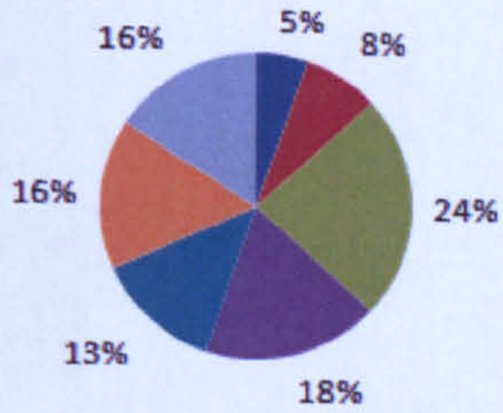
Interpretation

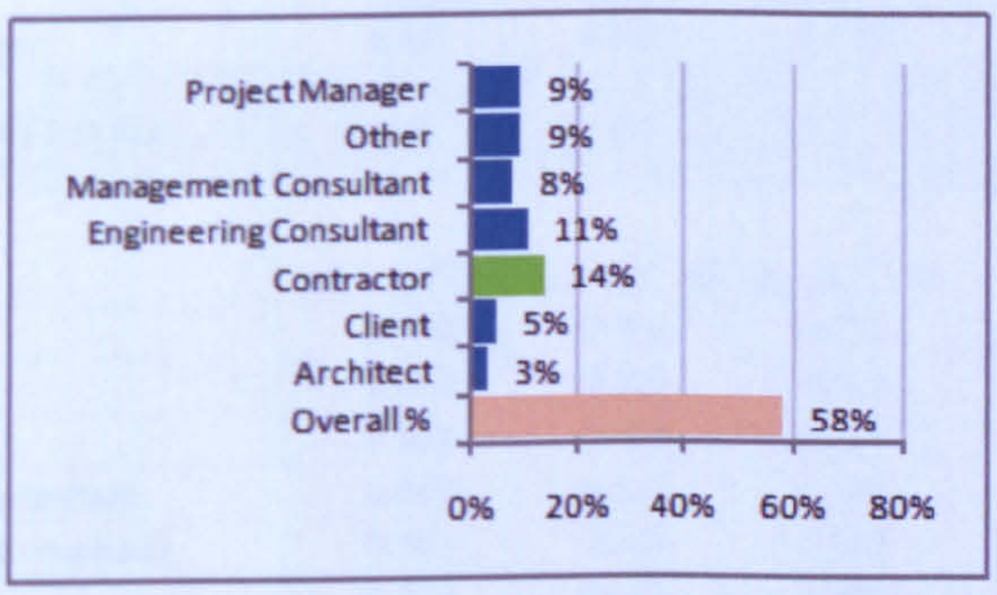
Engineering Consultant and 'Other' group within this sample agreed more that developing a high performance team is necessary for project success.

Question 13b

# Having the right calibre of staff Row Labels	Column Labels Agree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect			2	2
Client	2		3	5
Contractor	5		9	14
Engineering Consultant	6		7	13
Management Consultant	2		5	7
Other	6	1	6	13
Project Manager	5		6	11
Grand Total	**26**	**1**	**38**	**65**







"58% of respondents agree that having the right calibre of staff is important for successful projects. Contractor (14%) represent the largest group from this sample (n=65)."

Figure 7-25 detailed analysis of Question 13b

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 13b

H_o *Having the right calibre staff is NOT important*

H_1 Having the right calibre staff is important

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	2	0	0	2
Client	3	2	0	5
Contractor	9	5	0	14
Engineering Consultant	7	6	0	13
Management Consultant	5	2	0	7
Other	6	6	1	13
Project Manager	6	5	0	11
COLUMN TOTALS	38	26	1	65

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	1.169	0.800	0.031	2
Client	2.923	2.000	0.077	5
Contractor	8.185	5.600	0.215	14
Engineering Consultant	7.600	5.200	0.200	13
Management Consultant	4.092	2.800	0.108	7
Other	7.600	5.200	0.200	13
Project Manager	6.431	4.400	0.169	11
COLUMN TOTALS	38	26	1	65

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.590	0.800	0.031	0.831
Client	0.002	0.000	0.077	0.077
Contractor	0.081	0.064	0.215	0.280
Engineering Consultant	0.047	0.123	0.200	0.323
Management Consultant	0.201	0.229	0.108	0.336
Other	0.337	0.123	3.200	3.323
Project Manager	0.029	0.082	0.169	0.251
				5.421

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(3-1)

5*2

10

$$\chi 2 = \sum \frac{(fo - fe)2}{fe}$$

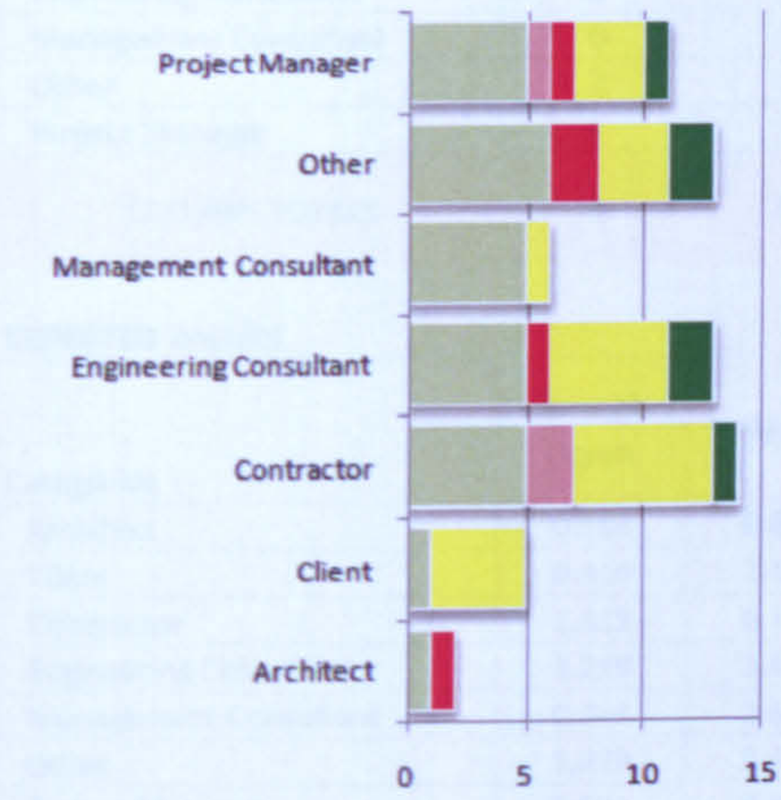
Therefore H_o is **ACCEPTED**

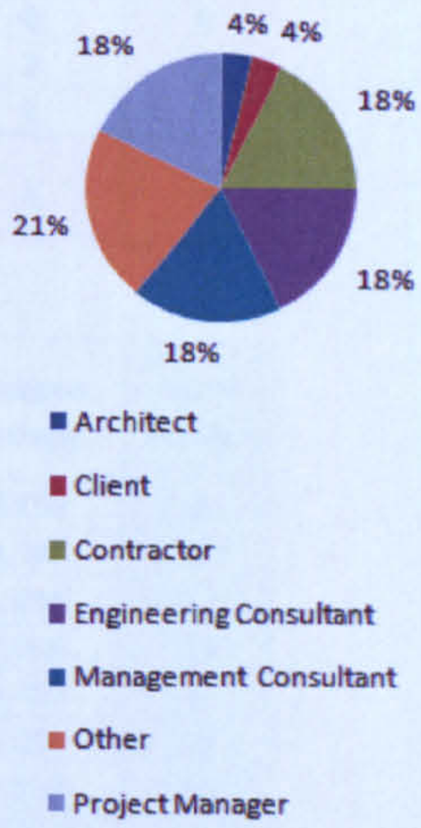
Interpretation

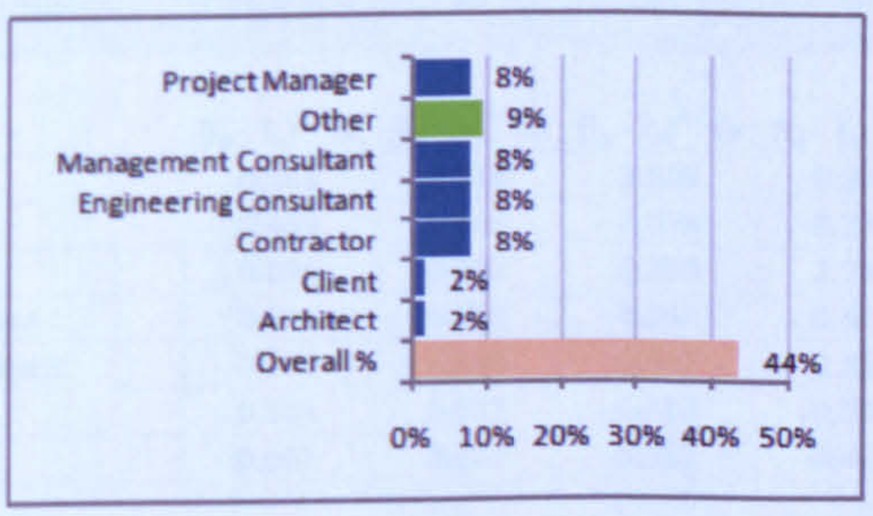
Contractors agreed more (14% of the total 58% response rate) that the right calibre resource was important for successful projects. The reason could be due to the fact that contractors have a lot of pressure to ensure that the final product is to the right cost, schedule and quality parameters otherwise there could be contractual implications leading toreceding profits.

Question 13c

# Minimising changes to the project scope / Row Labels	Column Labels: Agree	Disagree	Disagree Strongly	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect	1		1			2
Client	1			4		5
Contractor	5	2		6	1	14
Engineering Consultant	5		1	5	2	13
Management Consultant	5			1		6
Other	6		2	3	2	13
Project Manager	5	1	1	3	1	11
Grand Total	**28**	**3**	**5**	**22**	**6**	**64**







"44% of respondents agree that changes to the project scope should be minimised. Other (9%) represents the largest group from this sample (n=64)."

Figure 7-26 Detailed analysis of Question 13c

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 13c

H_o *Minimising changes to the project is NOT important*

H_1 Minimising changes to the project is important

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Disagree Strongly	ROW TOTALS
Architect	0	1	0	0	1	2
Client	0	1	4	0	0	5
Contractor	1	5	6	2	0	14
Engineering Consultant	2	5	5	0	1	13
Management Consultant	0	5	1	0	0	6
Other	2	6	3	0	2	13
Project Manager	1	5	3	1	1	11
COLUMN TOTALS	6	28	22	3	5	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Disagree Strongly	ROW TOTALS
Architect	0.188	0.875	0.688	0.094	0.156	2
Client	0.469	2.188	1.719	0.234	0.391	5
Contractor	1.313	6.125	4.813	0.656	1.094	14
Engineering Consultant	1.219	5.688	4.469	0.609	1.016	13
Management Consultant	0.563	2.625	2.063	0.281	0.469	6
Other	1.219	5.688	4.469	0.609	1.016	13
Project Manager	1.031	4.813	3.781	0.516	0.859	11
COLUMN TOTALS	6	28	22	3	5	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.188	0.018	0.688	0.094	4.556	5.355
Client	0.469	0.645	3.028	0.234	0.391	4.297
Contractor	0.074	0.207	0.293	2.751	1.094	4.345
Engineering Consultant	0.501	0.083	0.063	0.609	0.000	0.756
Management Consultant	0.563	2.149	0.547	0.281	0.469	3.446
Other	0.501	0.017	0.483	0.609	0.954	2.063
Project Manager	0.001	0.007	0.161	0.455	0.023	0.647
						20.910

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(5-1)

5*4

20

Therefore H_o is **ACCEPTED**

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

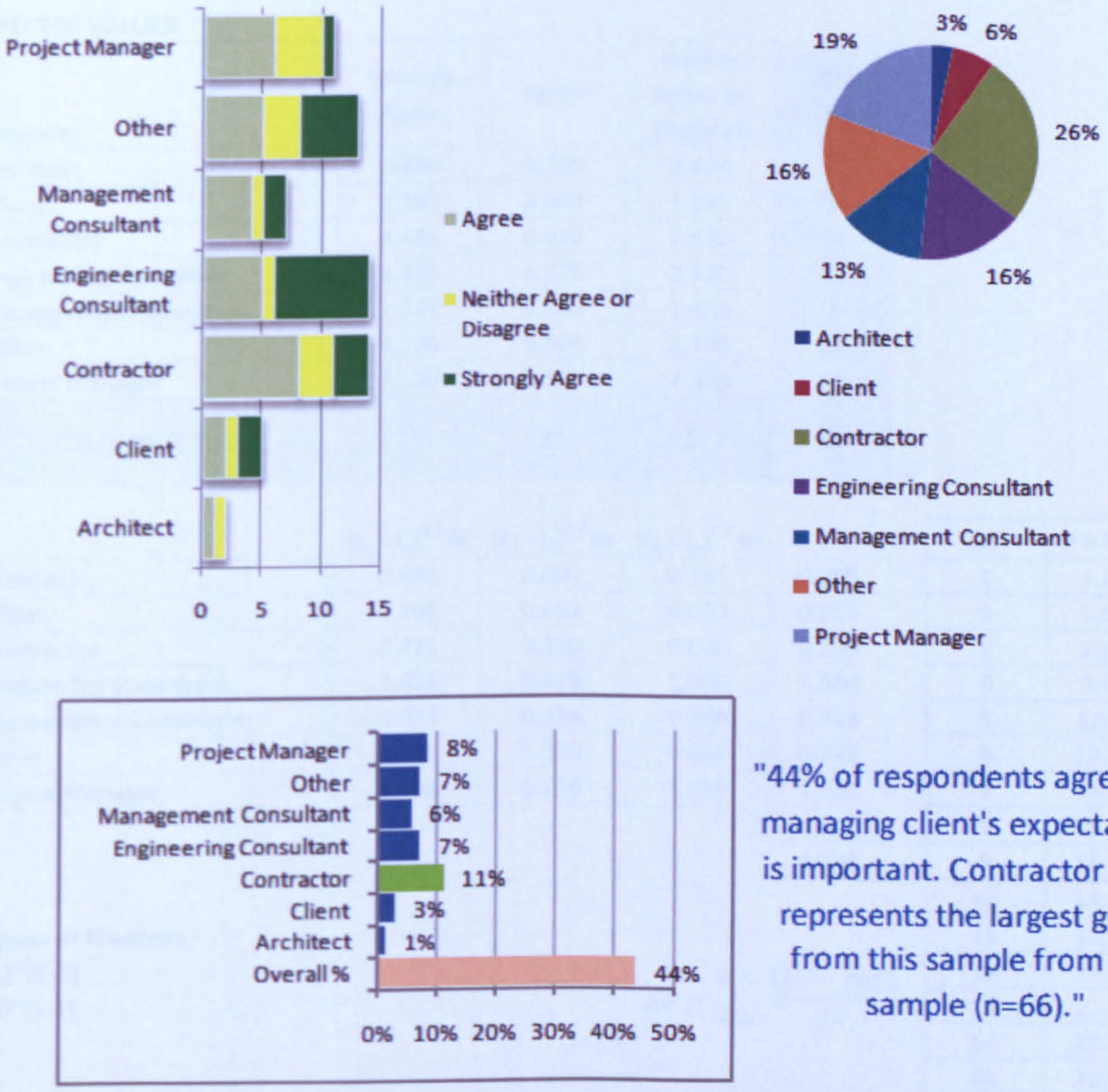
df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

The 'Other' category agreed more (9% of the 44% response rate) that changes to the project scope should be minimised in order to have a successful project. The composition of this group consisted of property developers. They see this as important because the returns on their investment need to be carefully managed to have a successful development and therefore they do not prefer any changes to the project scope.

Question 13d

#Have the right balance between process & project administration Row Labels	Column Labels Agree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect	1	1		2
Client	2	1	2	5
Contractor	8	3	3	14
Engineering Consultant	5	1	8	14
Management Consultant	4	1	2	7
Other	5	3	5	13
Project Manager	6	4	1	11
Grand Total	**31**	**14**	**21**	**66**



"44% of respondents agree that managing client's expectations is important. Contractor (11%) represents the largest group from this sample from this sample (n=66)."

Figure 7-27 Detailed analysis of Question 13d

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 13d

H_o *Managing the Client's expectation is NOT important*

H_1 Managing the Client's expectation is important

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	0	1	1	2
Client	2	2	1	5
Contractor	3	8	3	14
Engineering Consultant	8	5	1	14
Management Consultant	2	4	1	7
Other	5	5	3	13
Project Manager	1	6	4	11
COLUMN TOTALS	21	31	14	66

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	0.636	0.939	0.424	2
Client	1.591	2.348	1.061	5
Contractor	4.455	6.576	2.970	14
Engineering Consultant	4.455	6.576	2.970	14
Management Consultant	2.227	3.288	1.485	7
Other	4.136	6.106	2.758	13
Project Manager	3.500	5.167	2.333	11
COLUMN TOTALS	21	31	14	66

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.636	0.004	0.781	0.785
Client	0.105	0.052	0.003	0.055
Contractor	0.475	0.308	0.000	0.309
Engineering Consultant	2.822	0.378	1.306	1.684
Management Consultant	0.023	0.154	0.158	0.313
Other	0.180	0.200	0.021	0.222
Project Manager	1.786	0.134	1.190	1.325
				4.692

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(3-1)

5*2

10

$$\chi 2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_o is **ACCEPTED**

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00

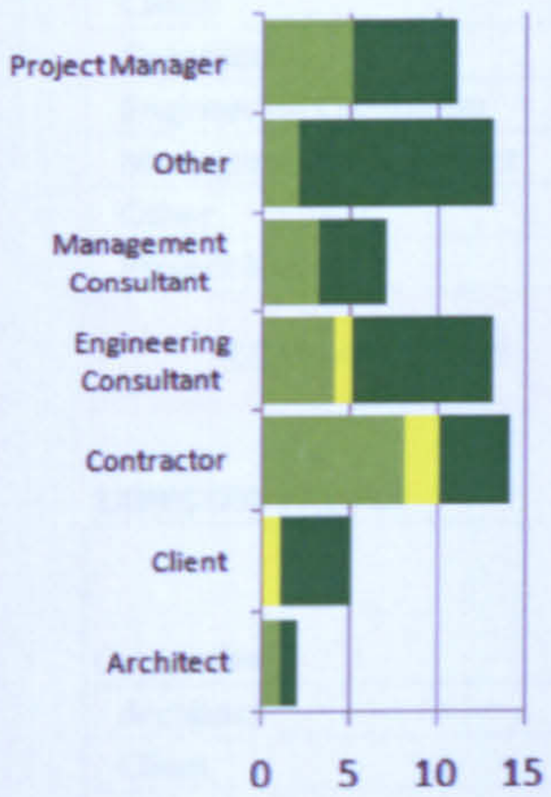
Interpretation

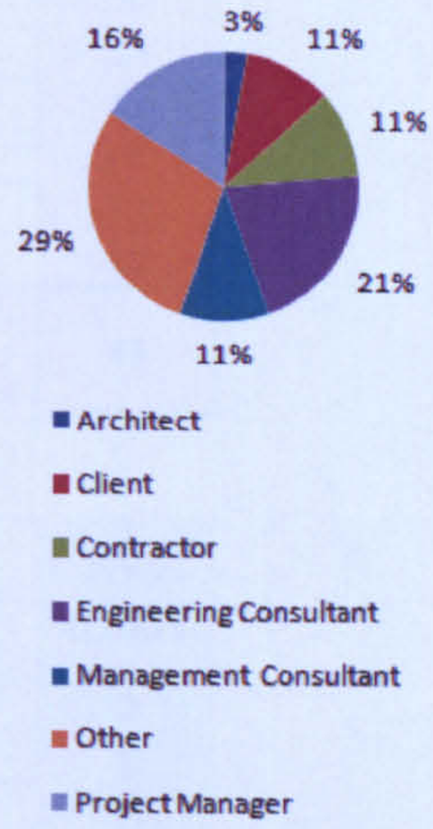
Contractors agreed more (11% of the 44% response rate) to the fact that managing client expectations was important. The reason for this could be due to the fact that in the entire supply chain of a typical project, the contractor is seen as the last link to the realisation of the final product. The client will be able to be the tangible result of the effort out in by the entire team.

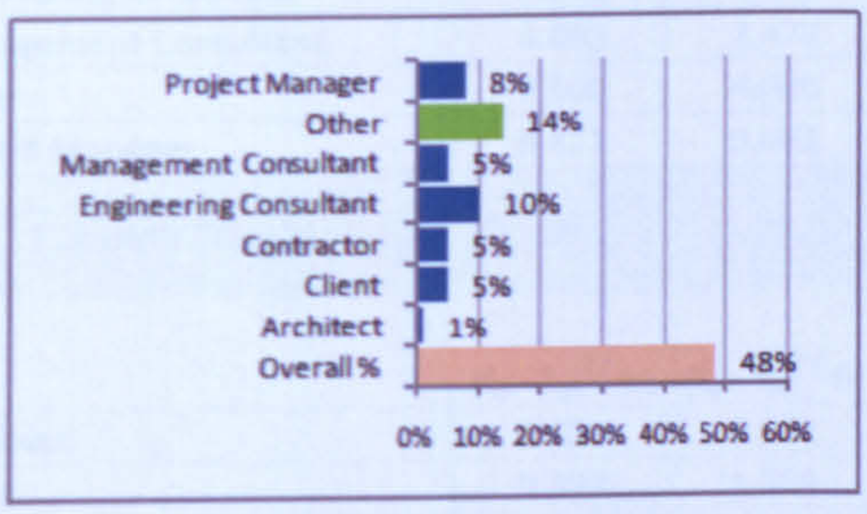
Contractors also like most professions rely on repeat business and in a competitive market place it is important for them, like any other profession, to manage client expectations.

Question 13 e

#Managing the clients expectations Row Labels	Column Labels Agree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect	1		1	2
Client		1	4	5
Contractor	8	2	4	14
Engineering Consultant	4	1	8	13
Management Consultant	3		4	7
Other	2		11	13
Project Manager	5		6	11
Grand Total	**23**	**4**	**38**	**65**







"48% of respondents agree that there must be the right balance between process and administration. Other (14%) represents the largest group from this sample (n=65)."

Figure 7-28 Detailed analysis of Question 13e

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 13e

H_o *It is NOT important to have the right balance between process and administration*

H_1 It is important to have the right balance between process and administration

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	1	1	0	2
Client	4	0	1	5
Contractor	4	8	2	14
Engineering Consultant	8	4	1	13
Management Consultant	4	3	0	7
Other	11	2	0	13
Project Manager	6	5	0	11
COLUMN TOTALS	38	23	4	65

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree or Disagree	ROW TOTALS
Architect	1.169	0.708	0.123	2
Client	2.923	1.769	0.308	5
Contractor	8.185	4.954	0.862	14
Engineering Consultant	7.600	4.600	0.800	13
Management Consultant	4.092	2.477	0.431	7
Other	7.600	4.600	0.800	13
Project Manager	6.431	3.892	0.677	11
COLUMN TOTALS	38	23	4	65

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.024	0.121	0.123	0.244
Client	0.397	1.769	1.558	3.327
Contractor	2.140	1.873	1.504	3.377
Engineering Consultant	0.021	0.078	0.050	0.128
Management Consultant	0.002	0.110	0.431	0.541
Other	1.521	1.470	0.800	2.270
Project Manager	0.029	0.315	0.677	0.992
				10.879

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(3-1)

5*2

10

$$\chi 2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_o is **ACCEPTED**

Interpretation

The 'Other' group agreed more (14% of the 48% overall response rate) to the need to have the right balance between process and its administration. The members of the 'Other' group are property developers and major client organisations like BAA.

Question 14

What do you consider to be the most common symptoms of project failure?

Question type

Multiple statements presented / multiple selections made by the respondent.

Results

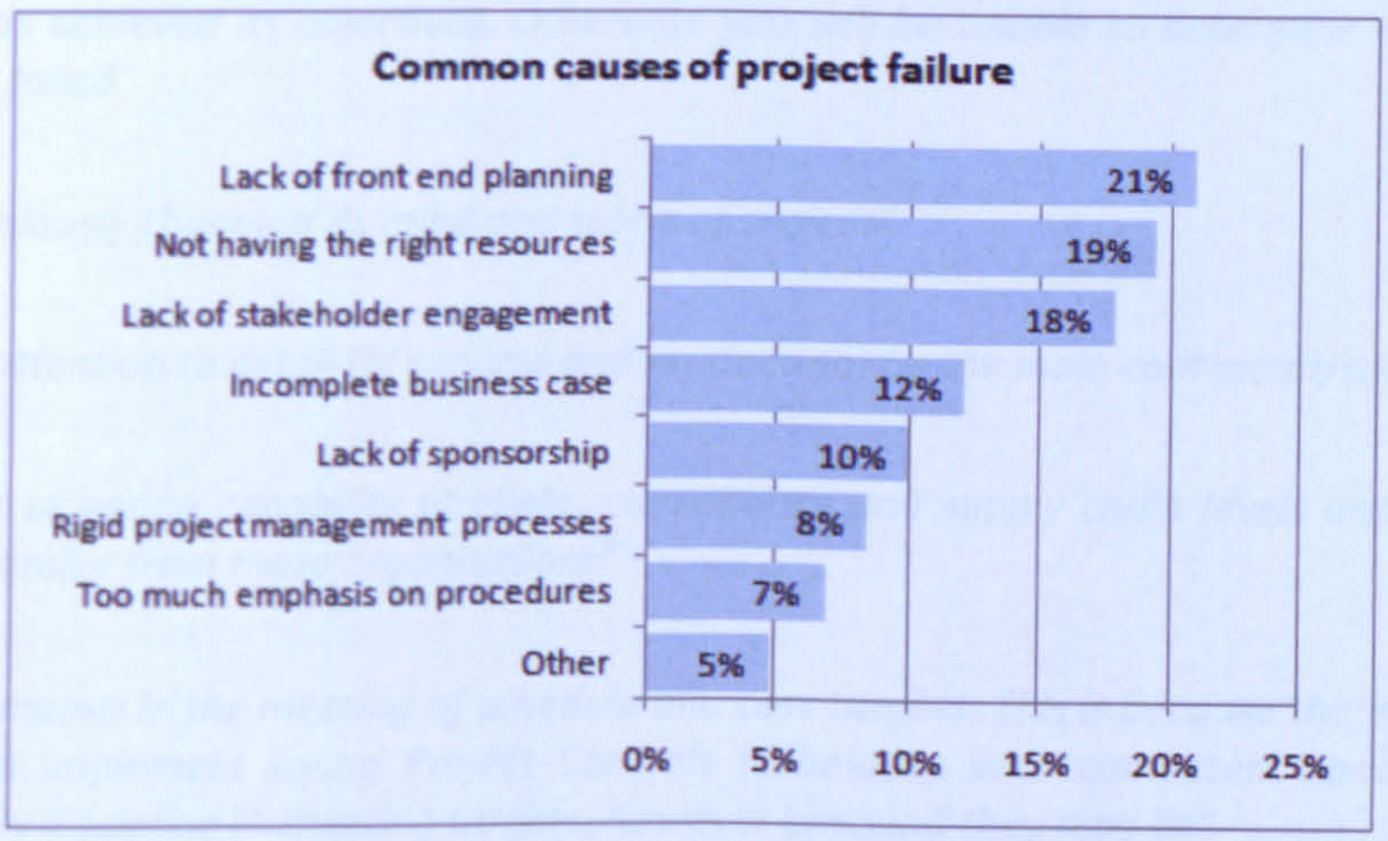


Figure 7-29 Question 14, Questionnaire Survey results

Analysis

21% of responses are recorded against the 'lack of front end planning'. Respondents see this as the major cause of project failure.

Of the responses recorded against the 'other' category, the following are a breakdown of the comments received:

"Too much change within projects, bad management of Risk & Contingency"

"Time constraints and limited opportunity for works projects"

"External factors"

"Need for strong leadership/champion"

"Funding Constraints - Rigid yearly Profiling of Cash Spend"

"Individuals within the team which have different goals. Misalignment between corporate and project goals"

"Failure to appreciate and make appropriate allowance for uncertainties!"

"Having enough time at the front end to consider appropriate structure and selection of teams and team members"

"Clients with unrealistic expectations or with inexperience of procurement process"

In our organisation the project does not go ahead without a business case so that is not a cause of failure. However, a project should not go ahead without a mechanism (agreed up front) to measure whether it has achieved its objectives. Otherwise you will be unable to determine whether it has succeeded or failed"

"Client continuously changing its mind and scope of project"

"Insufficient attention to detail (of process and production) by the main contractor/subcontractors"

"Engagement of wrong capability at client, consultancy and supply chain levels and lack of 'real' knowledge transfer from these organisations"

"Projects fail mainly in the meeting of schedule and cost targets. This is because there is a failure to recognise and implement sound Project Controls techniques with competent specialists, and a failure to apply discipline to meeting targets, however unsound they may be"

"The answer depends on the country"

"Supply Chain Failure"

Comparison of results with OGC's common causes of project failure

We have also assessed the results from this question and tried to show the equivalence to the common causes of project failure described by the UK's Office of Government Commerce (OGC). The results are shown in table 6

Survey criteria	%	OGC common causes of project failure
Lack of front end planning	21%	(5)
Not having the right resources	19%	
Lack of stakeholder engagement	18%	(3)
Incomplete business case	12%	(6)
Lack of sponsorship	10%	(2)
Rigid project management processes	8%	(4)
Too much emphasis on following procedures	7%	
Other	5%	

OGC common causes of project failure

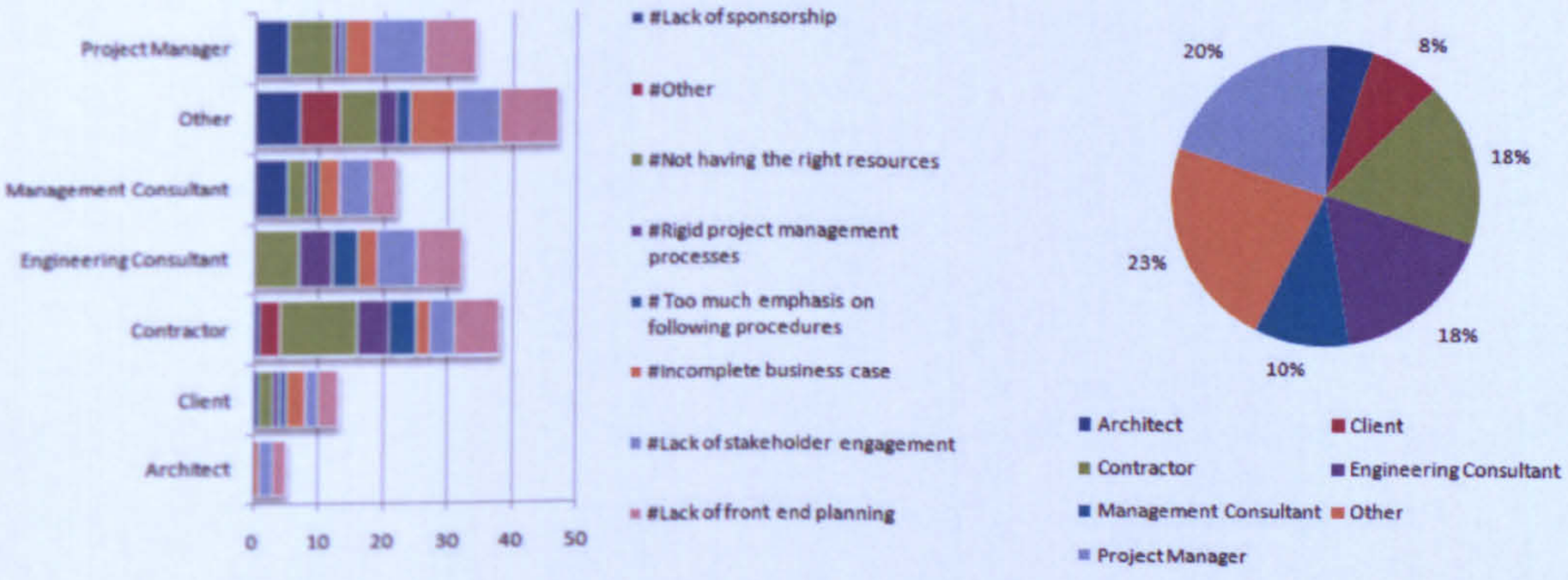
(1)	Lack of clear links between the project and the organisation's key strategic priorities,including agreed measures of success.
(2)	Lack of clear senior management and Ministerial ownership and leadership.
(3)	Lack of effective engagement with stakeholders.
(4)	Lack of skills and proven approach to project management and risk management.
(5)	Too little attention to breaking development and implementation into manageable steps.
(6)	Evaluation of proposals driven by initial price rather than long-term value for money (especially securing delivery of business benefits).
(7)	Lack of understanding of, and contact with the supply industry at senior levels in the organisation.
(8)	Lack of effective project team integration between clients, the supplier team and the supply chain.

Table 7-2 Assessing survey results against OGC's common causes of project failure

KPMG also carried out a survey amongst 140 construction and engineering organisations worldwide (KPMG 2010). In one of their survey questions they also asked respondents what was the major cause of underperformance and the majority of responses (80%) indicated poor planning / bidding / estimating as the main cause.

Whilst this survey was slightly different, it correlates with the findings of this survey as well.

Row Labels	Values #Lack of sponsorship	#Other	#Not having the right resources	#Rigid project management processes	# Too much emphasis on following procedures	#Incomplete business case	#Lack of stakeholder engagement	#Lack of front end planning
Architect	0	0	0	0	0	1	2	2
Client	1	0	2	1	1	3	2	3
Contractor	1	3	12	5	4	2	4	7
Engineering Consultant	0	0	7	5	4	3	6	7
Management Consultant	5	0	3	1	1	3	5	4
Other	7	6	6	3	2	7	7	9
Project Manager	5	0	7	1	1	4	8	8
Grand Total	**19**	**9**	**37**	**16**	**13**	**23**	**34**	**40**



"21% of scores indicated that respondents believe that lack of front end planning is the cause of project failure. Other (5%) represents the largest group from this sample (n=70)."

Figure 7-30 Detailed analysis of Question 14

Interpretation

The 'Other' group agreed more (5% of the 21% recorded scores) that lack of front end planning was seen the most common cause of project failure.

Question 15

In general, what are the main reasons why organisations follow a project management process?

Question type

Multiple statements presented / multiple selections made by the respondent.

Results

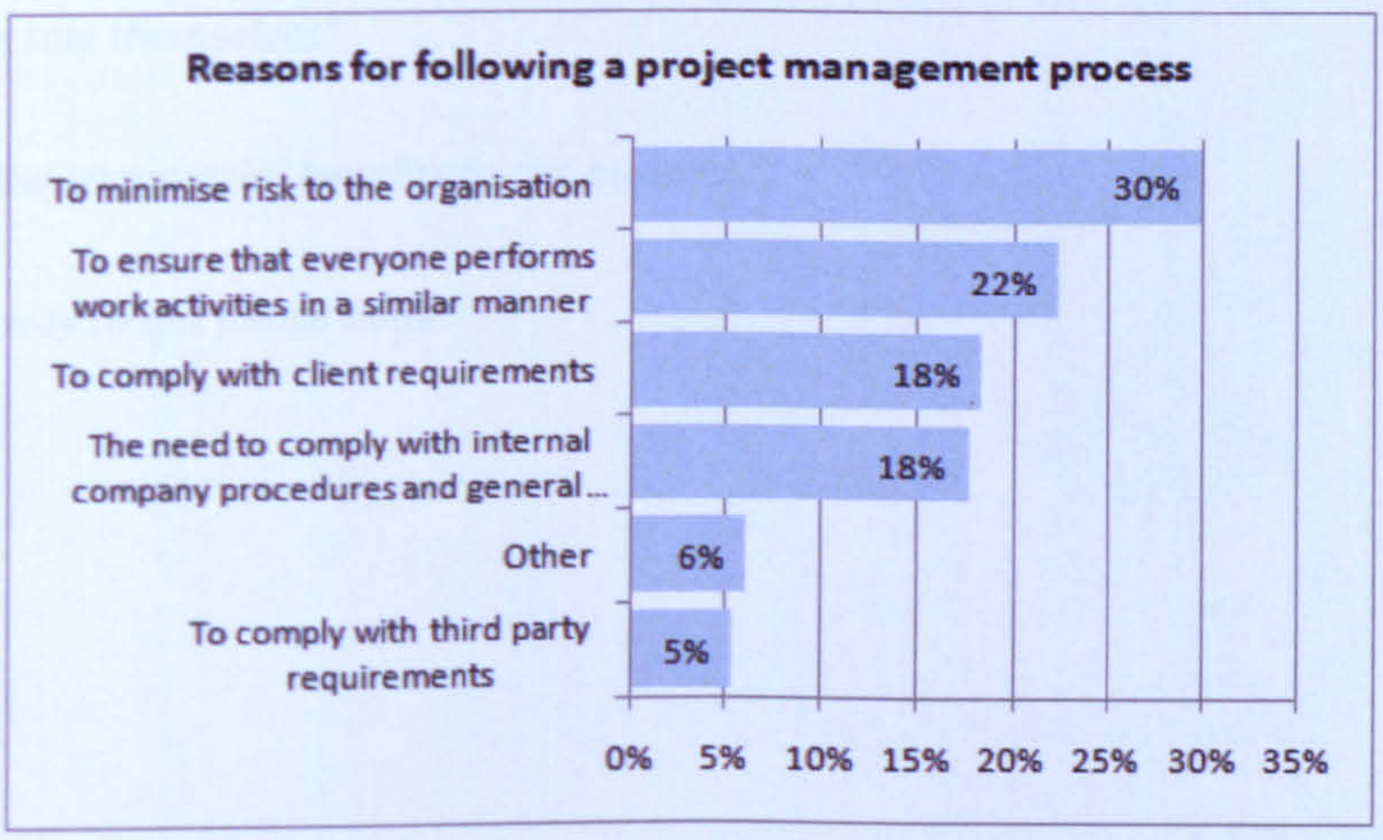


Figure 7-31 Question 15, Questionnaire Survey results

Analysis

When respondents were asked, "what is the main reason for following a project management process?" 30% of responses are recorded against 'to minimise risk to the organisation'.

6% of responses are recorded against 'other' and the breakdown of comments received under this category is as follows:

"To ensure that we adopt best practice"

"Because by doing so we are more likely to deliver the project objectives successfully"

"To keep the Supply Chain informed on Company Process / Procedures - Key and Strategic Suppliers"

"To provide best value propositions to Clients"

"To enable information/ data to be collated and aggregated consistently"

"To meet the many obligations and satisfy all the client and project needs and drivers whilst protecting the business issues - technical and commercial, financial, etc"

"To have framework that should increase the opportunity of achieving a successful project"

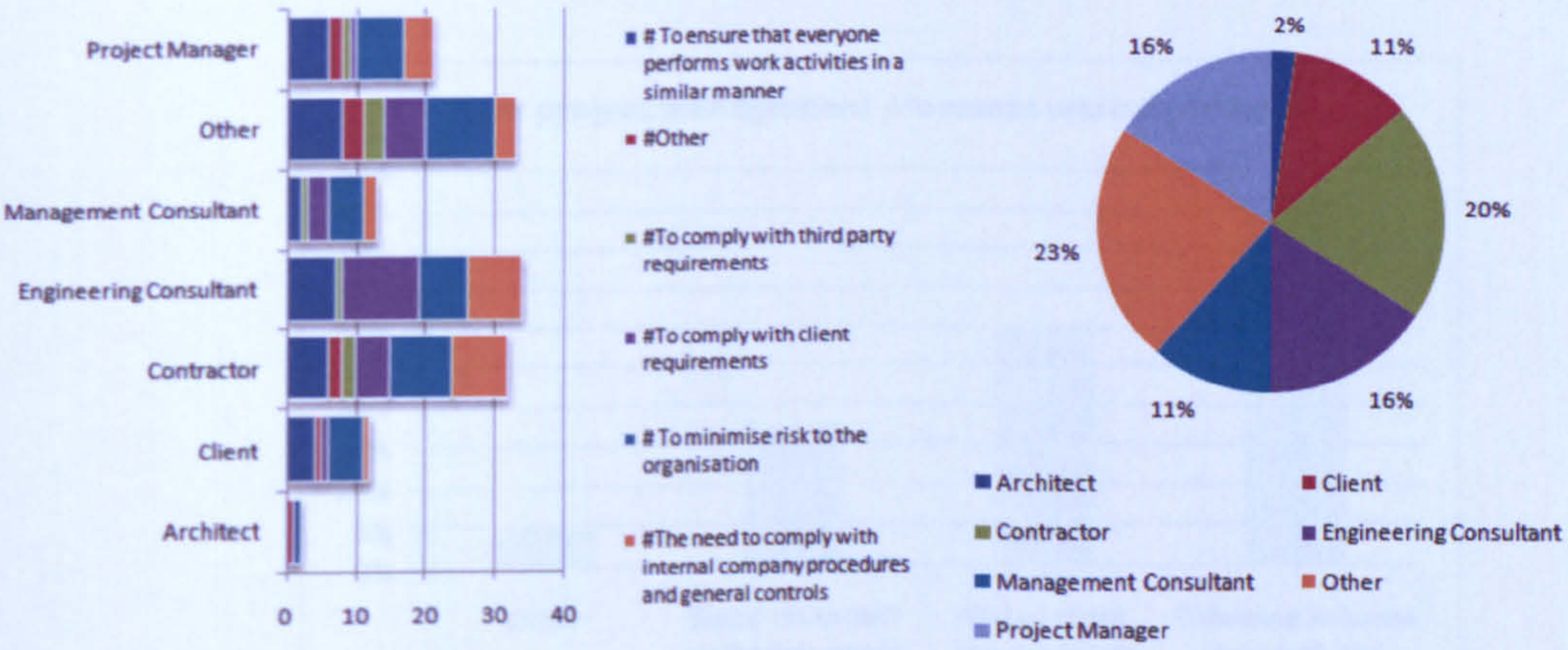
"Often organisations follow process for the right reasons but people follow them for the wrong reasons"

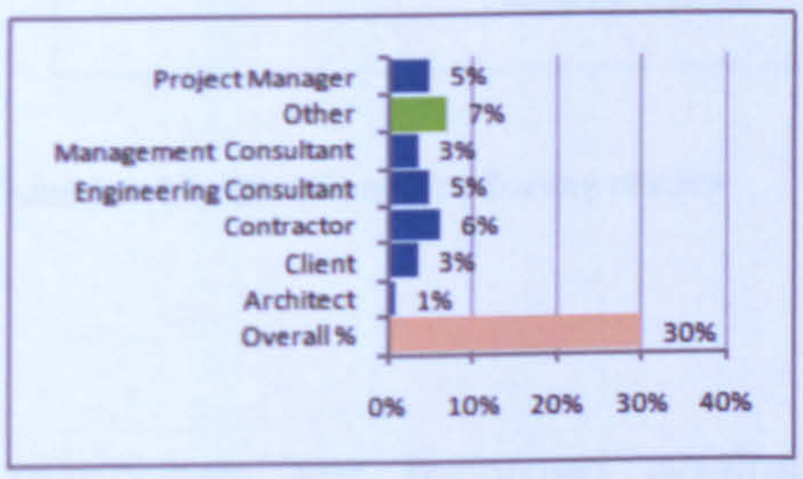
"I don't quite understand the question. Organisations generally follow the project management process because the project is complex and they don't have the necessary in house skills to undertake this role themselves"

"To optimise the commercial benefits to the business"

"It is the best way to get things done"

Row Labels	Values # To ensure that everyone performs work activities in a similar manner	#Other	#To comply with third party requirements	#To comply with client requirements	# To minimise risk to the organisation	#The need to comply with internal company procedures and general controls
Architect	0	1	0	0	1	0
Client	4	1	0	1	5	1
Contractor	6	2	2	5	9	8
Engineering Consultant	7	0	1	11	7	8
Management Consultant	2	0	1	3	5	2
Other	8	3	3	6	10	3
Project Manager	6	2	1	1	7	4
Grand Total	**33**	**9**	**8**	**27**	**44**	**26**





"30% of scores indicate that respondents use process to minimise risk to their organisation. Other (7%) represents the largest group from this sample (n=70)."

Figure 7-32 Detailed analysis of Question 15

Interpretation

On further analysis and assessment of the highest score, the 'Other' group agreed more (7% of the 30% recorded score) that process was used to minimise risk to the organisation.

Question 16

In terms of your organisation, how were your project management processes and procedures originally developed?

Question type

Multiple statements presented / multiple selections made by the respondent.

Results

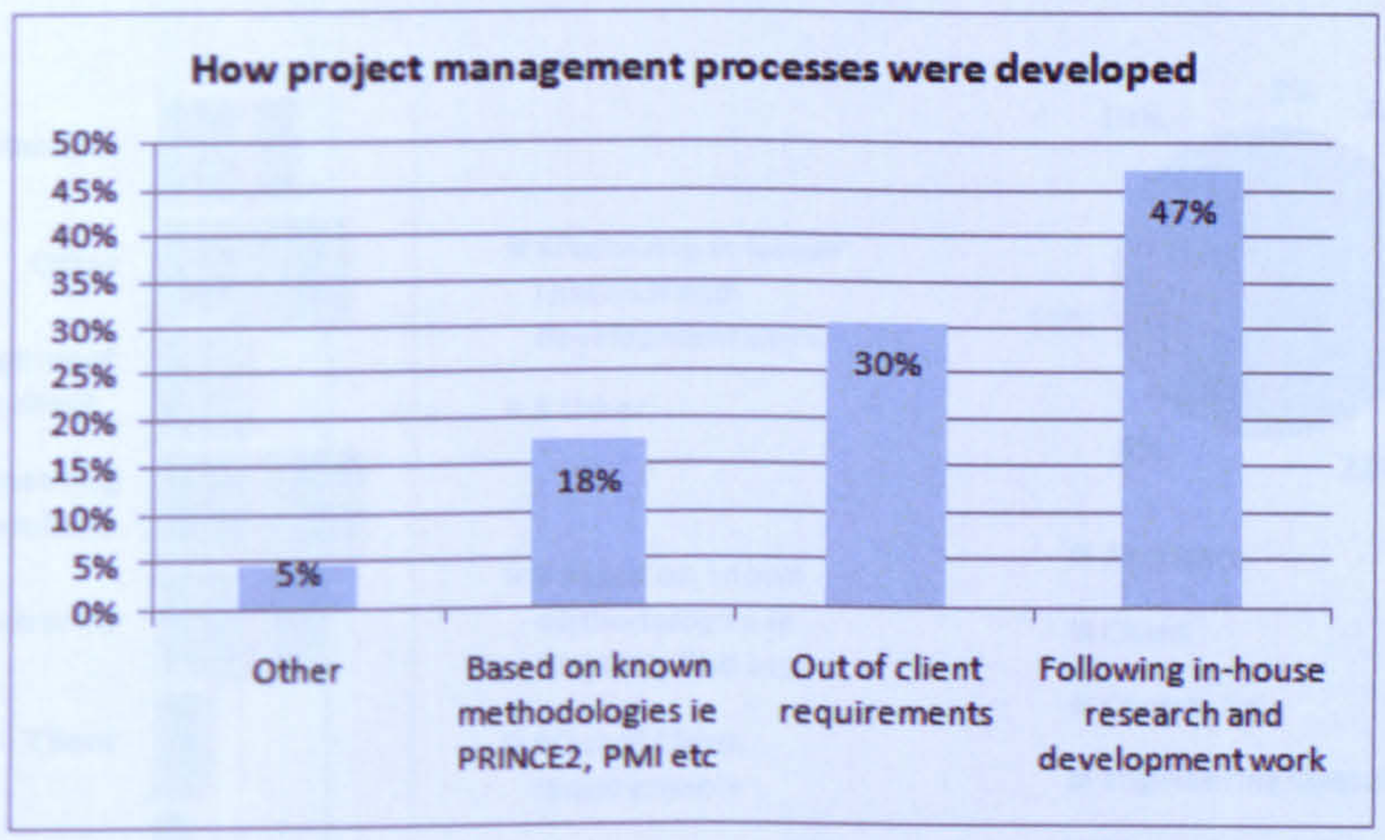


Figure 7-33 Question 16, Questionnaire Survey results

Analysis

47% of responses are recorded against 'following in-house research and development work' category. The breakdown of the 'other' category is as follows:

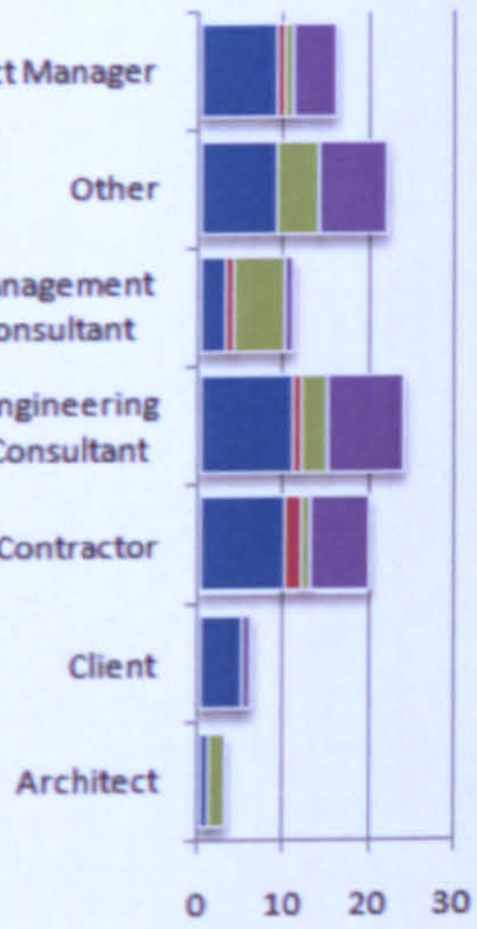
"We provide a client advisory role"

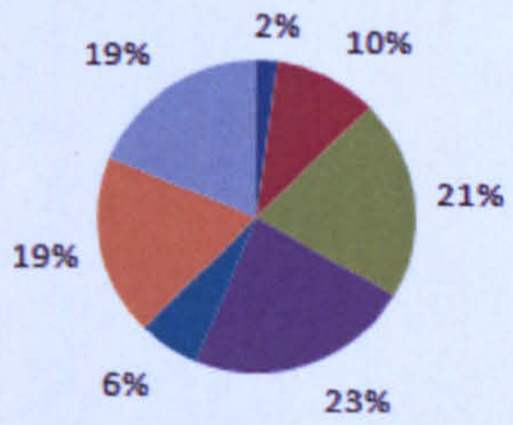
"Involvement with External Consultants"

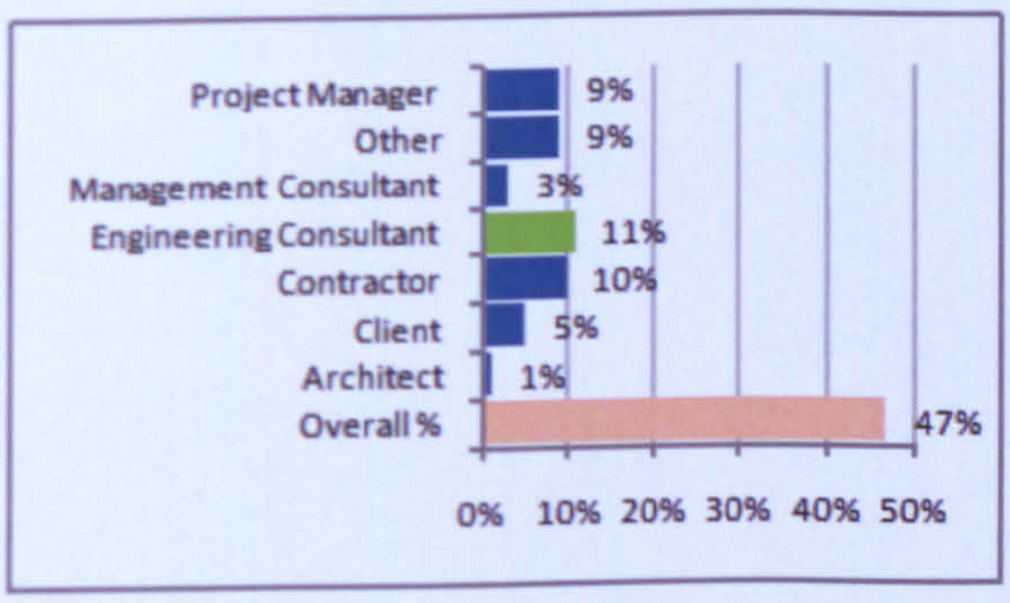
"By the company Principal through years of experience"

"normally after a process of trial and error"

Row Labels	Values #Following in-house research and development work	# Other	# Based on known methodologies ie PRINCE2, PMI etc	#Out of client requirements
Architect	1	0	2	0
Client	5	0	0	1
Contractor	10	2	1	7
Engineering Consultant	11	1	3	9
Management Consultant	3	1	6	1
Other	9	0	5	8
Project Manager	9	1	1	5
Grand Total	**48**	**5**	**18**	**31**







"47% of scores indicate that PM processes have been developed in-house. Engineering Consultant (11%) represents the largest groups from this sample (n=70)."

Figure 7-34 detailed analysis of Question 16

Interpretation

From figure 7-33, it can be seen that Engineering Consultant indicated (11% of the 47% score recorded) that their procedures and procedures were developed following in-house research and development work.

Question 17

Have you undertaken a project management maturity assessment of your organisation?

Question type

Multiple options presented / single selection made by the respondent.

Results

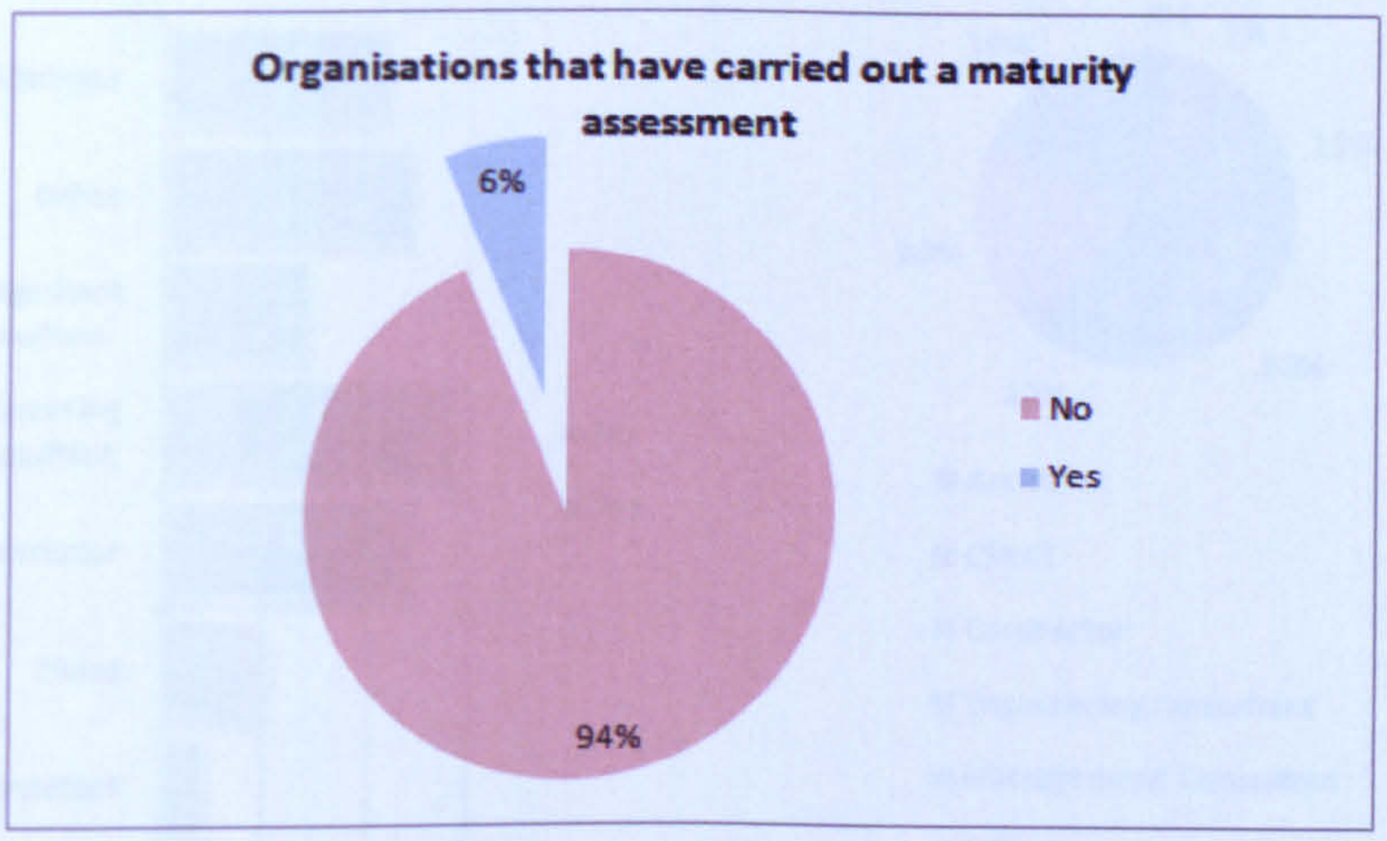
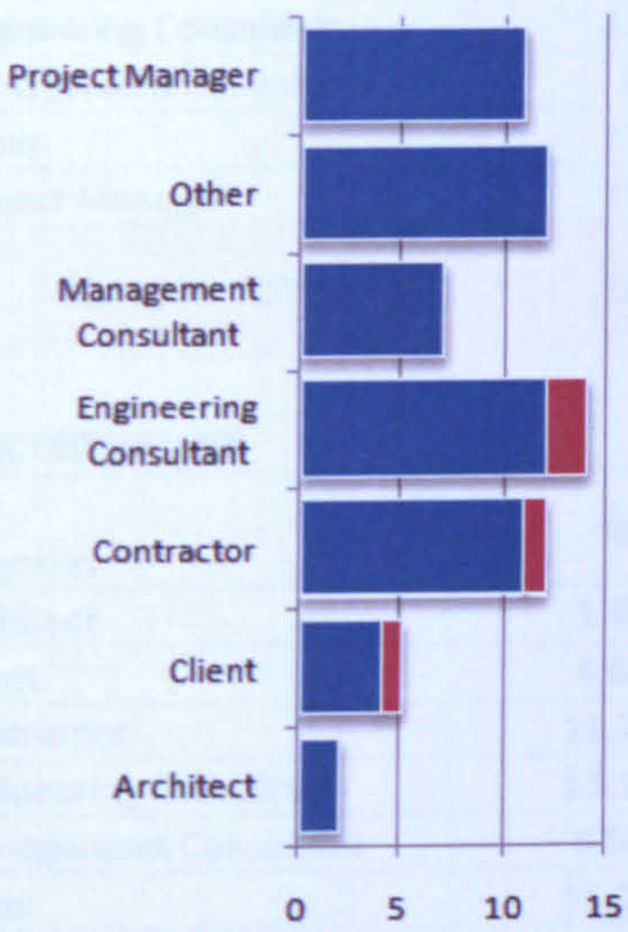


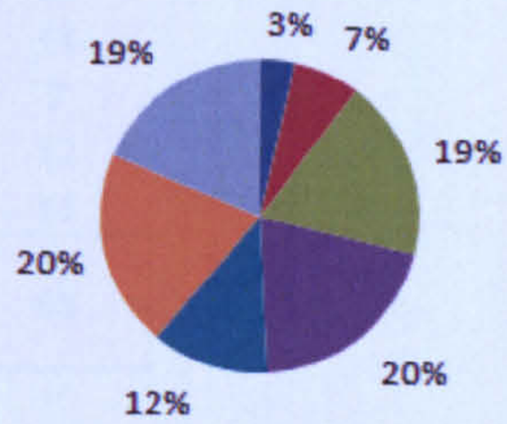
Figure 7-35 Question 17, Questionnaire Survey results

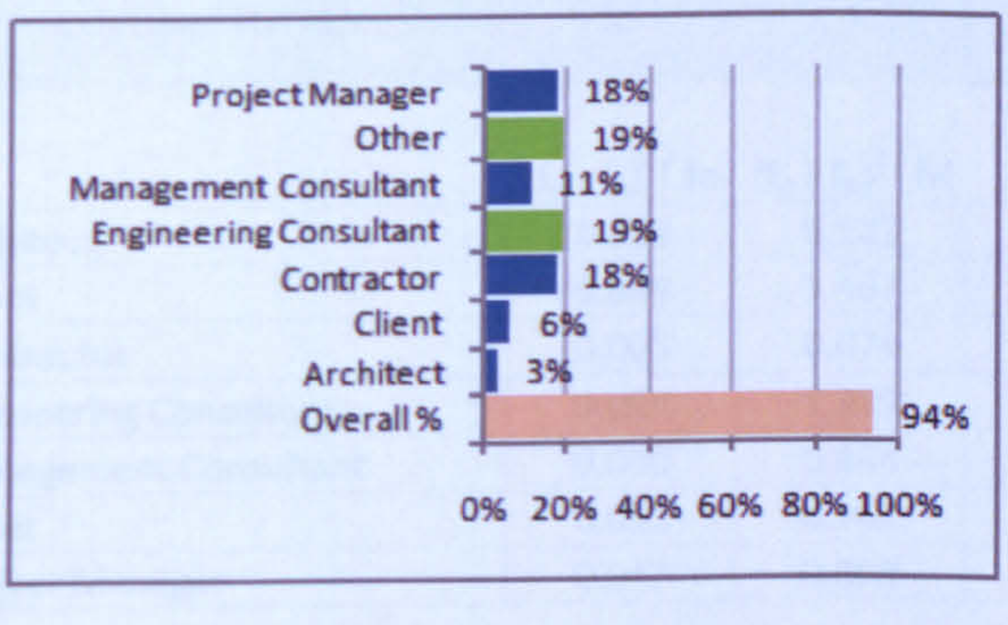
Analysis

Only 6% of respondents indicate that they have undertaken a project management maturity assessment of their capabilities.

#17.0 Have you undertaken a project management maturity assessment of your organisation? Row Labels	Column Labels No	Yes	Grand Total
Architect	2		2
Client	4	1	5
Contractor	11	1	12
Engineering Consultant	12	2	14
Management Consultant	7		7
Other	12		12
Project Manager	11		11
Grand Total	**59**	**4**	**63**







"94% of respondents indicate that they have NOT carried out a PM maturity assessment within their organisation. Engineering Consultant (19%) and Other (19%) represents the largest groups from this sample (n=63)."

Figure 7-36 Detailed analysis of Question 17

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 17

H_o *Not all organisations undertake a PM maturity assessment*

H_1 All organisations do undetake a PM maturity assessment

OBSERVED VALUES

Categories	No	Yes	ROW TOTALS
Architect	2	0	2
Client	4	1	5
Contractor	11	1	12
Engineering Consultant	12	2	14
Management Consultant	7	0	7
Other	12	0	12
Project Manager	11	0	11
COLUMN TOTALS	59	4	63

EXPECTED VALUES

Categories	No	Yes	ROW TOTALS
Architect	1.873	0.127	2
Client	4.683	0.317	5
Contractor	11.238	0.762	12
Engineering Consultant	13.111	0.889	14
Management Consultant	6.556	0.444	7
Other	11.238	0.762	12
Project Manager	10.302	0.698	11
COLUMN TOTALS	59	4	63

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.009	0.127	0.136
Client	0.099	1.467	1.567
Contractor	0.005	0.074	0.079
Engineering Consultant	0.094	1.389	1.483
Management Consultant	0.030	0.444	0.475
Other	0.052	0.762	0.814
Project Manager	0.047	0.698	0.746
			5.299

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(2-1)

5*1

5

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_o is **ACCEPTED**

Interpretation

Whilst the majority of respondents did not carry out a project management maturity assessment of their organisation, the Engineering Consultant and 'Other' group indicated this more than other members in the group i.e. 19% of the overall 94% response rate.

The reason for this could be that Engineering Consultancies do not regard themselves as pure project management organisations and are engaged in projects merely as a project team member.

The 'Other' category belongs to large clients and property developers. Again these organisations could be seen to occupy a higher place in the supply chain and they are relying on other participants in the supply chain to deliver their projects.

Question 18

Which of the following project management ideology / methods are you familiar with?

Question type

Multiple options presented / multiple selections made by the respondent.

Results

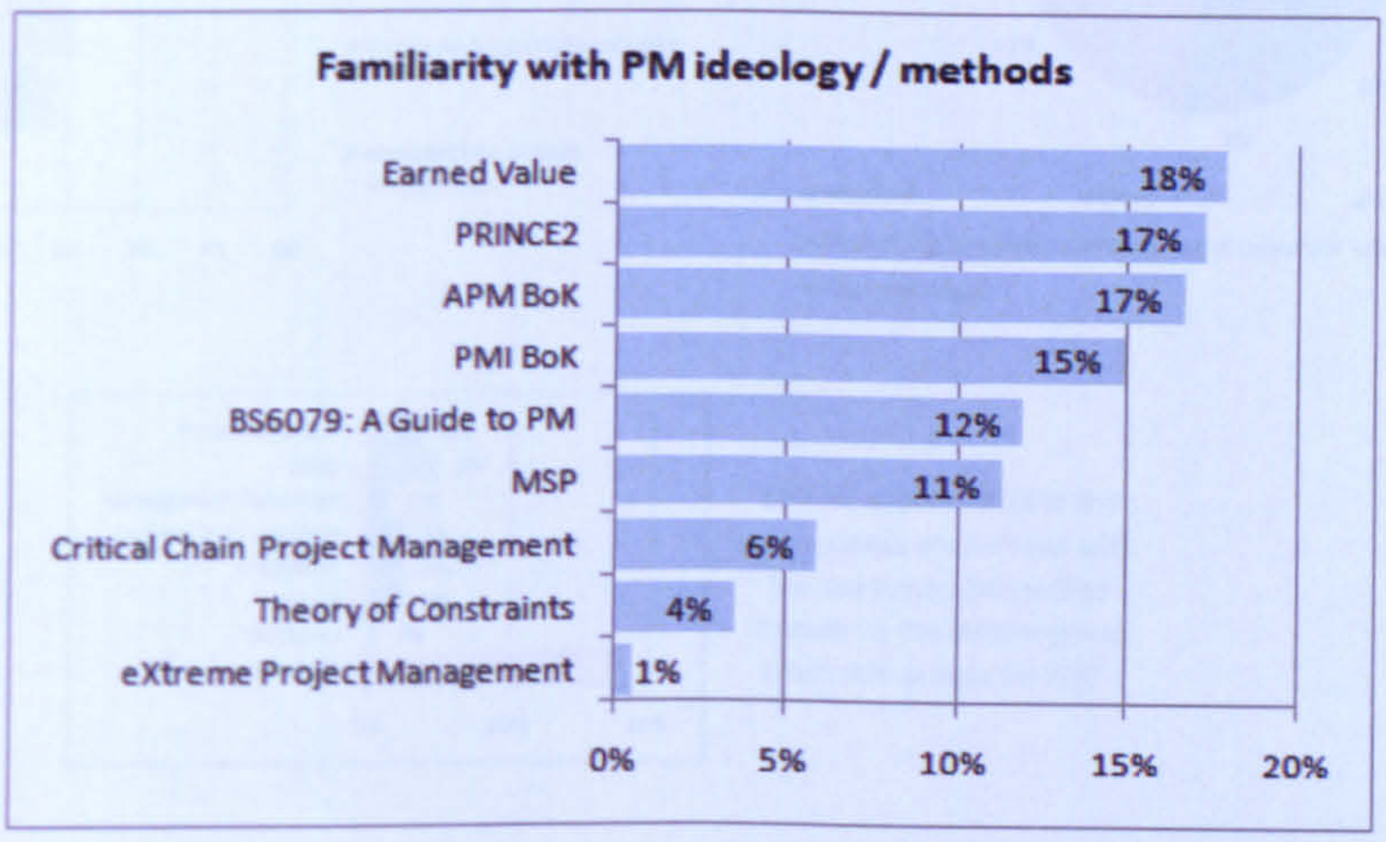


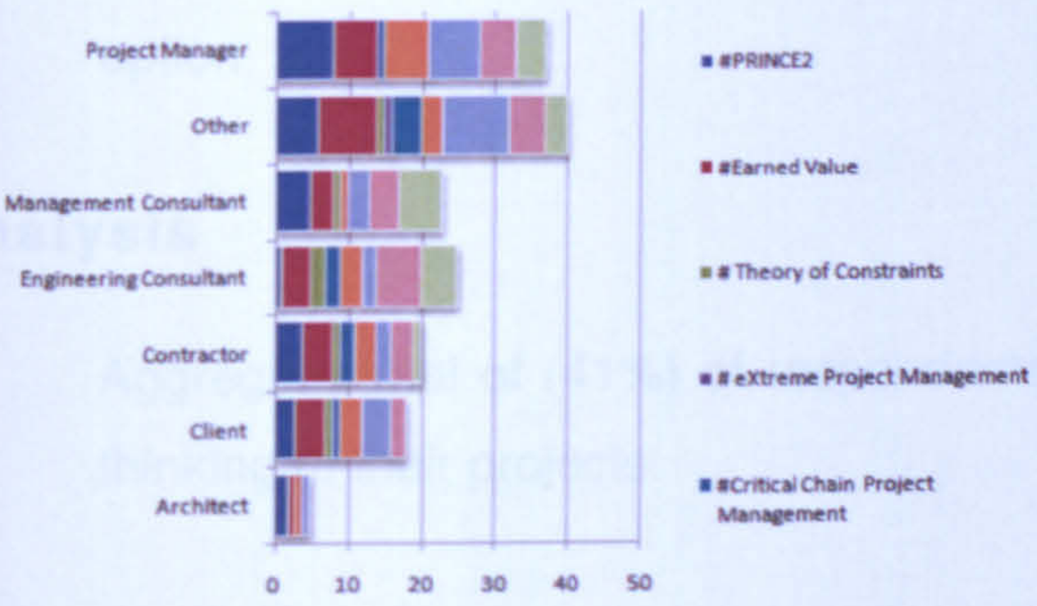
Figure 7-37 Question 18, Questionnaire Survey results

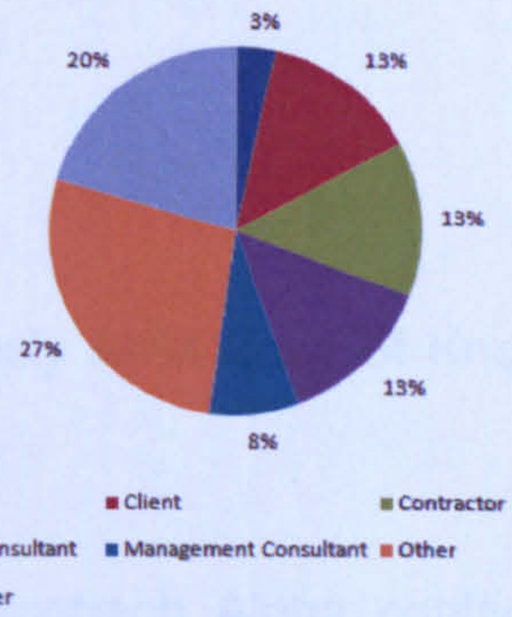
Analysis

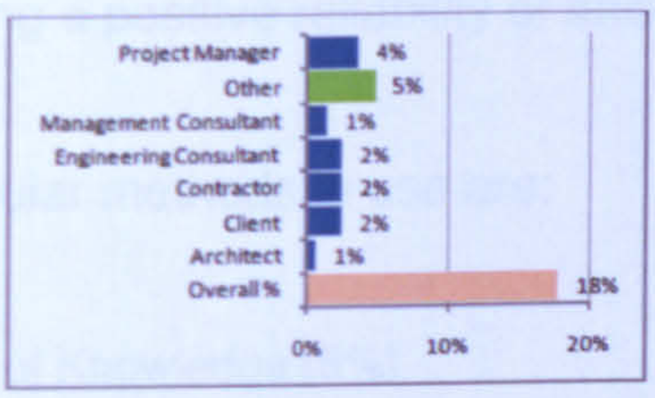
18% of responses were recorded against the use of Earned Value in comparison to Critical Chain Project management (6%), Theory of Constraints (4%) and eXtreme Project Management (1%).

Earned Value Management has been with the project management profession since its introduction in the 1960s. It is taught widely on most project management courses and most project managers are aware of it. This could be one of the possible reasons why Earned Value is showing a larger percentage than the other methods.

Row Labels	Values #PRINCE2	#Earned Value	# Theory of Constraints	# eXtreme Project Management	#Critical Chain Project Management	#British Standard 6079: A Guide to Project Management	#Association for Project Management, Body of Knowledge	#Project Management Institute, Body of Knowledge	#Managing Successful Programmes (MSP)
Architect	2	1	0	0	0	1	1	0	0
Client	3	4	1	0	1	3	4	2	0
Contractor	4	4	1	0	2	3	2	3	1
Engineering Consultant	1	4	2	0	2	3	2	6	5
Management Consultant	5	3	1	0	0	1	3	4	6
Other	6	8	1	1	4	3	9	5	3
Project Manager	8	6	0	0	1	6	7	5	4
Grand Total	**29**	**30**	**6**	**1**	**10**	**20**	**28**	**25**	**19**







"18% of scores indicate that respondents are familiar with Earned Value. Other (5%) represents the largest group from this sample (n=70)."

Figure 7-38 Detailed analysis of Question 18

Interpretation

The Other group indicated more familiarity with Earned Value i.e. 5% of the 18% scores recorded. Large organisations like BAA are very familiar with the use of Earned Value and are promoting its use throughout its project management supply chain.

Question 19

How often do you use the following?

Question type

Multiple options presented / Likert-type selection made by the respondent to each option

Analysis

Aggregate total of (41%) of respondents actually apply APM Body of Knowledge thinking to their projects.

The results from this questionnaire produced a Cronbach Alpha coefficient of 0.777 indicating a positive reliability of answers.

The most popular methods in use are:

- APM Body of Knowledge (8%)
- BS 6079: A Guide to Project Management (8%)
- Critical Chain Project Management (7%)
- Managing Successful Programmes (5%)
- PRINCE2 (5%)
- Theory of Constraints (3%)

Results

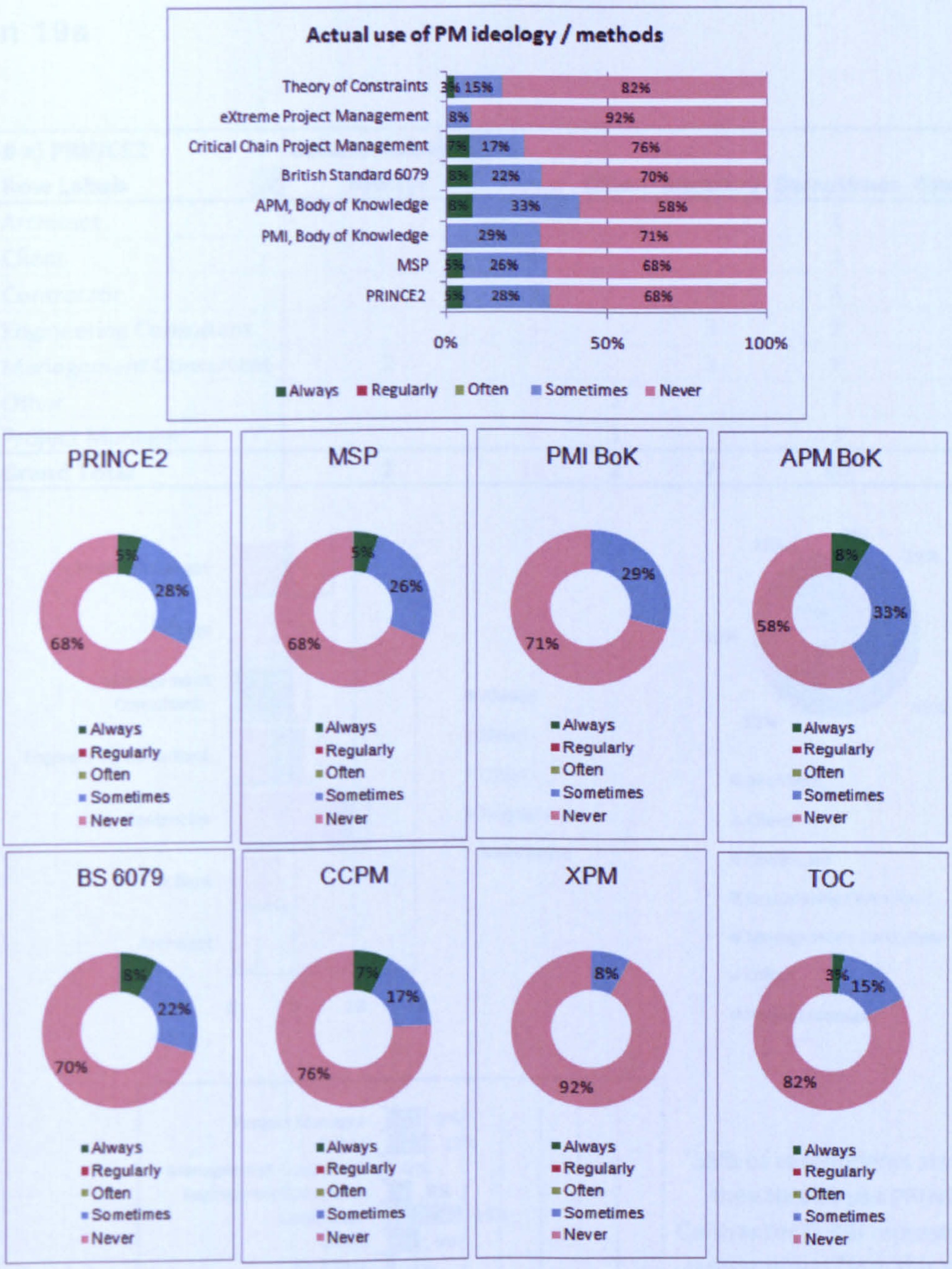
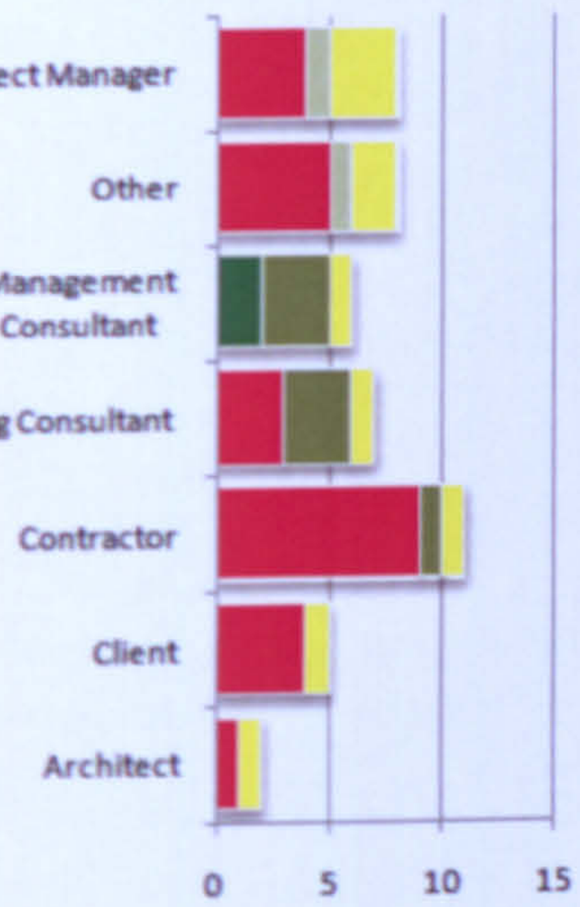
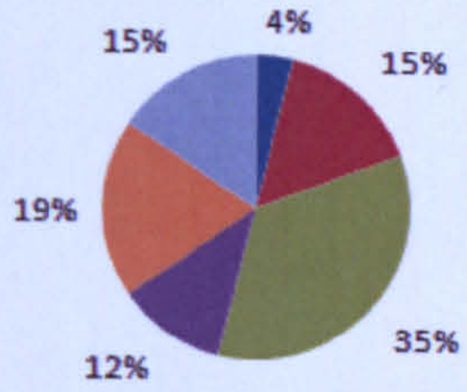


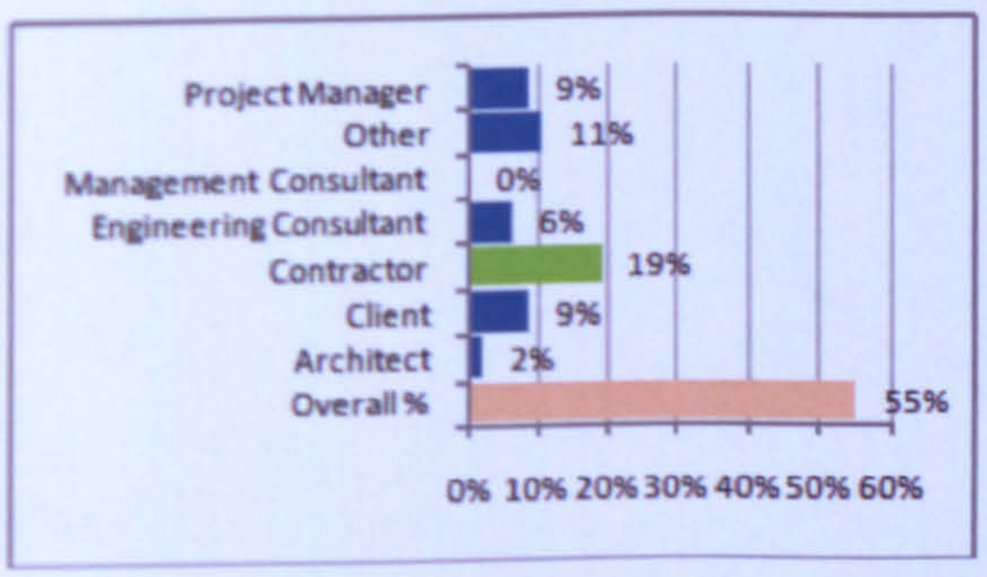
Figure 7-39 Question 19, Questionnaire Survey results

Question 19a

# a) PRINCE2	Column Labels					
Row Labels	Always	Never	Often	Regulary	Sometimes	Grand Total
Architect		1			1	2
Client		4			1	5
Contractor		9		1	1	11
Engineering Consultant		3		3	1	7
Management Consultant	2			3	1	6
Other		5	1		2	8
Project Manager		4	1		3	8
Grand Total	**2**	**26**	**2**	**7**	**10**	**47**







"55% of respondents state that they NEVER use PRINCE2. Contractor (19%) represents the largest group from this sample (n=47)."

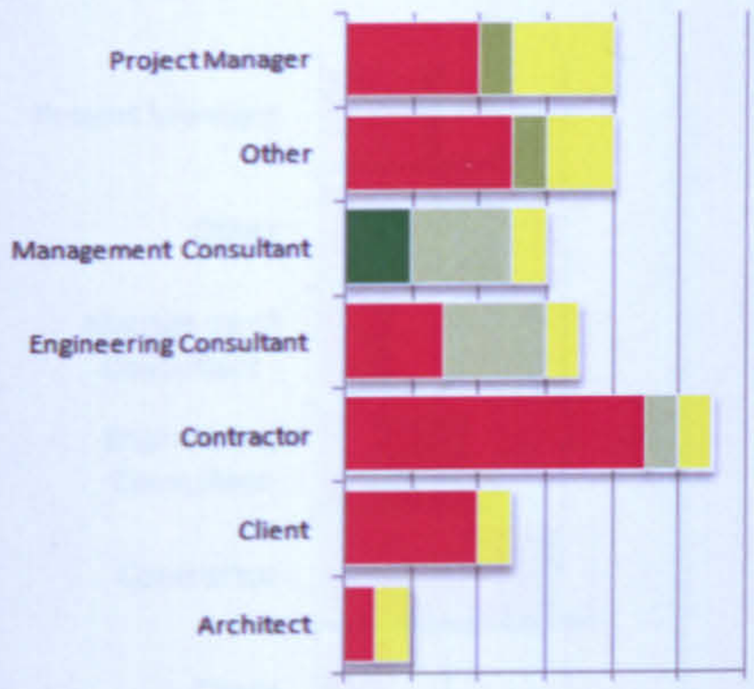
Figure 7-40 Detailed analysis of Question 19a

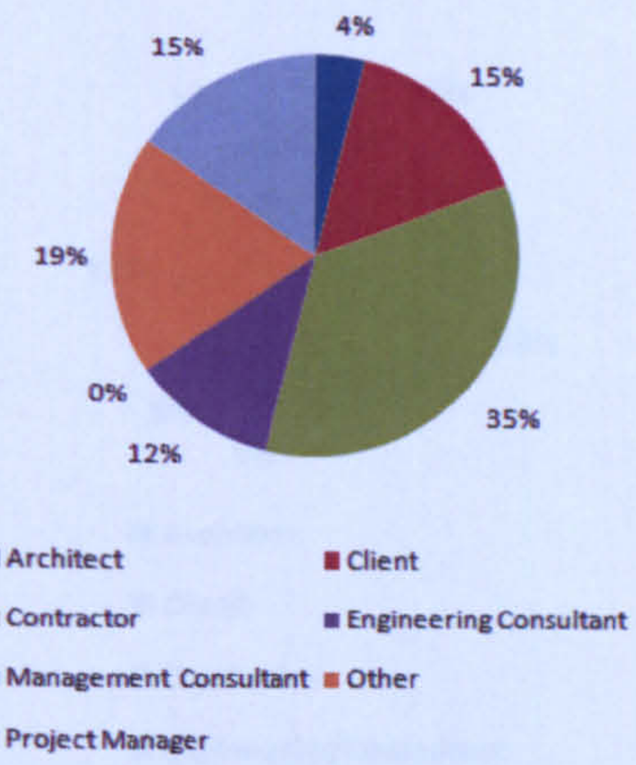
Interpretation

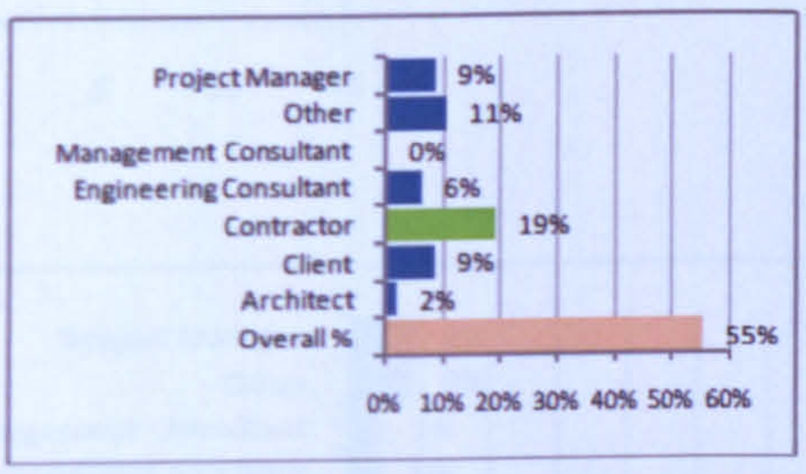
Contractors have indicated that they never use PRINCE2 i.e. 19% of the 55% score recorded. This is correct, as this methodology cannot be used without major modifications to suit the contracting business model.

Question 19b

# b) Managing Successful Programmes (MSP) Row Labels	Column Labels Always	Never	Often	Regulary	Sometimes	Grand Total
Architect		1			1	2
Client		4			1	5
Contractor		9		1	1	11
Engineering Consultant		3		3	1	7
Management Consultant	2			3	1	6
Other		5	1		2	8
Project Manager		4	1		3	8
Grand Total	**2**	**26**	**2**	**7**	**10**	**47**







"55% of respondents state that they NEVER use MSP. Contractor (19%) represents the largest group from this sample (n=47)."

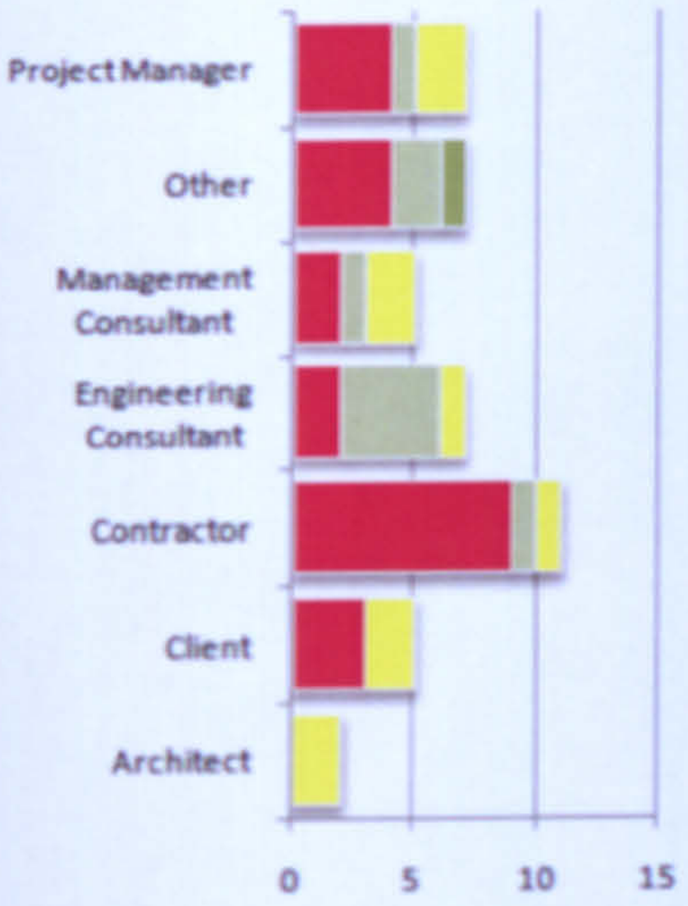
Figure 7-41 Detailed analysis of Question 19b

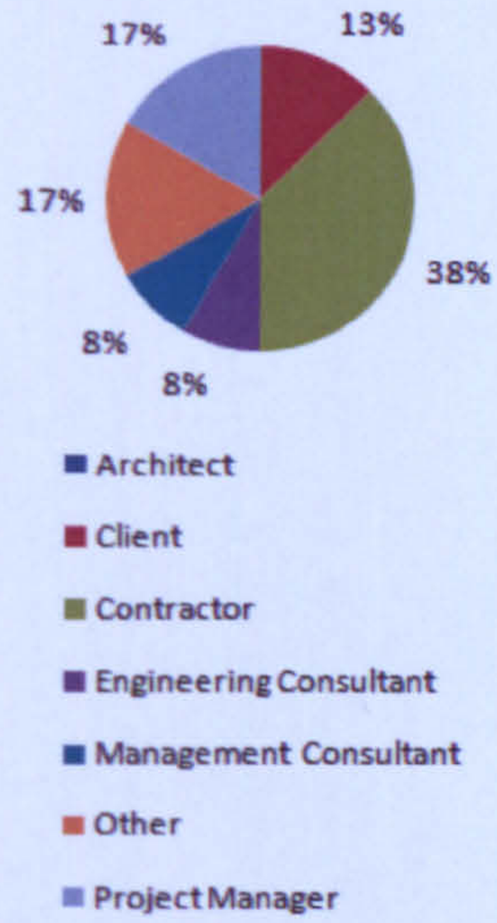
Interpretation

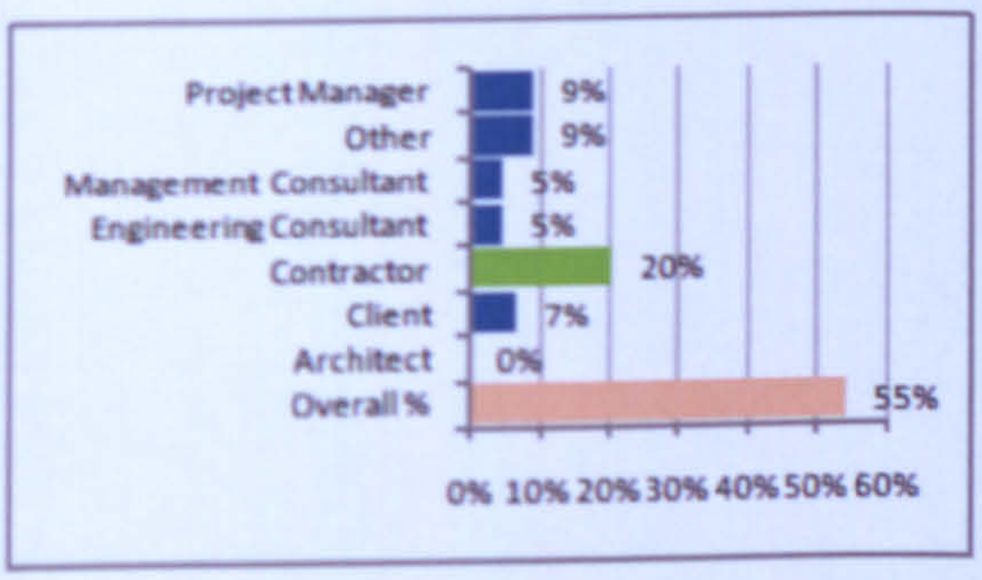
Contractors indicate that they never use Managing Successful Programmes (MSP) i.e. 19% of the 55% score recorded. Again this is a mere reflection of the business undertaken by contractors. MSP is mainly used as a strategic tool for shaping and forming programmes and is normally used at the higher end of the project management supply chain.

Question 19c

# c) Project Management Institute, Body of Knowledge Row Labels	Column Labels Never	Often	Regulary	Sometimes	Grand Total
Architect				2	2
Client	3			2	5
Contractor	9	1		1	11
Engineering Consultant	2	4		1	7
Management Consultant	2	1		2	5
Other	4	2	1		7
Project Manager	4	1		2	7
Grand Total	**24**	**9**	**1**	**10**	**44**







"55% of respondents state they NEVER use PMI BoK. Contractor (20%) represents the largest groups from this sample (n=44)."

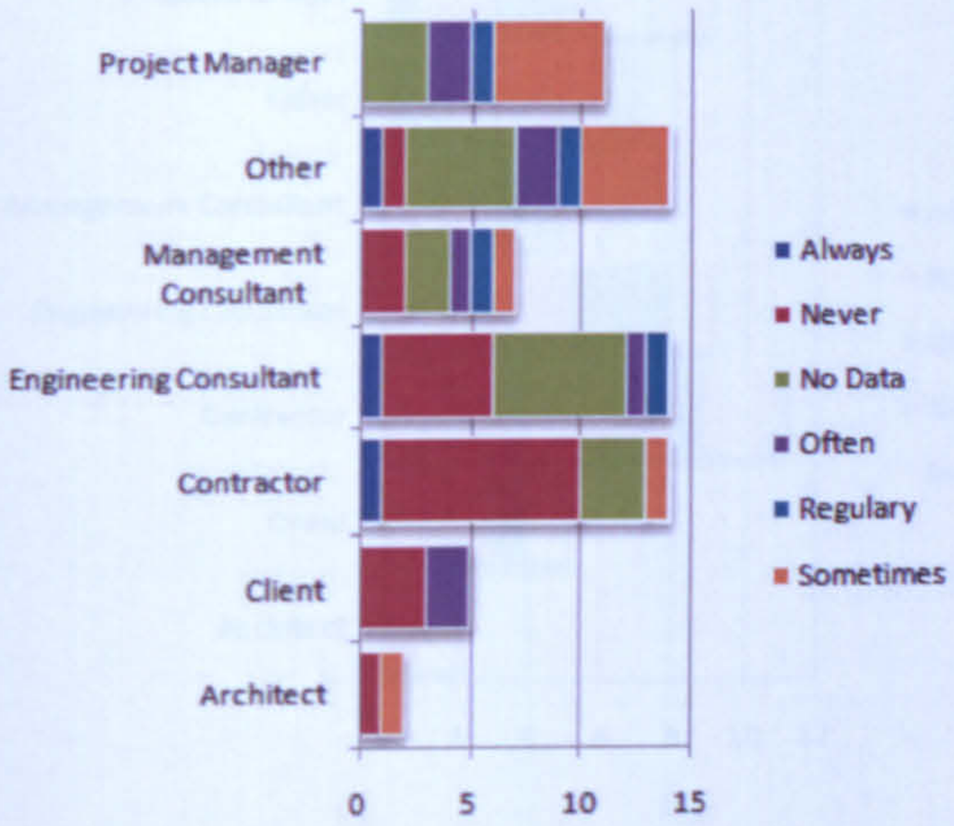
Figure 7-42 Detailed analysis of Question 19c

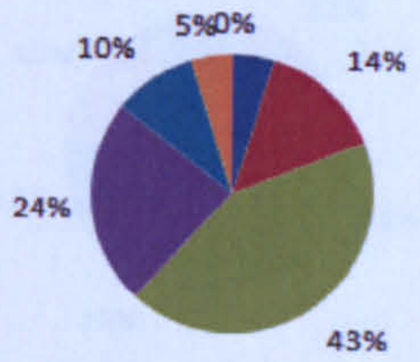
Interpretation

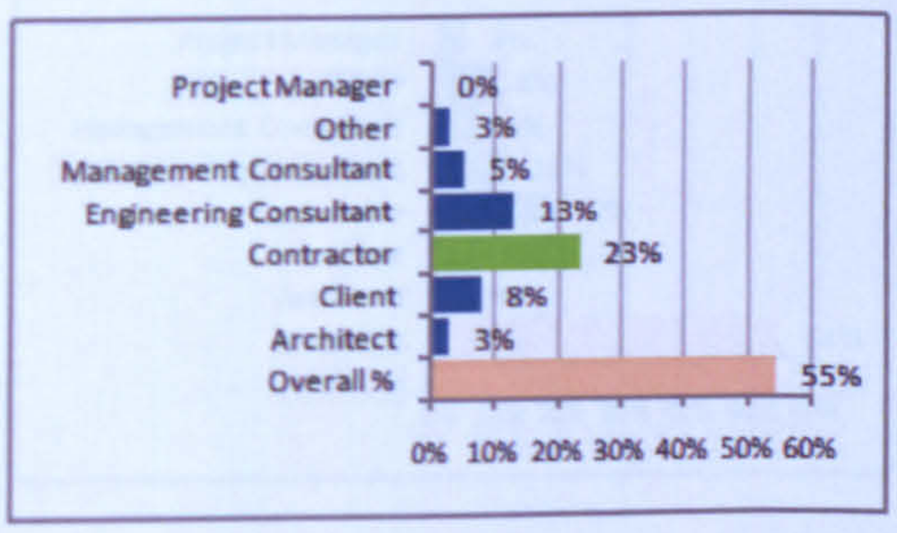
Contractors indicate that they never use the Project Management Institute Body of Knowledge (PMIBoK) i.e. 20% of the 55% score recorded. This again merely reflects the nature of construction work particularly at the contracting end, where the main focus and drive is on project delivery to cost and schedule whilst maintaining a healthy profit.

Question 19d

#d) Association for Project Management, Body of Knowledge Row Labels	Column Labels Always	Never	No Data	Often	Regulary	Sometimes	Grand Total
Architect		1				1	2
Client		3		2			5
Contractor	1	9	3			1	14
Engineering Consultant	1	5	6	1	1		14
Management Consultant		2	2	1	1	1	7
Other	1	1	5	2	1	4	14
Project Manager			3	2	1	5	11
Grand Total	**3**	**21**	**19**	**8**	**4**	**12**	**67**







"55% of respondents state that they NEVER use APM BoK. Contractor (23%) represents the largest groups from this sample (n=67)."

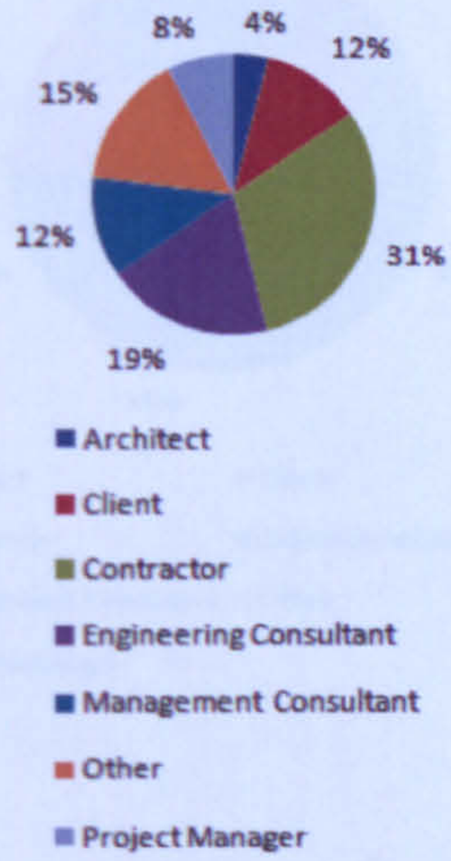
Figure 7-43 Detailed analysis of Question 19d

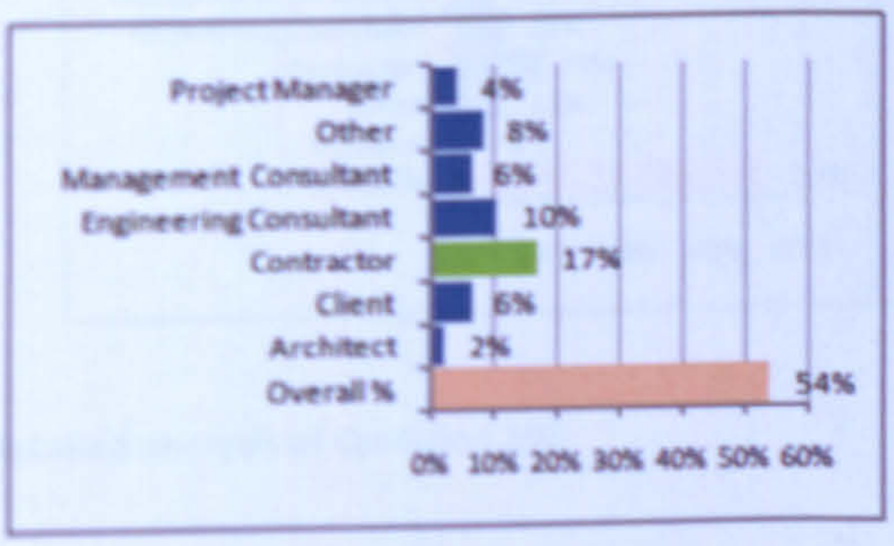
Interpretation

Contractors do not particularly follow the Association for Project Management Body of Knowledge (APMBoK) i.e. 23% of the recorded 55% score. As they are mainly delivery focused.

Question 19e

# e) British Standard 6079, A Guide to Project Management Row Labels	Column Labels Always	Never	Often	Regulary	Sometimes	Grand Total
Architect		1			1	2
Client		3	1		1	5
Contractor		8		1	2	11
Engineering Consultant		5	1	2	1	9
Management Consultant		3	1	1		5
Other	2	4		1		7
Project Manager	1	2	2	1	3	9
Grand Total	**3**	**26**	**5**	**6**	**8**	**48**





"54% of respondents state they NEVER use BS 6079. Contractor (17%) represents the largest group from this sample (n=48)."

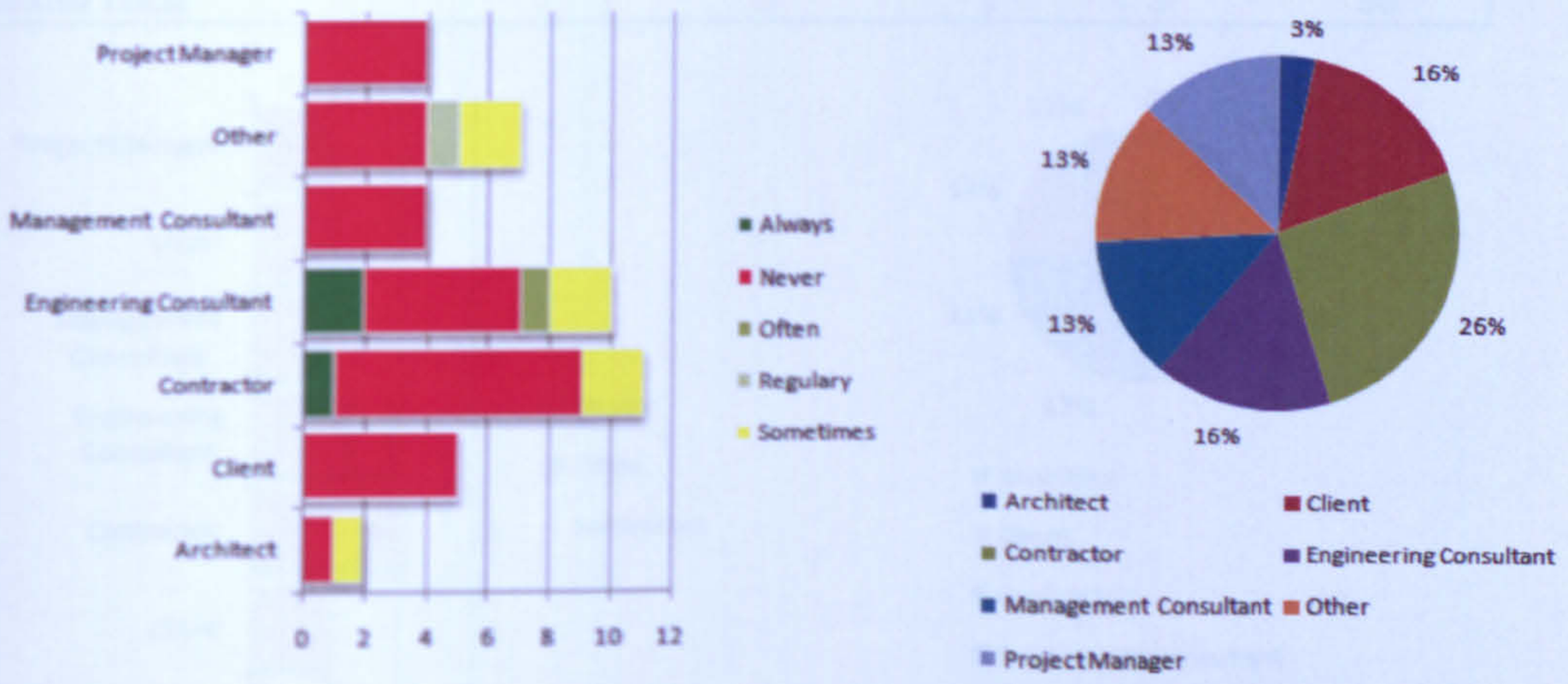
Figure 7-44 Detailed analysis of Question 19e

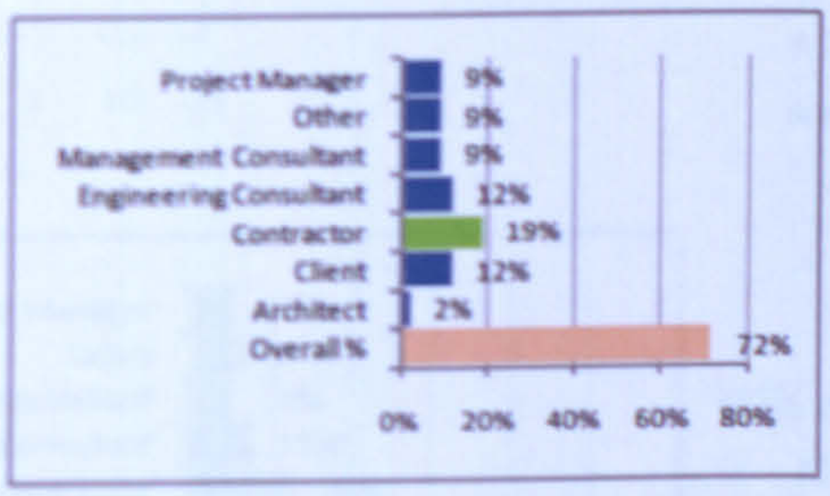
Interpretation

Contractors have indicated (17% of the 54% recorded score) that they never use British Standard BS 6079. Again this is in line with expectations and reflects the nature and norms of construction contracting.

Question 19f

# f) Critical Chain Project Management	Column Labels					
Row Labels	Always	Never	Often	Regulary	Sometimes	Grand Total
Architect		1			1	2
Client		5				5
Contractor	1	8			2	11
Engineering Consultant	2	5	1		2	10
Management Consultant		4				4
Other		4		1	2	7
Project Manager		4				4
Grand Total	**3**	**31**	**1**	**1**	**7**	**43**





"72% of respondents state they NEVER use CCPM. Contractor (19%) represents the largest group in this sample (n=43)."

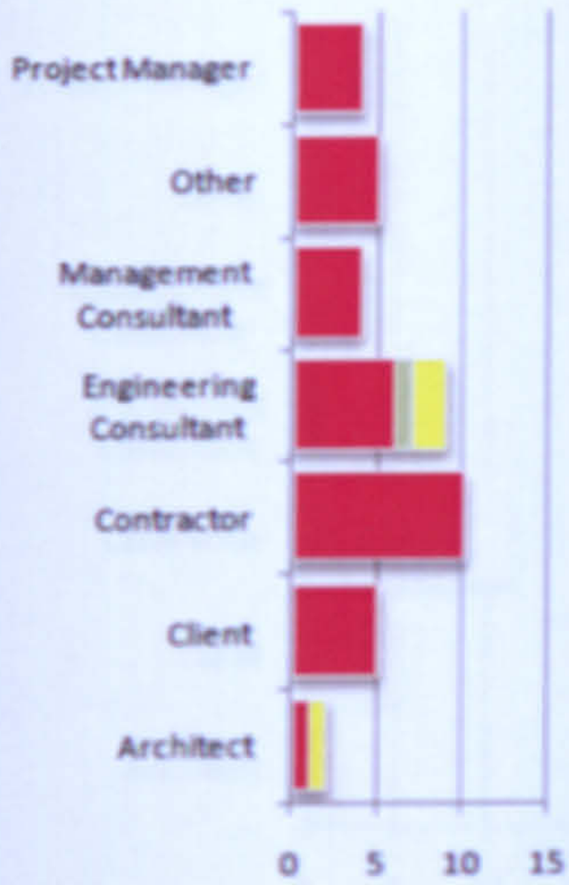
Figure 7-45 Detailed analysis of Question 19f

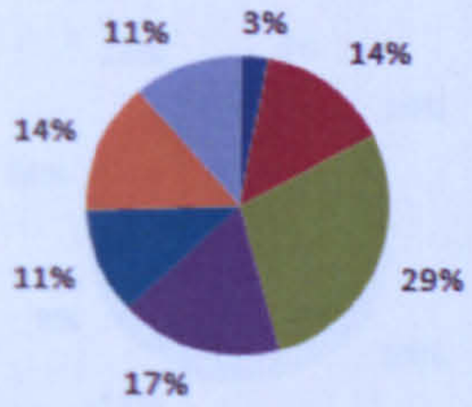
Interpretation

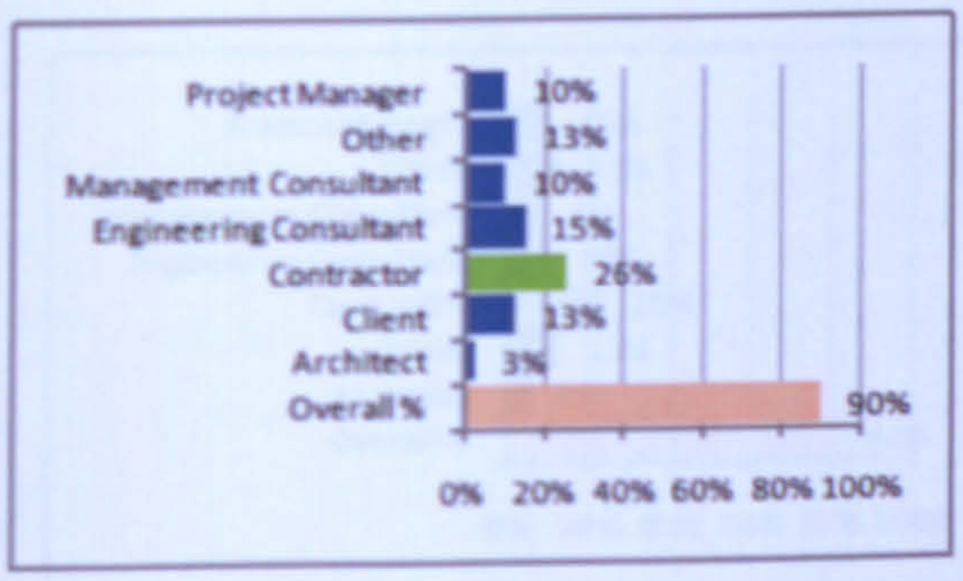
Contractors are the largest groups within the sample that have indicated that they never use Critical Chain Project Management (CCPM) i.e. 19% of the 72% recorded score. Whilst CCPM can be seen as a radical approach to project scheduling, it could be concluded that contractors prefer traditional tried and test methods of scheduling that are also widely recognised in the industry.

Question 19g

# g)eXtreme Project Management	Column Labels			
Row Labels	Never	Often	Sometimes	Grand Total
Architect	1		1	2
Client	5			5
Contractor	10			10
Engineering Consultant	6	1	2	9
Management Consultant	4			4
Other	5			5
Project Manager	4			4
Grand Total	**35**	**1**	**3**	**39**







"90% of respondents NEVER use XPM. Contractor (26%) represents the largest group from this sample (n=39)."

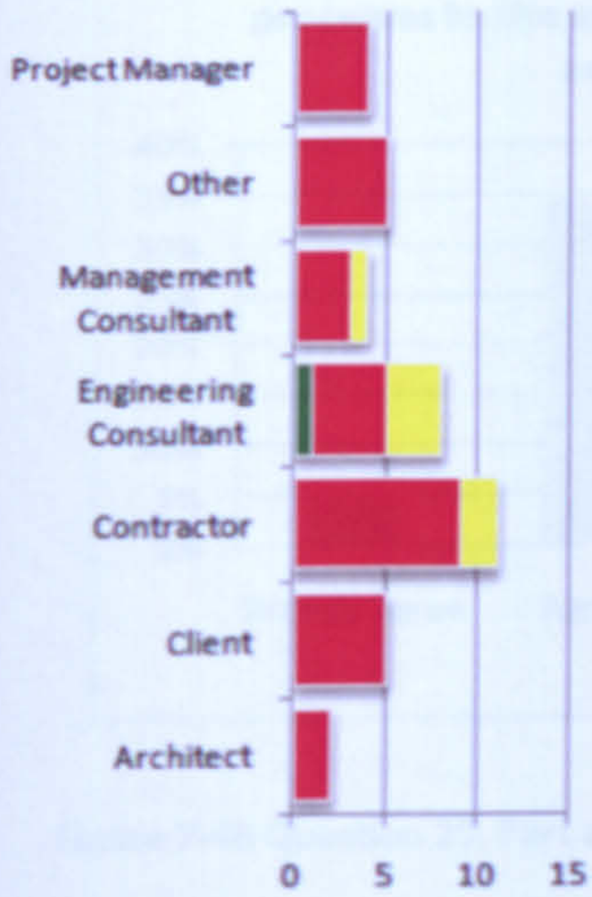
Figure 7-46 Detailed analysis of Question 19g

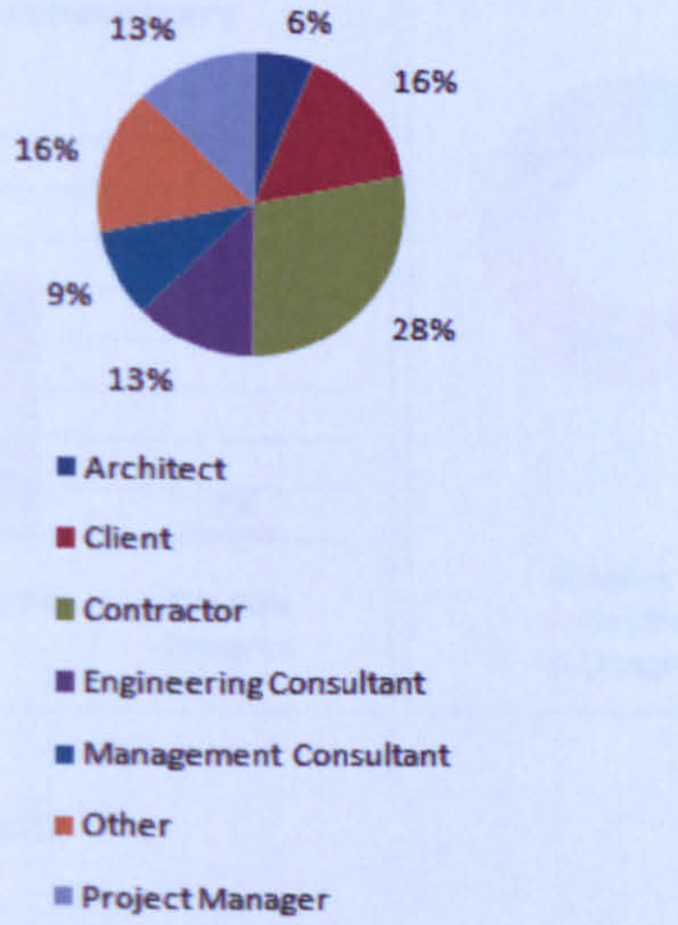
Interpretation

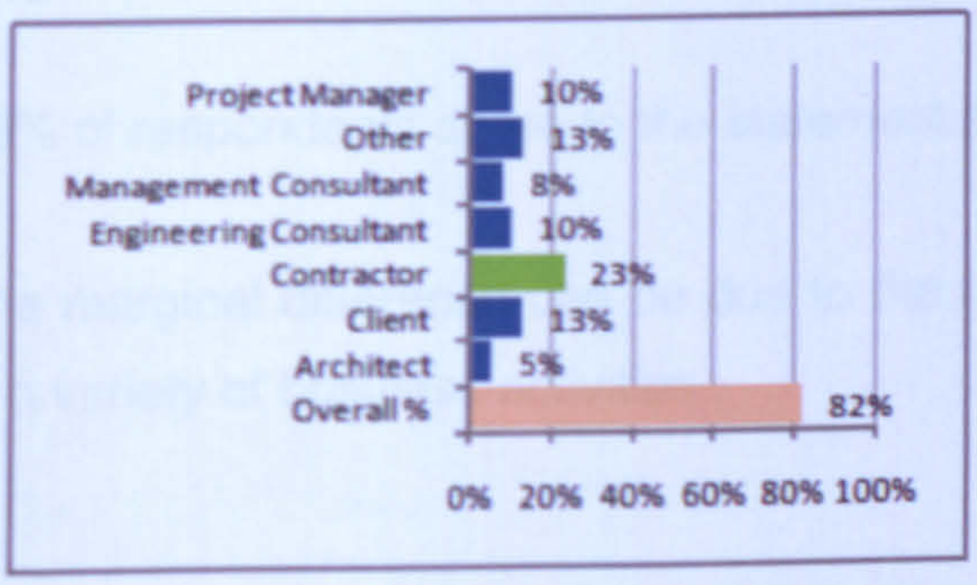
eXtreme Project Management is a concept that has been developed in the IT industry and therefore there is such a high percentage of scores indicating that it is never used and in particular by Contractors (26% of the 90% score recorded)

Question 19h

#h) Theory of Constraints Row Labels	Column Labels Always	Never	Sometimes	Grand Total
Architect		2		2
Client		5		5
Contractor		9	2	11
Engineering Consultant	1	4	3	8
Management Consultant		3	1	4
Other		5		5
Project Manager		4		4
Grand Total	**1**	**32**	**6**	**39**







"82% of respondents indicate that they NEVER use TOC. Contractor (23%) represents the largest group from this sample (n=39)."

Figure 7-47 Detailed analysis of Question 19h

Interpretation

Theory of Constraints (TOC) is a concept that was born out of the manufacturing industry and therefore a high percentage of non use is in line with expectations, with contractors indicating that they never use it (23% of the 82% score recorded).

Question 20a

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

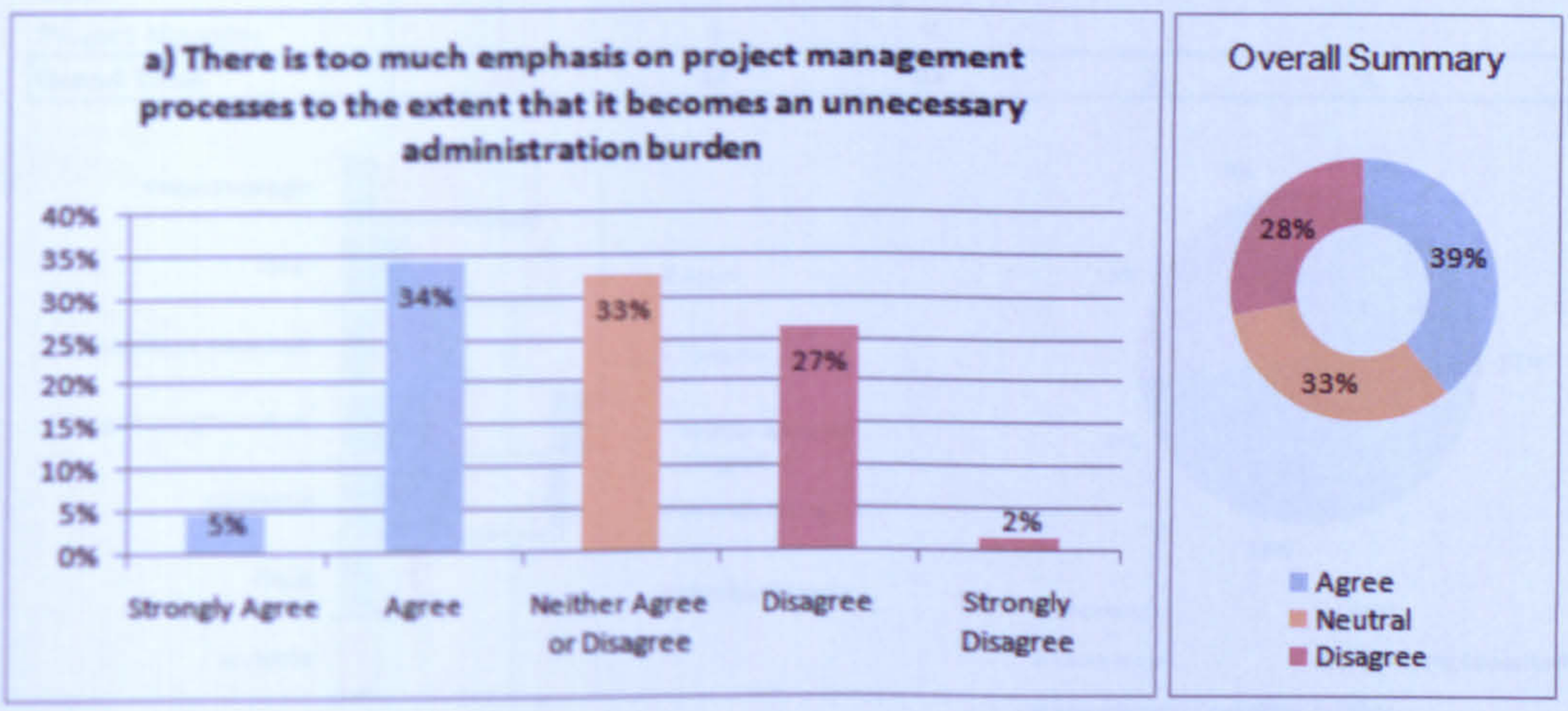


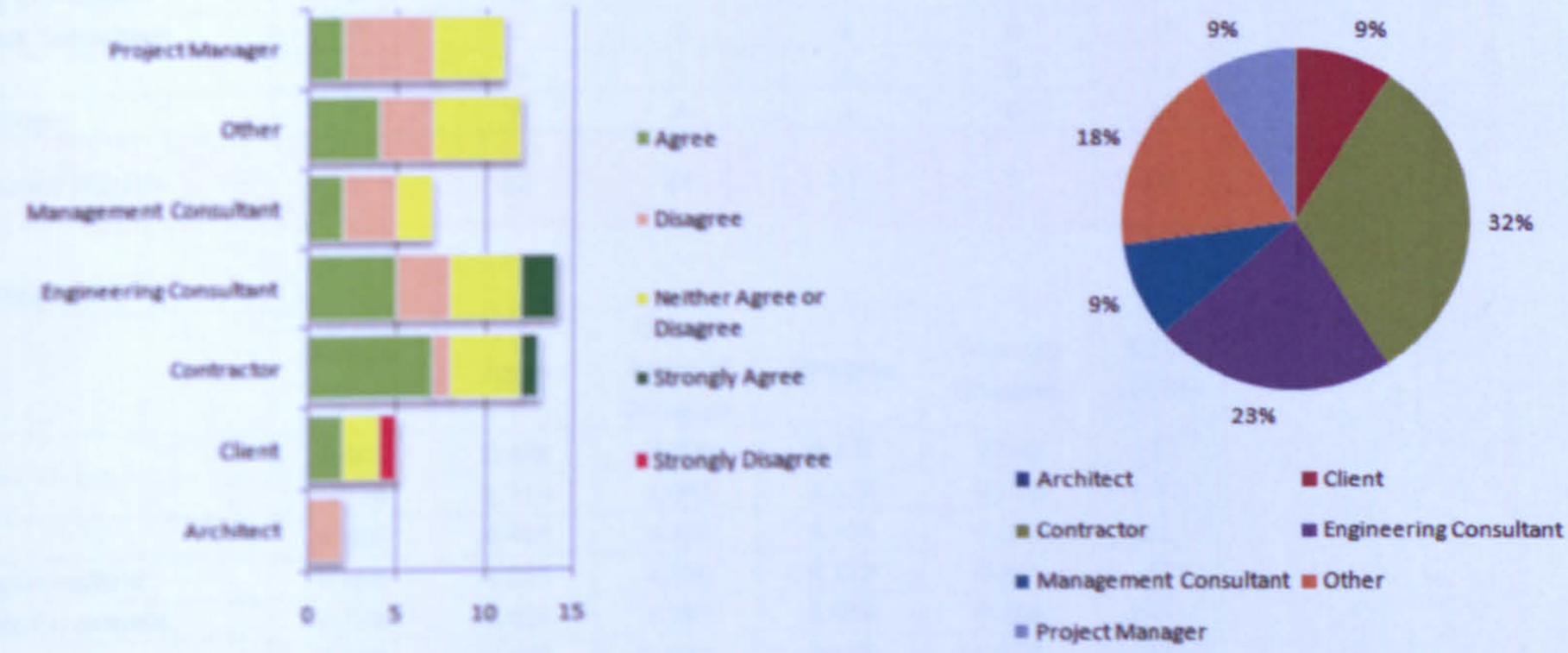
Figure 7-48 Question 20, Part a, Questionnaire Survey results

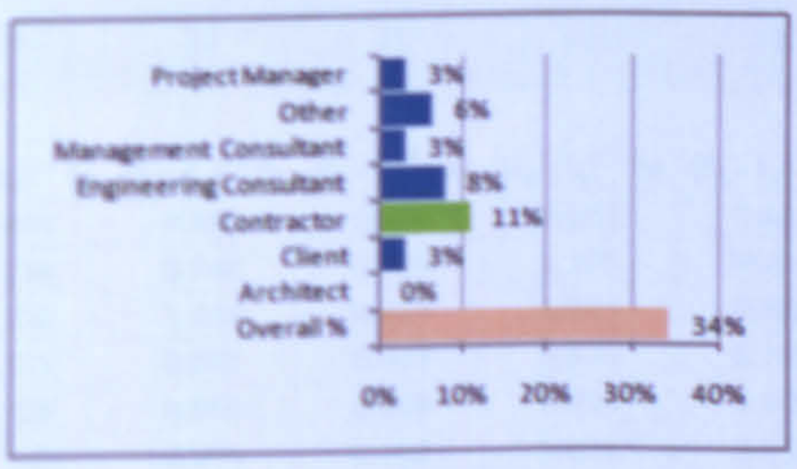
Analysis

39% of respondents agree to the statement as opposed to 28% who disagree.

The marginal difference can be due to the fact that the respondents are engaged in a variety of business activities.

#a) There is too much emphasis on project management processes to the extent that it becomes an unecessary adminstration burden	Column Labels					
Row Labels	Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Strongly Disagree	Grand Total
Architect		2				2
Client	2		2		1	5
Contractor	7	1	4	1		13
Engineering Consultant	5	3	4	2		14
Management Consultant	2	3	2			7
Other	4	3	5			12
Project Manager	2	5	4			11
Grand Total	**22**	**17**	**21**	**3**	**1**	**64**





"34% of respondents state that there is too much emphasis on process that it becomes a burden for projects. Contractor (11%) represents the largest group from this sample (n=64)."

Figure 7-49 Detailed analysis of Question 20a

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20a

H_0 *There is NOT too much emphasis on procedures that it becomes an administration burden*

H_1 There is too much emphasis on procedures that it becomes an administration burden

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0	0	0	2	0	2
Client	0	2	2	0	1	5
Contractor	1	7	4	1	0	13
Engineering Consultant	2	5	4	3	0	14
Management Consultant	0	2	2	3	0	7
Other	0	4	5	3	0	12
Project Manager	0	2	4	5	0	11
COLUMN TOTALS	3	22	21	17	1	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0.094	0.688	0.656	0.531	0.031	2
Client	0.234	1.719	1.641	1.328	0.078	5
Contractor	0.609	4.469	4.266	3.453	0.203	13
Engineering Consultant	0.656	4.813	4.594	3.719	0.219	14
Management Consultant	0.328	2.406	2.297	1.859	0.109	7
Other	0.563	4.125	3.938	3.188	0.188	12
Project Manager	0.516	3.781	3.609	2.922	0.172	11
COLUMN TOTALS	3	22	21	17	1	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.094	0.688	0.656	4.061	0.031	5.436
Client	0.234	0.046	0.079	1.328	10.878	12.331
Contractor	0.250	1.434	0.017	1.743	0.203	3.396
Engineering Consultant	2.751	0.007	0.077	0.139	0.219	0.442
Management Consultant	0.328	0.069	0.038	0.700	0.109	0.916
Other	0.563	0.004	0.287	0.011	0.188	0.489
Project Manager	0.516	0.839	0.042	1.478	0.172	2.531
						25.541

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(5-1)

5*4

20

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_0 is **ACCEPTED**

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

The vast majority of respondents agree (34%) that there is too much emphasis on process that it becomes an unnecessary administration burden. Contractors agreed more (11% of the 34% recorded score).

Question 20b

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

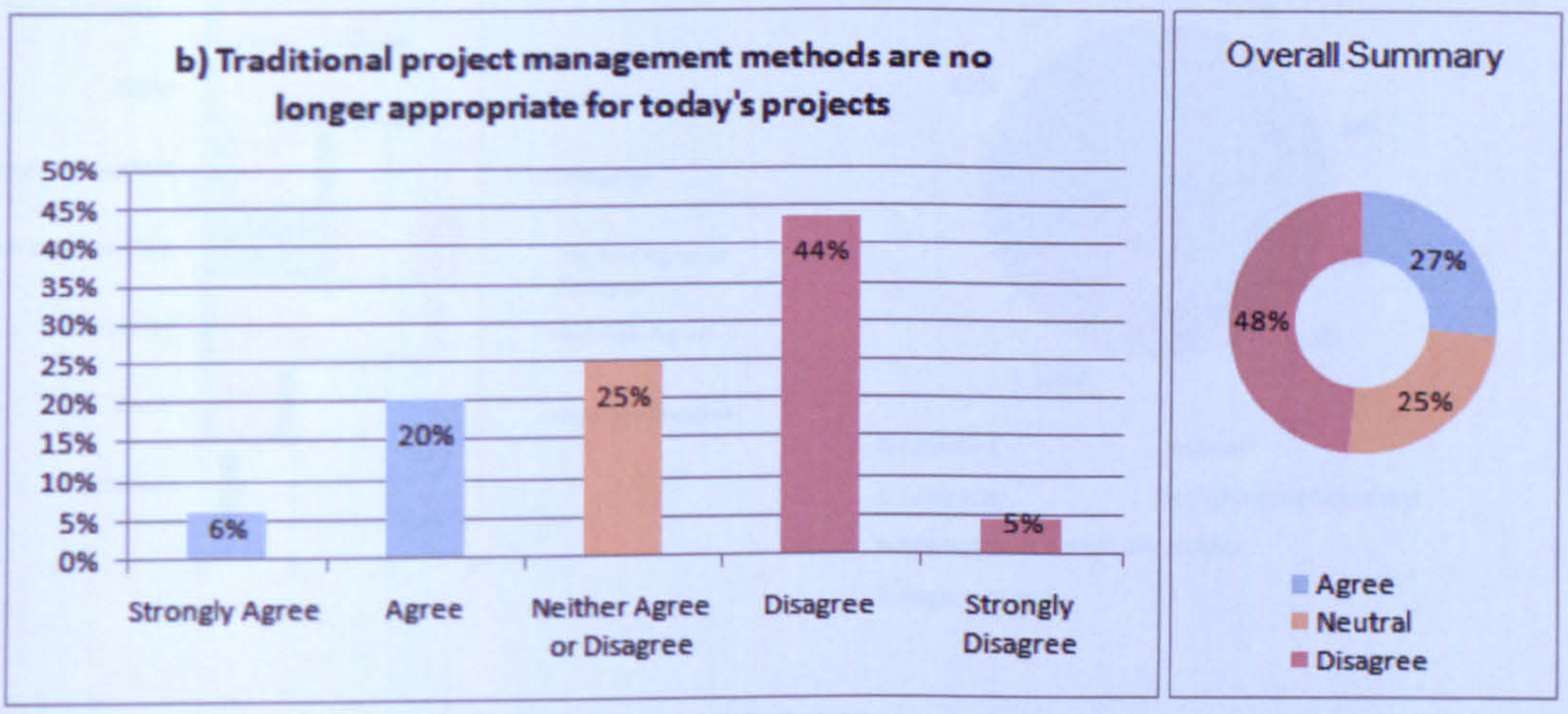


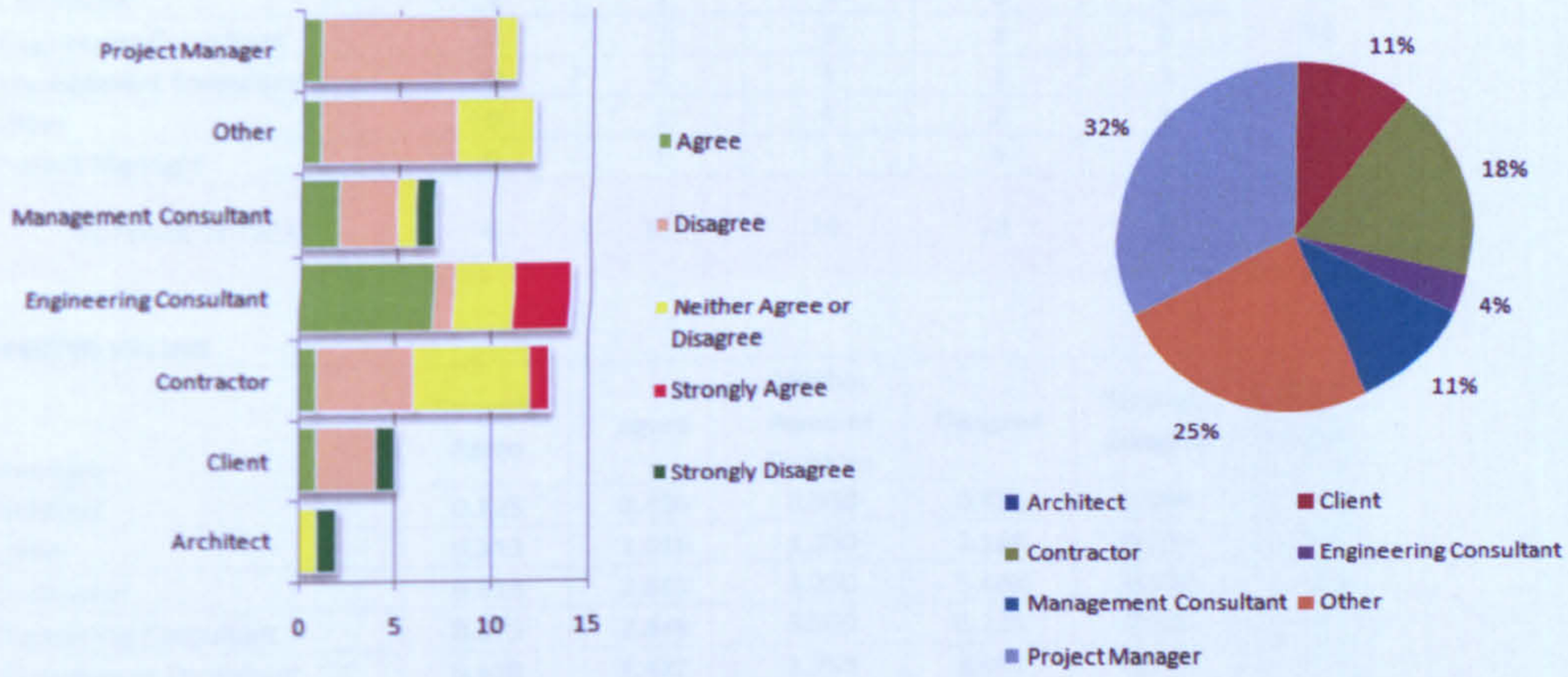
Figure 7-50 Question 20, Part b, Questionnaire Survey results

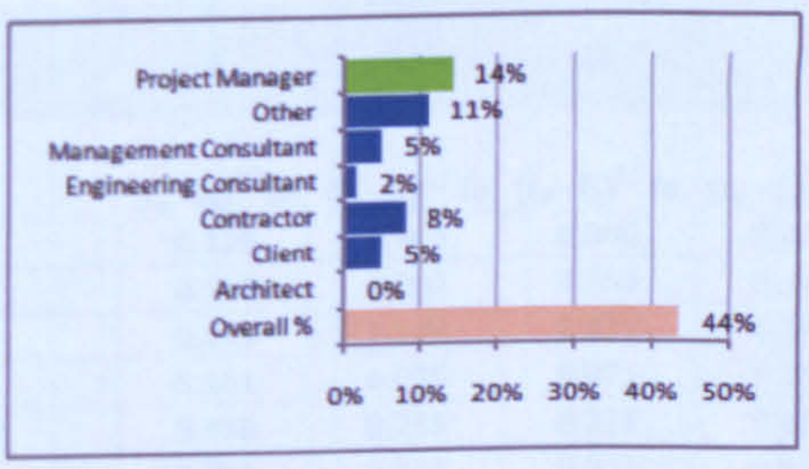
Analysis

27% of respondents agree to the statement as opposed to 48%, who disagree.

Traditional project management is clearly seen relevant to today's projects. This could be due to the fact that a large proportion of respondents are involved in construction and engineering projects, where traditional project management methods are widely used.

#b)Traditional project management methods are no longer appropriate for todays projects Row Labels	Column Labels Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Strongly Disagree	Grand Total
Architect			1		1	2
Client	1	3			1	5
Contractor	1	5	6	1		13
Engineering Consultant	7	1	3	3		14
Management Consultant	2	3	1		1	7
Other	1	7	4			12
Project Manager	1	9	1			11
Grand Total	**13**	**28**	**16**	**4**	**3**	**64**





"44% of respondents DISAGREE that traditional PM is no longer applicable to today's projects. Project Manager (14%) represents the largest group in this sample (n=64)."

Figure 7-51 Detailed analysis of Question 20b

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20a

H_o *Traditional project management methods ARE appropriate to todays projects*

H_1 Traditional project management methods are NOT appropriate to todays projects

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0	0	1	0	1	2
Client	0	1	0	3	1	5
Contractor	1	1	6	5	0	13
Engineering Consultant	3	7	3	1	0	14
Management Consultant	0	2	1	3	1	7
Other	0	1	4	7	0	12
Project Manager	0	1	1	9	0	11
COLUMN TOTALS	4	13	16	28	3	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0.125	0.406	0.500	0.875	0.094	2
Client	0.313	1.016	1.250	2.188	0.234	5
Contractor	0.813	2.641	3.250	5.688	0.609	13
Engineering Consultant	0.875	2.844	3.500	6.125	0.656	14
Management Consultant	0.438	1.422	1.750	3.063	0.328	7
Other	0.750	2.438	3.000	5.250	0.563	12
Project Manager	0.688	2.234	2.750	4.813	0.516	11
COLUMN TOTALS	4	13	16	28	3	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.125	0.406	0.500	0.875	8.760	10.542
Client	0.313	0.000	1.250	0.302	2.501	4.053
Contractor	0.043	1.019	2.327	0.083	0.609	4.039
Engineering Consultant	5.161	6.075	0.071	4.288	0.656	11.090
Management Consultant	0.438	0.235	0.321	0.001	1.376	1.934
Other	0.750	0.848	0.333	0.583	0.563	2.327
Project Manager	0.688	0.682	1.114	3.644	0.516	5.955
						39.939

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(5-1)

5*4

20

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_o is **REJECTED**

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

Project Managers disagree that traditional project management is no longer appropriate to today's projects (14% of the 44% response rate). This could be due to the fact that is relevant and that what is required is better adaptation of the traditional concepts to suit the faster pace of projects today.

Question 20c

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

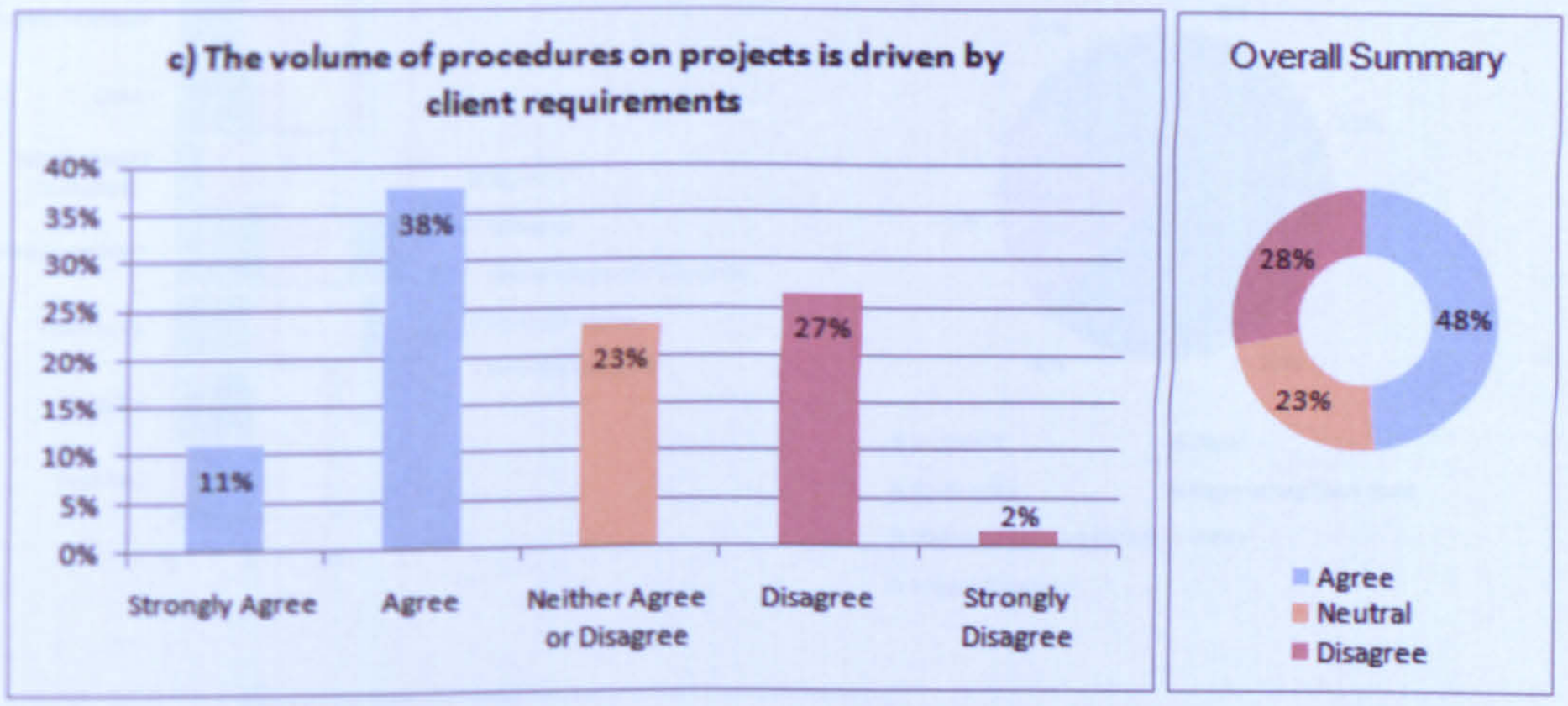


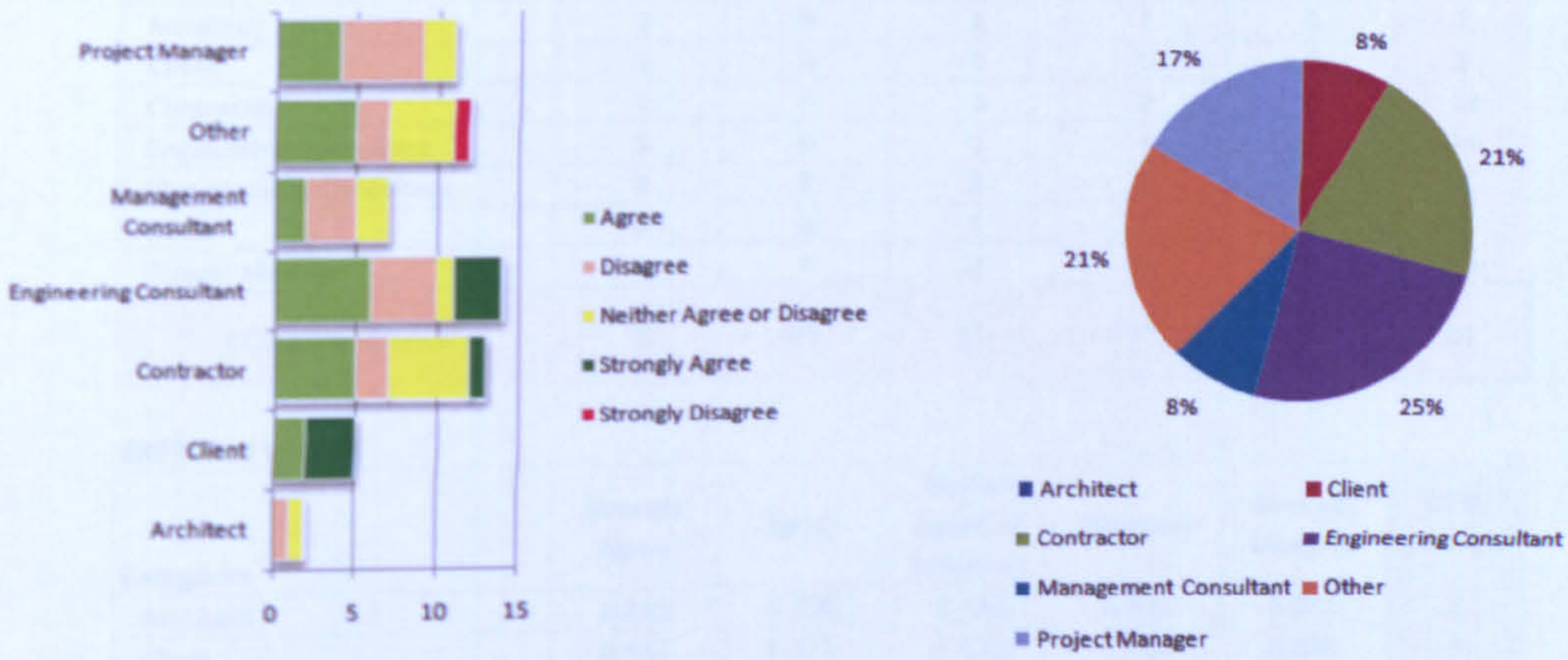
Figure 7-52 Question 20, Part c, Questionnaire Survey results

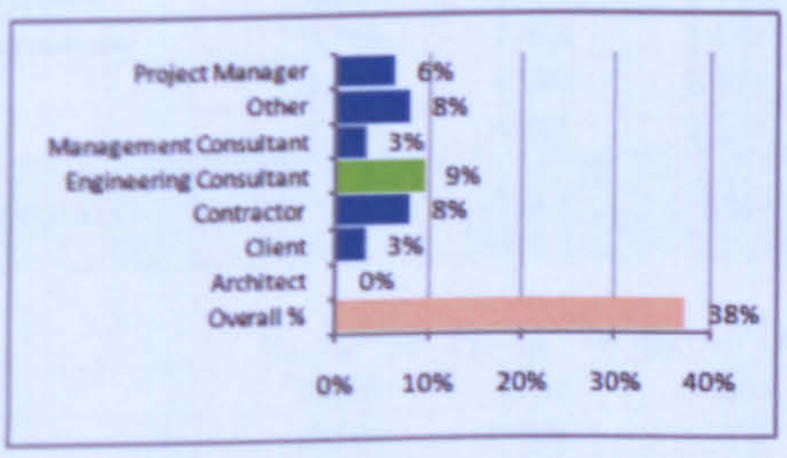
Analysis

48% of respondents agree to the statement as opposed to 28% who disagree.

It would appear that the volume of procedures was driven by client requirements. Public sector clients have to do this to ensure that there is transparency in their business transactions and this could be one of the reasons why we have a high % of respondents agreeing to this statement.

#c) The volume of procedures on projects is driven by client requirements Row Labels	Column Labels Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Strongly Disagree	Grand Total
Architect		1	1			2
Client	2			3		5
Contractor	5	2	5	1		13
Engineering Consultant	6	4	1	3		14
Management Consultant	2	3	2			7
Other	5	2	4		1	12
Project Manager	4	5	2			11
Grand Total	**24**	**17**	**15**	**7**	**1**	**64**





"38% of respondents agree that the volume of procedures is driven by client requirements. Engineering Consultant (9%) represents the largest group from this sample (n=64)."

Figure 7-53 Detailed analysis of Question 20c

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20c

H_o *The volume of procedures is NOT driven by Client requirements*

H_1 The volume of procedures is driven by Client requirements

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0	0	1	1	0	2
Client	3	2	0	0	0	5
Contractor	1	5	5	2	0	13
Engineering Consultant	3	6	1	4	0	14
Management Consultant	0	2	2	3	0	7
Other	0	5	4	2	1	12
Project Manager	0	4	2	5	0	11
COLUMN TOTALS	7	24	15	17	1	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0.219	0.750	0.469	0.531	0.031	2
Client	0.547	1.875	1.172	1.328	0.078	5
Contractor	1.422	4.875	3.047	3.453	0.203	13
Engineering Consultant	1.531	5.250	3.281	3.719	0.219	14
Management Consultant	0.766	2.625	1.641	1.859	0.109	7
Other	1.313	4.500	2.813	3.188	0.188	12
Project Manager	1.203	4.125	2.578	2.922	0.172	11
COLUMN TOTALS	7	24	15	17	1	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.219	0.750	0.602	0.414	0.031	1.797
Client	11.004	0.008	1.172	1.328	0.078	2.586
Contractor	0.125	0.003	1.252	0.611	0.203	2.070
Engineering Consultant	1.409	0.107	1.586	0.021	0.219	1.933
Management Consultant	0.766	0.149	0.079	0.700	0.109	1.037
Other	1.313	0.056	0.501	0.442	3.521	4.520
Project Manager	1.203	0.004	0.130	1.478	0.172	1.783
						15.727

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(5-1)

5*4

20

Therefore H_o is **REJECTED**

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

Interpretation

Engineering Consultants agree (9% of the 38% response rate) that the volume of procedures is driven by Client requirements.

Question 20d

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

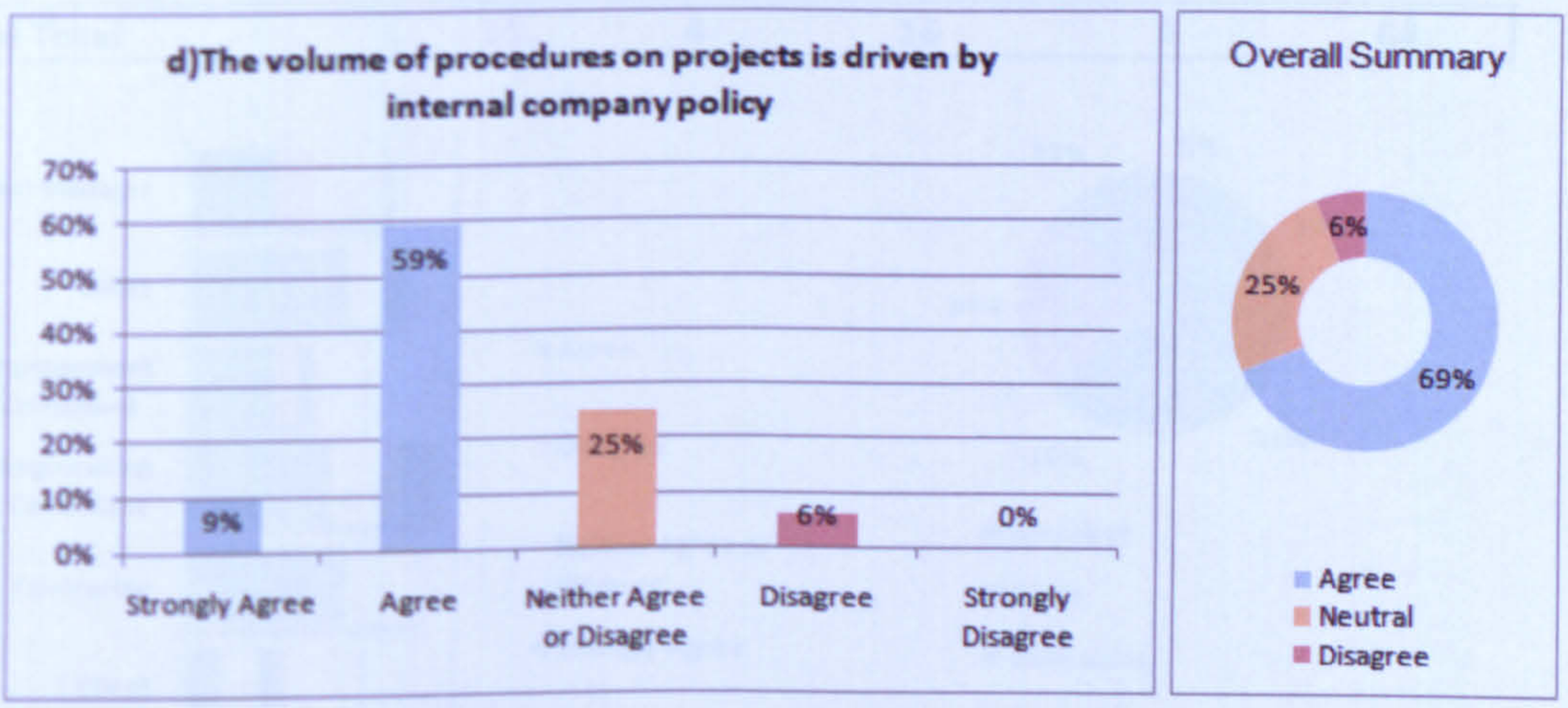


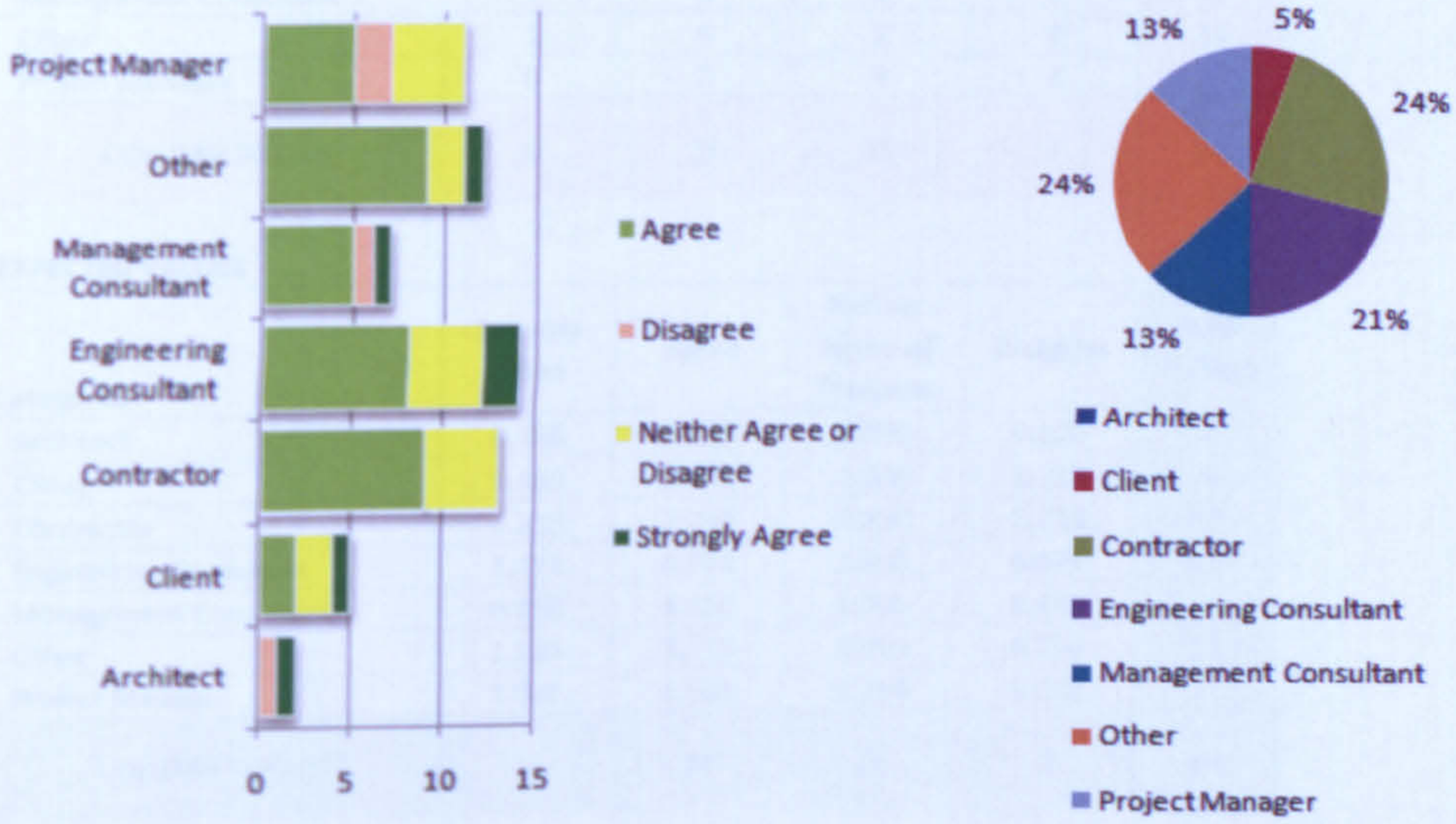
Figure 7-54 Question 20, Part d, Questionnaire Survey results

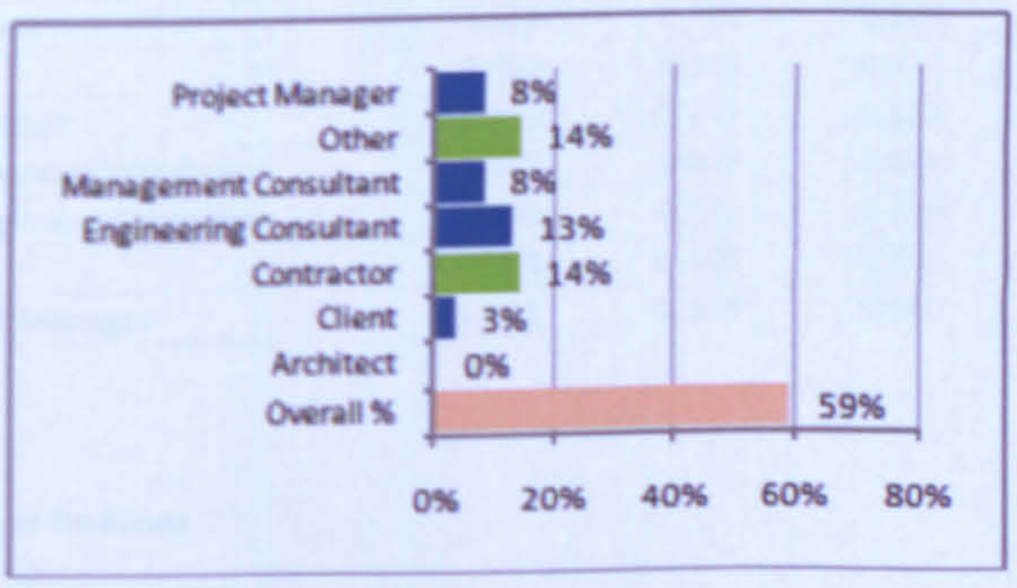
Analysis

69% of respondents agree with the statement as opposed to 6% who disagree.

In question 15, respondents agreed that a process was necessary to follow in order to limit risk to the organisation undertaking the work. It therefore follows that if that is true then the response to this question is also true.

# d)The volume of procedures on projects is driven by internal company policy	Column Labels				
Row Labels	Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect		1		1	2
Client	2		2	1	5
Contractor	9		4		13
Engineering Consultant	8		4	2	14
Management Consultant	5	1		1	7
Other	9		2	1	12
Project Manager	5	2	4		11
Grand Total	**38**	**4**	**16**	**6**	**64**





"59% of respondents agree that the volume of procedures are driven by internal company policy. Contractor (14%) and Other (14%) representing the largest groups in this sample (n=64)."

Figure 7-55 Detailed analysis of Question 20d

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20d

H_0 *The volume of procedures is NOT driven by internal company policy*

H_1 *The volume of procedures is driven by internal company policy*

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	ROW TOTALS
Architect	1	0	0	1	2
Client	1	2	2	0	5
Contractor	0	9	4	0	13
Engineering Consultant	2	8	4	0	14
Management Consultant	1	5	0	1	7
Other	1	9	2	0	12
Project Manager	0	5	4	2	11
COLUMN TOTALS	6	38	16	4	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	ROW TOTALS
Architect	0.188	1.188	0.500	0.125	2
Client	0.469	2.969	1.250	0.313	5
Contractor	1.219	7.719	3.250	0.813	13
Engineering Consultant	1.313	8.313	3.500	0.875	14
Management Consultant	0.656	4.156	1.750	0.438	7
Other	1.125	7.125	3.000	0.750	12
Project Manager	1.031	6.531	2.750	0.688	11
COLUMN TOTALS	6	38	16	4	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	3.521	1.188	0.500	6.125	7.813
Client	0.602	0.316	0.450	0.313	1.079
Contractor	1.219	0.213	0.173	0.813	1.198
Engineering Consultant	0.360	0.012	0.071	0.875	0.958
Management Consultant	0.180	0.171	1.750	0.723	2.645
Other	0.014	0.493	0.333	0.750	1.577
Project Manager	1.031	0.359	0.568	2.506	3.433
					18.702

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(4-1)

5*3

15

$$\chi 2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_0 is **REJECTED**

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

Contractors and the 'Others' group agree that volume of procedures is driven by internal company policy (14% of 59% of response rate).

For contractors to remain competitive and profitable, they have a highly proceduralised setup. This is to ensure that there is strict compliance with the many rules and regulations placed upon them by virtual of being engaged in construction work.

The 'Other' group consisted of very large organisations and property development companies. Size of the organisation may be attributable to the amount of procedural compliance that is required to ensure that the exposure of the organisation as a result of actions undertaken by its employees is kept to a minimum.

Question 20e

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

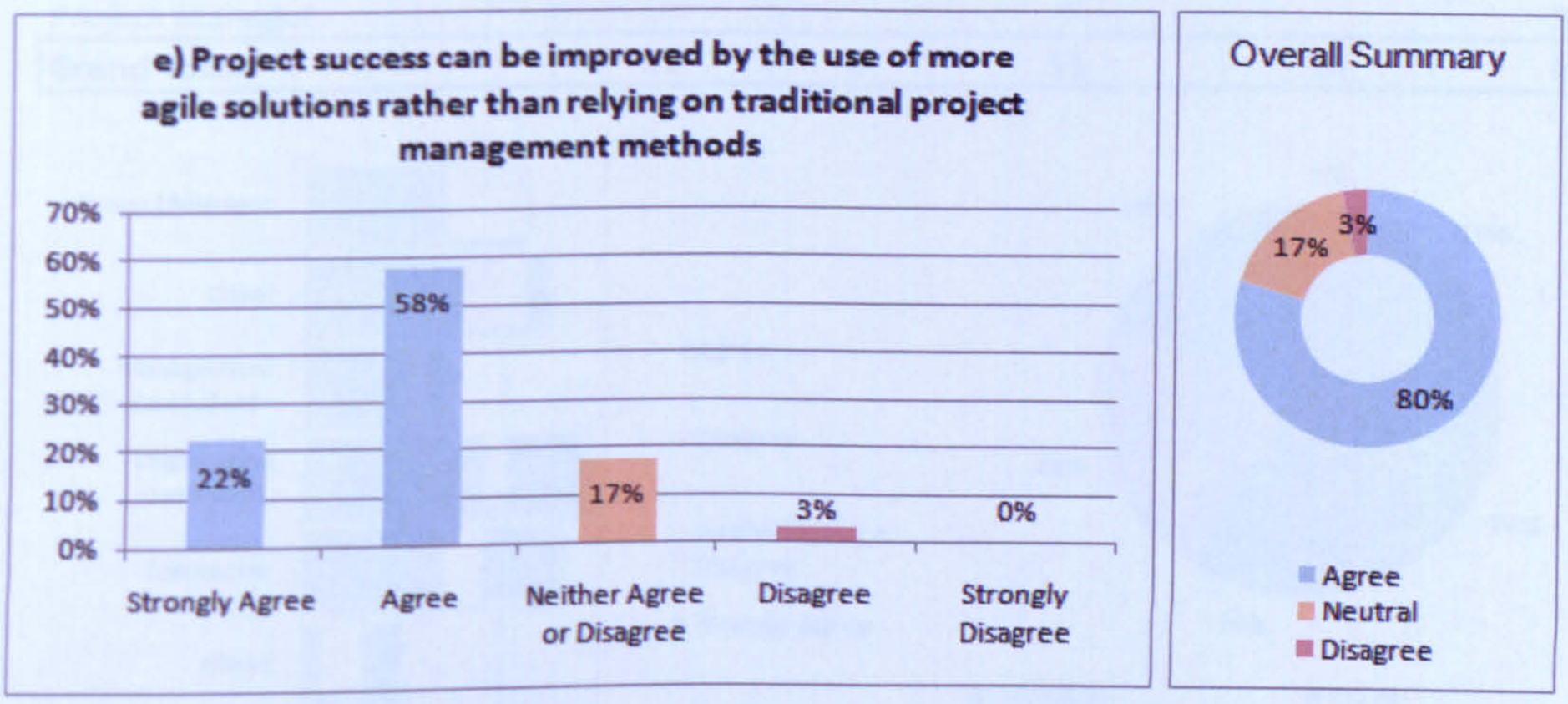
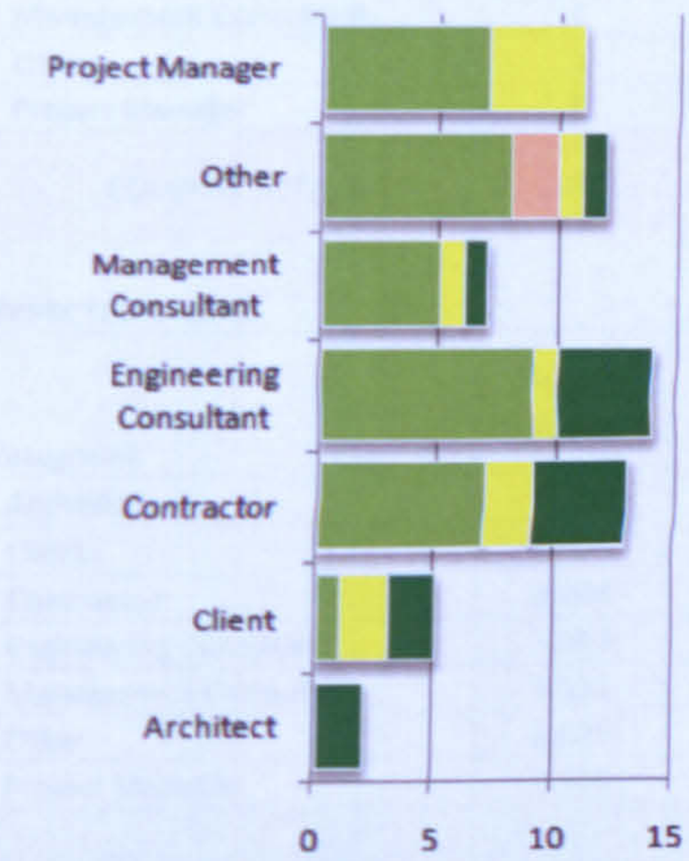


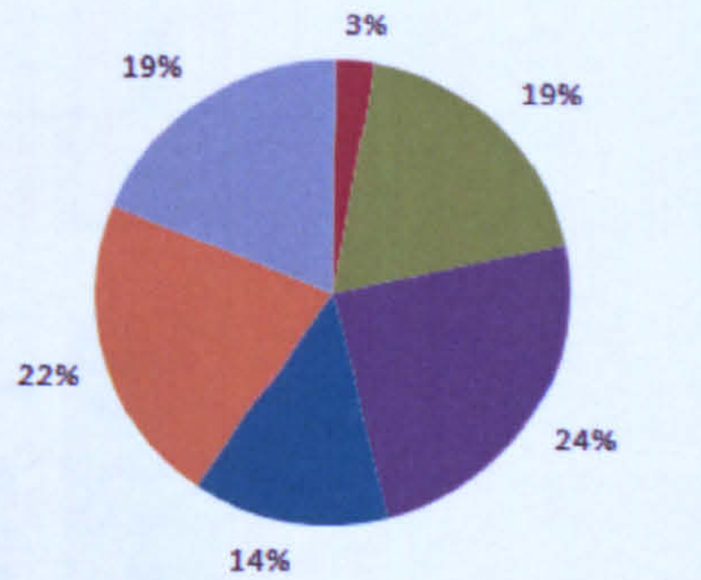
Figure 7-56 Question 20, Part e, Questionnaire Survey results

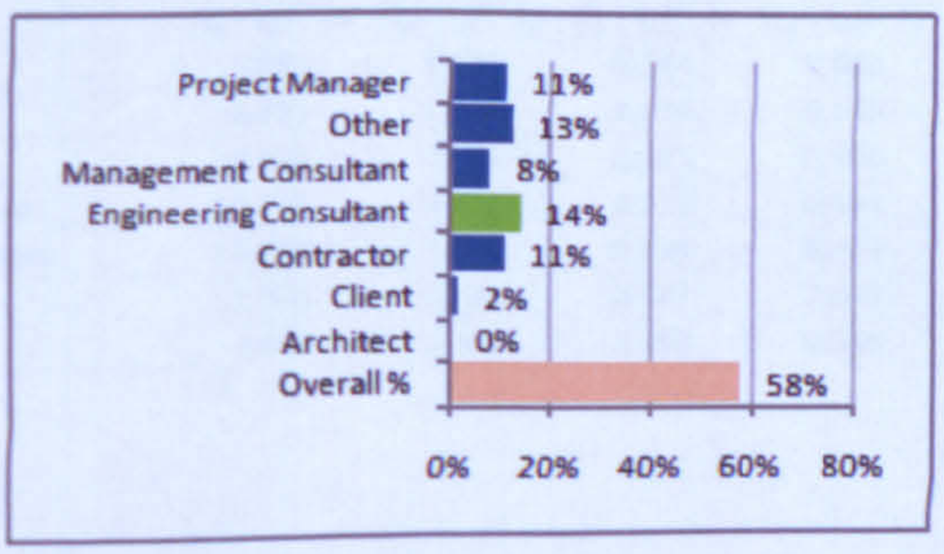
Analysis

80% of respondents agree to the statement as opposed to 3% who disagree.

#e) Project success can be improved by the use of more agile solutions rather than relying on traditional project management methods Row Labels	Column Labels Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect				2	2
Client	1		2	2	5
Contractor	7		2	4	13
Engineering Consultant	9		1	4	14
Management Consultant	5		1	1	7
Other	8	2	1	1	12
Project Manager	7		4		11
Grand Total	**37**	**2**	**11**	**14**	**64**







"58% of respondents agree that success can be achieved by more agile methods than traditional methods. Engineering Consultant (14%) represents the largest group from this sample (n=64)."

Figure 7-57 Detailed analysis of Question 20e

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20e

H_o *Project success can NOT be improved by more agile methods*

H_1 *Project success CAN be improved by more agile methods*

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	ROW TOTALS
Architect	2	0	0	0	2
Client	2	1	2	0	5
Contractor	4	7	2	0	13
Engineering Consultant	4	9	1	0	14
Management Consultant	1	5	1	0	7
Other	1	8	1	2	12
Project Manager	0	7	4	0	11
COLUMN TOTALS	14	37	11	2	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	ROW TOTALS
Architect	0.438	1.156	0.344	0.063	2
Client	1.094	2.891	0.859	0.156	5
Contractor	2.844	7.516	2.234	0.406	13
Engineering Consultant	3.063	8.094	2.406	0.438	14
Management Consultant	1.531	4.047	1.203	0.219	7
Other	2.625	6.938	2.063	0.375	12
Project Manager	2.406	6.359	1.891	0.344	11
COLUMN TOTALS	14	37	11	2	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	5.580	1.156	0.344	0.063	1.563
Client	0.751	1.237	1.514	0.156	2.907
Contractor	0.470	0.035	0.025	0.406	0.466
Engineering Consultant	0.287	0.101	0.822	0.438	1.361
Management Consultant	0.184	0.224	0.034	0.219	0.478
Other	1.006	0.163	0.547	7.042	7.752
Project Manager	2.406	0.065	2.353	0.344	2.762
					17.287

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(4-1)

5*3

15

Therefore H_o is **REJECTED**

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

Engineering Consultants agree more that more agile methods can help in project success i.e. 14% of the overall 58% response rate. This could be due to the fact that Engineering Consultants are normally in the 'middle' of the project supply chain. They are often responding to tenders, winning work and then asked to comply with differing project management procedures as they engage as a 'team member' on different projects.

Question 20f

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

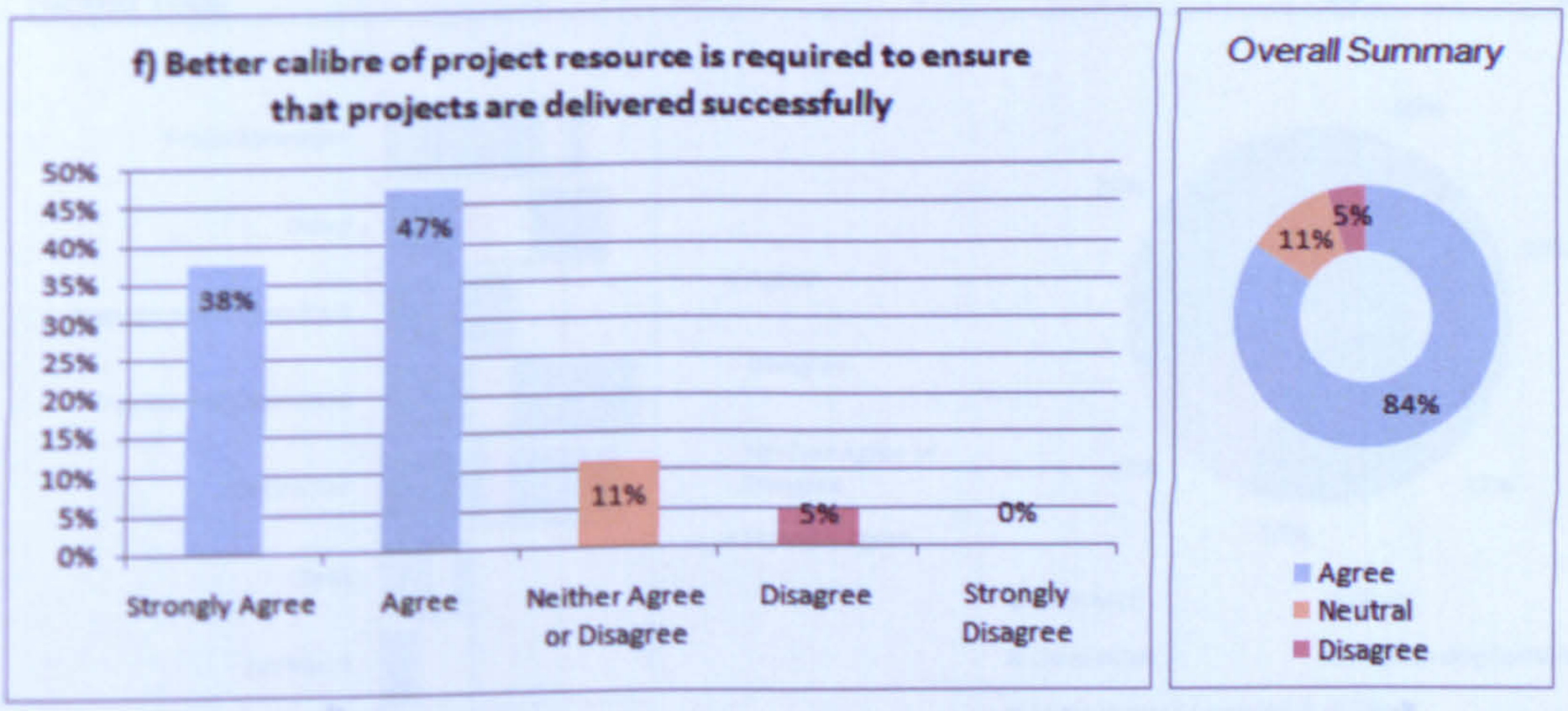


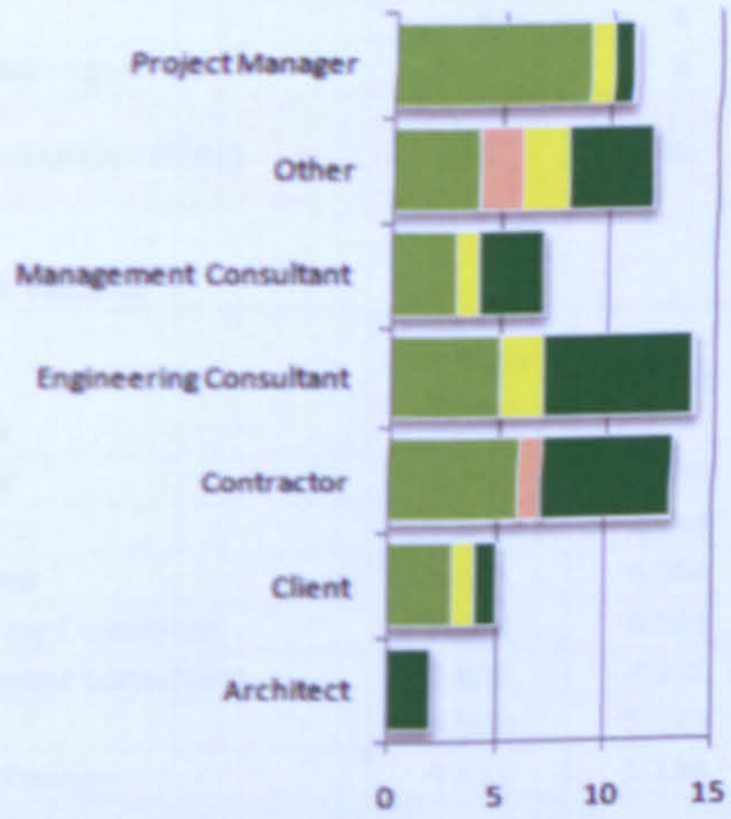
Figure 7-58 Question 20, Part f, Questionnaire Survey results

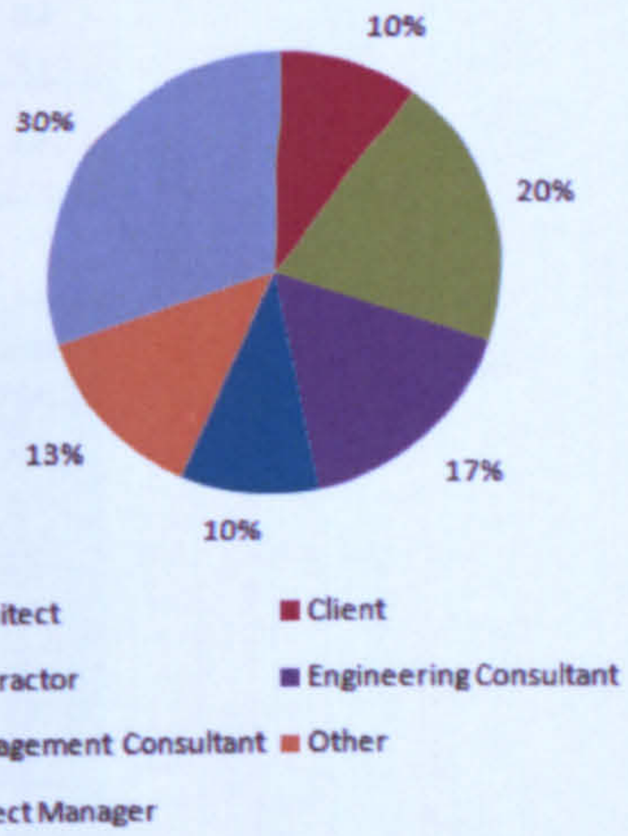
Analysis

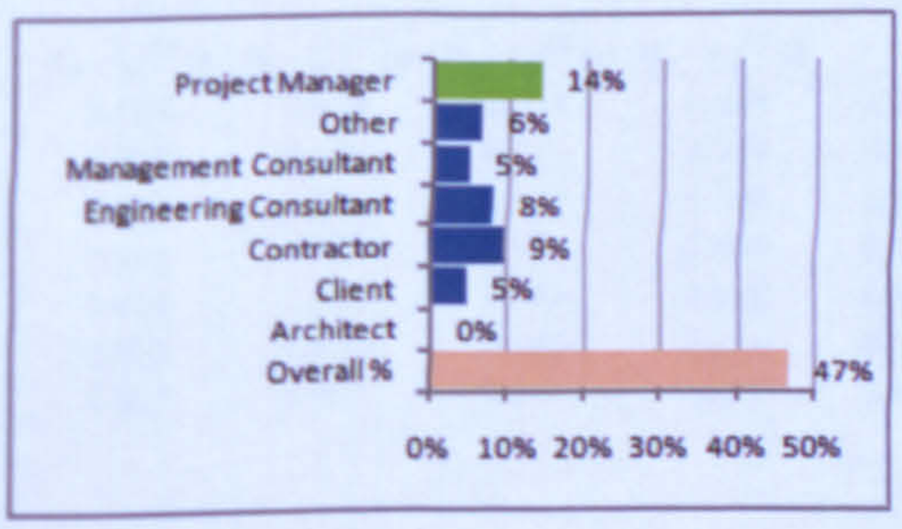
84% of respondents agree to the statement as opposed to 5% who disagree.

This is in stark contrast to the question 13, which asked a similar question.

# f) Better calibre of project resource is required to ensure that projects are delivered successfully Row Labels	Column Labels Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Grand Total
Architect				2	2
Client	3		1	1	5
Contractor	6	1		6	13
Engineering Consultant	5		2	7	14
Management Consultant	3		1	3	7
Other	4	2	2	4	12
Project Manager	9		1	1	11
Grand Total	**30**	**3**	**7**	**24**	**64**







"47% of respondents agree that better calibre of resources are required for project success. Project Manager (14%) represents the largest group from this sample (n=64)."

Figure 7-59 Detailed analysis of Question 20f

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20f

H_o *Better calibre resources are NOT required for project success*

H_1 Better calibre resources are required for project success

OBSERVED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	ROW TOTALS
Architect	2	0	0	0	2
Client	1	3	1	0	5
Contractor	6	6	0	1	13
Engineering Consultant	7	5	2	0	14
Management Consultant	3	3	1	0	7
Other	4	4	2	2	12
Project Manager	1	9	1	0	11
COLUMN TOTALS	24	30	7	3	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	ROW TOTALS
Architect	0.750	0.938	0.219	0.094	2
Client	1.875	2.344	0.547	0.234	5
Contractor	4.875	6.094	1.422	0.609	13
Engineering Consultant	5.250	6.563	1.531	0.656	14
Management Consultant	2.625	3.281	0.766	0.328	7
Other	4.500	5.625	1.313	0.563	12
Project Manager	4.125	5.156	1.203	0.516	11
COLUMN TOTALS	24	30	7	3	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	2.083	0.938	0.219	0.094	1.250
Client	0.408	0.184	0.375	0.234	0.794
Contractor	0.260	0.001	1.422	0.250	1.674
Engineering Consultant	0.583	0.372	0.143	0.656	1.172
Management Consultant	0.054	0.024	0.072	0.328	0.424
Other	0.056	0.469	0.360	3.674	4.503
Project Manager	2.367	2.865	0.034	0.516	3.415
					13.231

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(4-1)

5*3

15

Therefore H_o is **ACCEPTED**

$$\chi^2 = \sum \frac{(fo - fe)2}{fe}$$

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

Project Managers particularly agree that better calibre resources are required for project success i.e. 14% of the 47% response rate.

Question 20g

Please read each of the following statements and provide your answers:

Question type

Likert-type response to each statement by the respondent.

Results

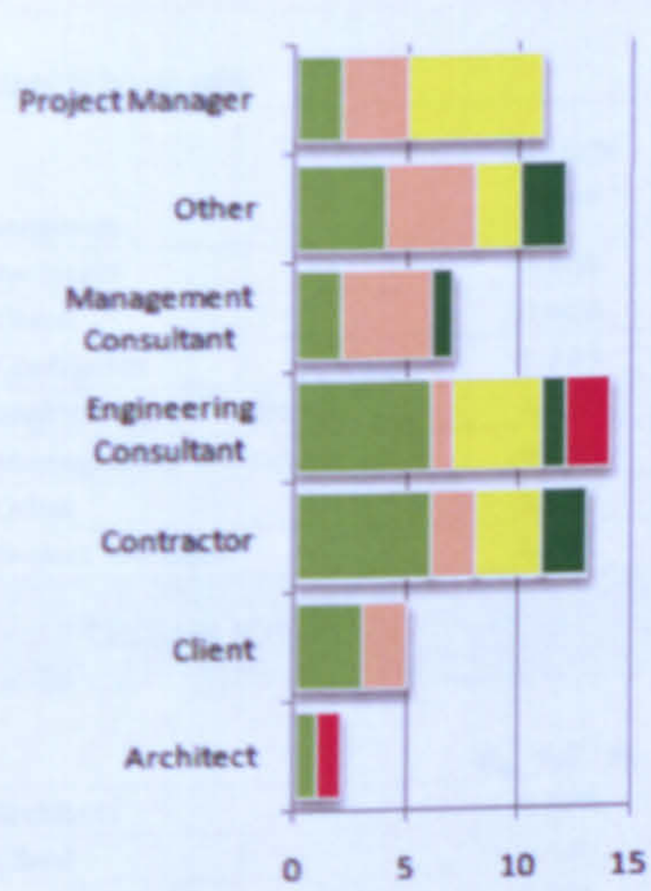
Figure 7-60 Question 20, Part e, Questionnaire Survey

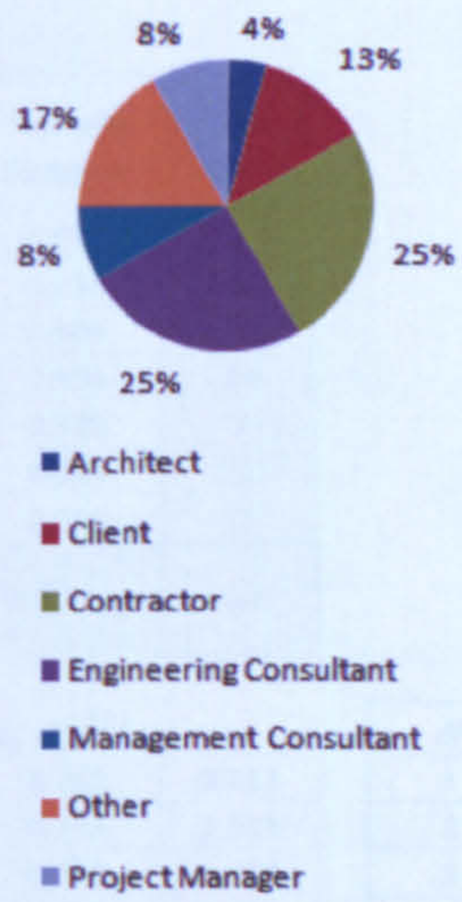
Analysis

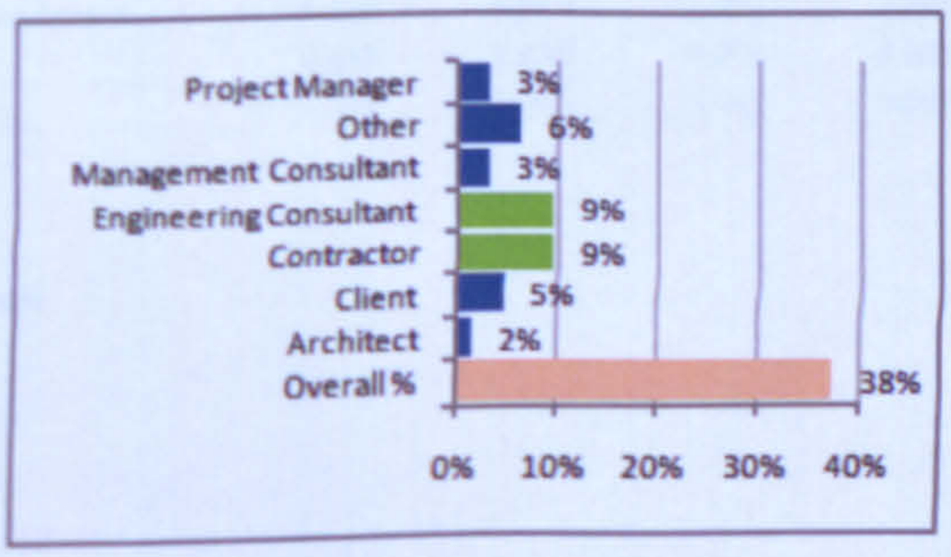
47% of respondents agree with the statement as opposed to 30% who disagree.

This question could have been misread by some the respondents and hence the marginal difference between those agreeing and disagreeing.

#g) Project teams should be given more freedom to devise their own project management processes rather than forcing them to comply with standard procedures	Column L					
Row Labels	Agree	Disagree	Neither Agree or Disagree	Strongly Agree	Strongly Disagree	Grand Total
Architect	1				1	2
Client	3	2				5
Contractor	6	2	3	2		13
Engineering Consultant	6	1	4	1	2	14
Management Consultant	2	4		1		7
Other	4	4	2	2		12
Project Manager	2	3	6			11
Grand Total	**24**	**16**	**15**	**6**	**3**	**64**







"38% of respondents agree that project teams should be given greater freedom to conduct their tasks. Engineering Consultant (9%) and Contractor (9%) represent the largest groups in this sample (n=64)."

Figure 7-61 Detailed analysis of Question 20g

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown below:

Question 20g

H_o *Project teams should NOT be given more freedom to do their tasks*

H_1 Project teams should be given more freedom to do their tasks

OBSERVED VALUES

Categories	*Strongly Agree*	*Agree*	*Neither Agree of Disagree*	*Disagree*	*Strongly Disagree*	ROW *TOTALS*
Architect	0	1	0	0	1	2
Client	0	3	0	2	0	5
Contractor	2	6	3	2	0	13
Engineering Consultant	1	6	4	1	2	14
Management Consultant	1	2	0	4	0	7
Other	2	4	2	4	0	12
Project Manager	0	2	6	3	0	11
COLUMN TOTALS	6	24	15	16	3	64

EXPECTED VALUES

Categories	Strongly Agree	Agree	Neither Agree of Disagree	Disagree	Strongly Disagree	ROW TOTALS
Architect	0.188	0.750	0.469	0.500	0.094	2
Client	0.469	1.875	1.172	1.250	0.234	5
Contractor	1.219	4.875	3.047	3.250	0.609	13
Engineering Consultant	1.313	5.250	3.281	3.500	0.656	14
Management Consultant	0.656	2.625	1.641	1.750	0.328	7
Other	1.125	4.500	2.813	3.000	0.563	12
Project Manager	1.031	4.125	2.578	2.750	0.516	11
COLUMN TOTALS	6	24	15	16	3	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect	0.188	0.083	0.469	0.500	8.760	9.813
Client	0.469	0.675	1.172	0.450	0.234	2.531
Contractor	0.501	0.260	0.001	0.481	0.609	1.350
Engineering Consultant	0.074	0.107	0.157	1.786	2.751	4.802
Management Consultant	0.180	0.149	1.641	2.893	0.328	5.010
Other	0.681	0.056	0.235	0.333	0.563	1.186
Project Manager	1.031	1.095	4.542	0.023	0.516	6.175
						30.867

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(5-1)

5*4

20

$$\chi 2 = \sum \frac{(fo - fe)2}{fe}$$

Therefore H_o is **REJECTED**

df	*P = 0.05*
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41

Interpretation

Two groups (Engineering Consultant & Contractor) from the sample agreed more that project teams should be given more freedom to perform their tasks (i.e. 9% of 38% response rate)

Firstly, looking at the Engineering Consultant, this is a profession that is probably involved as a team member on numerous projects where they have to comply with the respective policies and procedures. For this reason it can be concluded that they may feel that there is more freedom required to perform tasks.

All contractors are in business to make a profit. This is not a bad thing and is in line with modern day economic theory of the free market principles. Contractors are the last link and the most important link of the project supply chain. They are the organisation that will realise the efforts of the front end engineering and planning. They tend to be appointed after some sort of competition or negotiation and it is important that they deliver on what they have promised to undertake.

Contractors are under pressure from the moment they are appointed to ensure that the final product not only complies with standards (Quality, Environment, Health & Safety etc) and customer satisfaction but also makes a healthy return for their organisation. This is a fine balancing act and sometimes it cannot be achieved.

Staff working for contracting organisations have to adhere to rigid processes and procedures to ensure consisting and compliance. It is for this reason that they would like to have more flexibility to perform their tasks.

Question 21

How satisfied are you with your organisation's project management procedures?

Question type

Multiple options presented / single response by the respondent.

Results

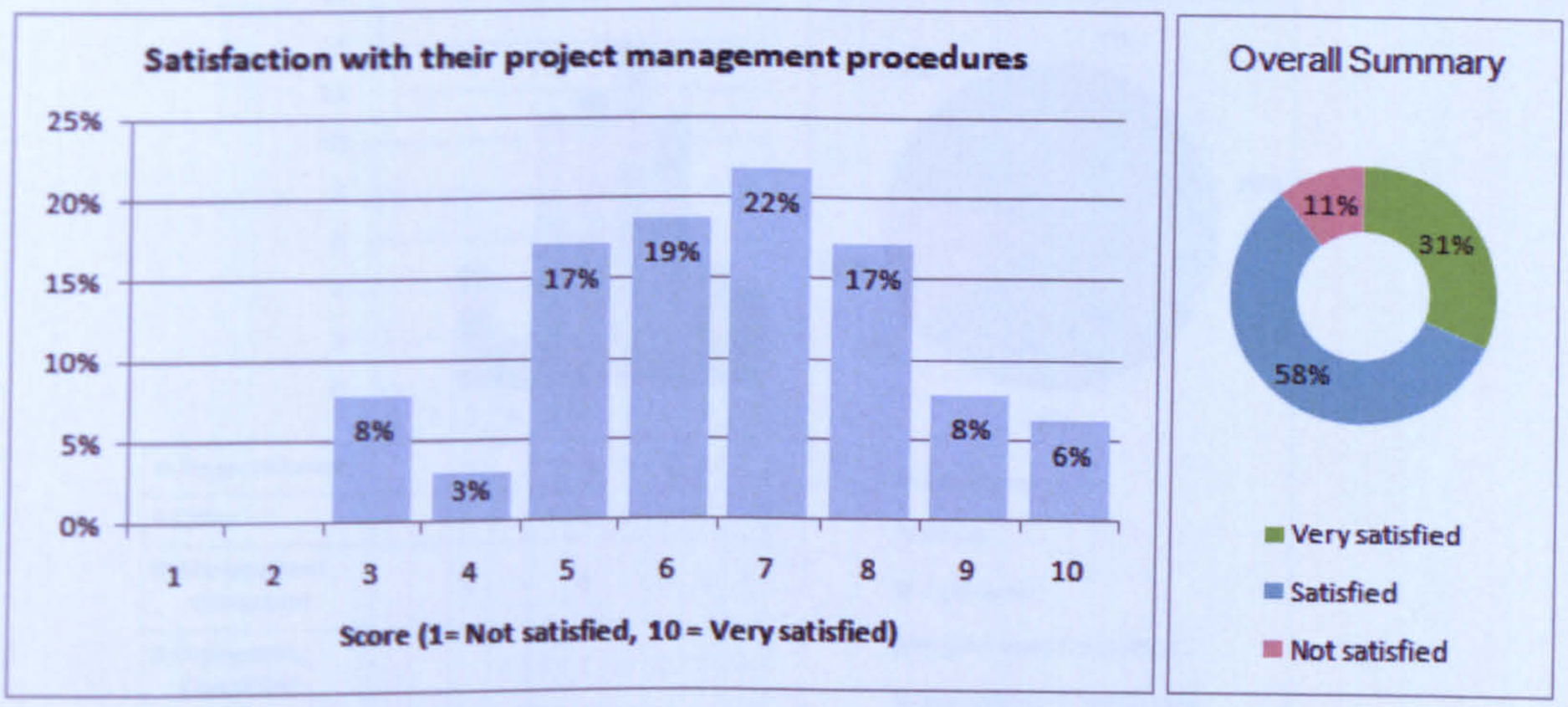


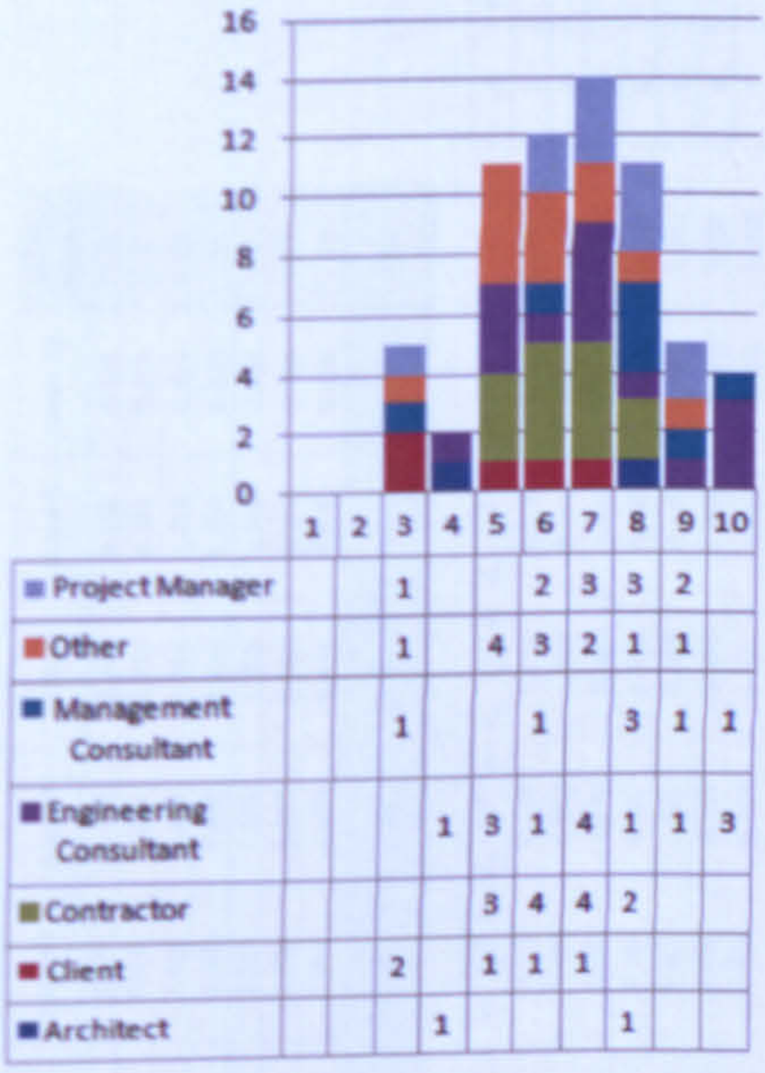
Figure 7-62 Question 21, Questionnaire survey results

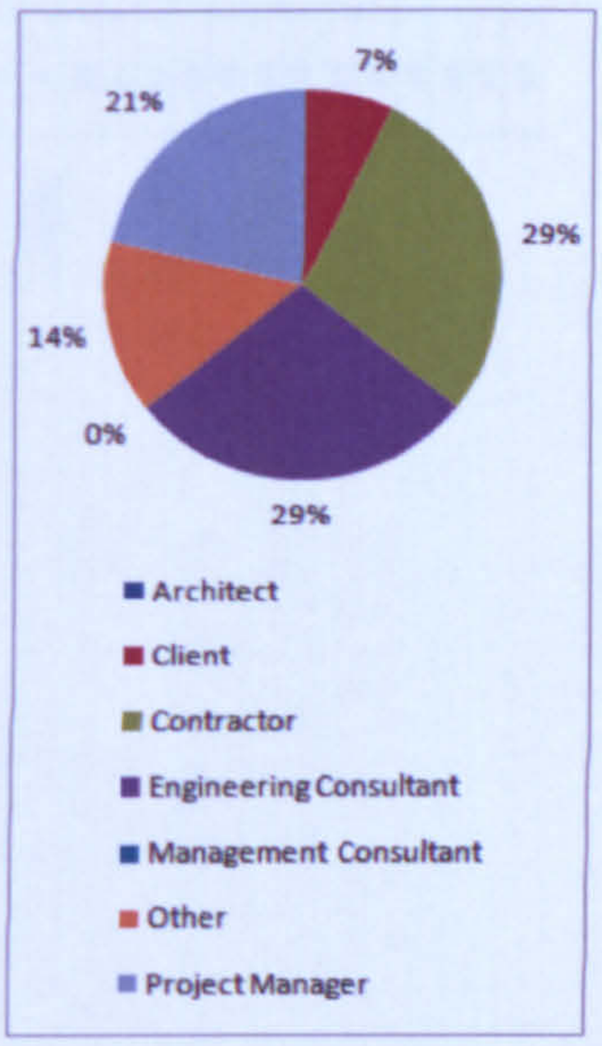
Analysis

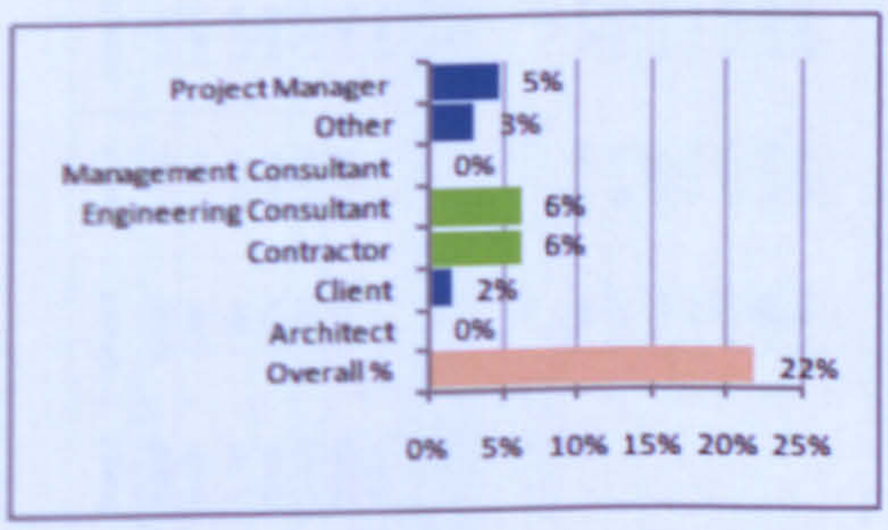
22% of respondents indicated a satisfaction with *their project* management procedures, by choosing a rating scale of 7.

Without having direct access to their project management procedures it is difficult to check if the results obtained via the survey correlate to what is actually in place. Also some respondents may have rated their organisation higher than usual. Having stated this, the spread of the results indicates a good coverage.

#21.0 How satisfied are you with your organisations project management procedures ? Row Labels	Colu 3	4	5	6	7	8	9	10	Grand Total
Architect		1				1			2
Client	2		1	1	1				5
Contractor			3	4	4	2			13
Engineering Consultant		1	3	1	4	1	1	3	14
Management Consultant	1			1		3	1	1	7
Other	1		4	3	2	1	1		12
Project Manager	1			2	3	3	2		11
Grand Total	**5**	**2**	**11**	**12**	**14**	**11**	**5**	**4**	**64**







"22% of respondents gave a score of 7 in relation to their organisation PM procedures. Engineering Consultant (6%) and Contractor (6%) representing the largest groups in the sample (n=64)."

Figure 7-63 Detailed analysis of Question 21

Chi Squared Test

The results of this survey were also analysed using the Chi square test and the results are shown overleaf:

Question 21

H_0 *Respondents are satisfied with their organisation's PM procedures*

H_1 Respondents are NOT satisfied with their organisation's PM procedures

OBSERVED VALUES

Categories	Score 1	Score 2	Score 3	Score 4	Score 5	Score 6	Score 7	Score 8	Score 9	Score 10	ROW TOTALS
Architect	0	0	0	1	0	0	0	1	0	0	2
Client	0	0	2	0	1	1	1	0	0	0	5
Contractor	0	0	0	0	3	4	4	2	0	0	13
Engineering Consultant	0	0	0	1	3	1	4	1	1	3	14
Management Consultant	0	0	1	0	0	1	0	3	1	1	7
Other	0	0	1	0	4	3	2	1	1	0	12
Project Manager	0	0	1	0	0	2	3	3	2	0	11
COLUMN TOTALS	0	0	5	2	11	12	14	11	5	4	64

EXPECTED VALUES

Categories	Score 1	Score 2	Score 3	Score 4	Score 5	Score 6	Score 7	Score 8	Score 9	Score 10	ROW TOTALS
Architect	0.000	0.000	0.156	0.063	0.344	0.375	0.438	0.344	0.156	0.125	2
Client	0.000	0.000	0.391	0.156	0.859	0.938	1.094	0.859	0.391	0.313	5
Contractor	0.000	0.000	1.016	0.406	2.234	2.438	2.844	2.234	1.016	0.813	13
Engineering Consultant	0.000	0.000	1.094	0.438	2.406	2.625	3.063	2.406	1.094	0.875	14
Management Consultant	0.000	0.000	0.547	0.219	1.203	1.313	1.531	1.203	0.547	0.438	7
Other	0.000	0.000	0.938	0.375	2.063	2.250	2.625	2.063	0.938	0.750	12
Project Manager	0.000	0.000	0.859	0.344	1.891	2.063	2.406	1.891	0.859	0.688	11
COLUMN TOTALS	0	0	5	2	11	12	14	11	5	4	64

	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	$(f_o - f_e)^2 / fe$	
Architect			0.156	14.063	0.344	0.375	0.438	1.253	0.156	0.125	16.909
Client			6.631	0.156	0.023	0.004	0.008	0.859	0.391	0.313	8.385
Contractor			1.016	0.406	0.262	1.002	0.470	0.025	1.016	0.813	5.009
Engineering Consultant			1.094	0.723	0.147	1.006	0.287	0.822	0.008	5.161	9.247
Management Consultant			0.375	0.219	1.203	0.074	1.531	2.684	0.375	0.723	7.185
Other			0.004	0.375	1.820	0.250	0.149	0.547	0.004	0.750	3.900
Project Manager			0.023	0.344	1.891	0.002	0.147	0.651	1.514	0.688	5.258
											55.892

Degrees of Freedom

(R-1)*(C-1)

(6-1)*(10-1)

5*9

45

Therefore H_0 is **ACCEPTED**

$$\chi 2 = \sum \frac{(fo - fe)2}{fe}$$

df	P = 0.05
1	3.84
2	5.99
3	7.82
4	9.49
5	11.07
6	12.59
7	14.07
8	15.51
9	16.92
10	18.31
11	19.68
12	21.03
13	22.36
14	23.69
15	25.00
16	26.30
17	27.59
18	28.87
19	30.14
20	31.41
40	55.76
50	67.50

Interpretation

From the survey results, 22% of respondents gave a score of "7" in relation to their firm's project management processes and procedures. Both Engineering Consultant and Contractor gave the highest scores to their respective organisations i.e. 6% of the 22% scores recorded.

The reason why these two groups are more satisfied that others is probably because they are in a better position, with regards to their position in the project supply chain, to see the benefits of their processes as they are involved in the delivery of tangible results.

Question 22

Generally speaking, if you would like to see an improvement in project management processes and procedures, what would these be?

Question type

Open-ended question.

Results

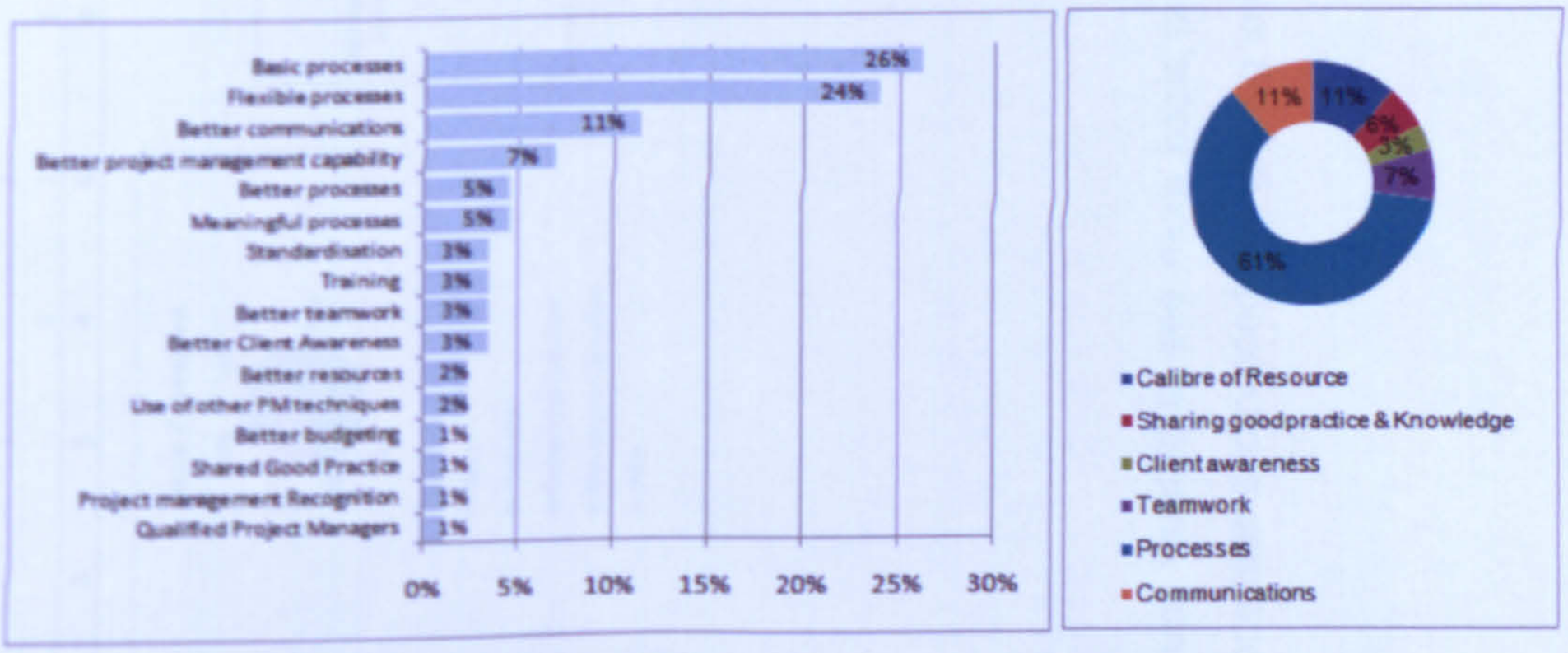


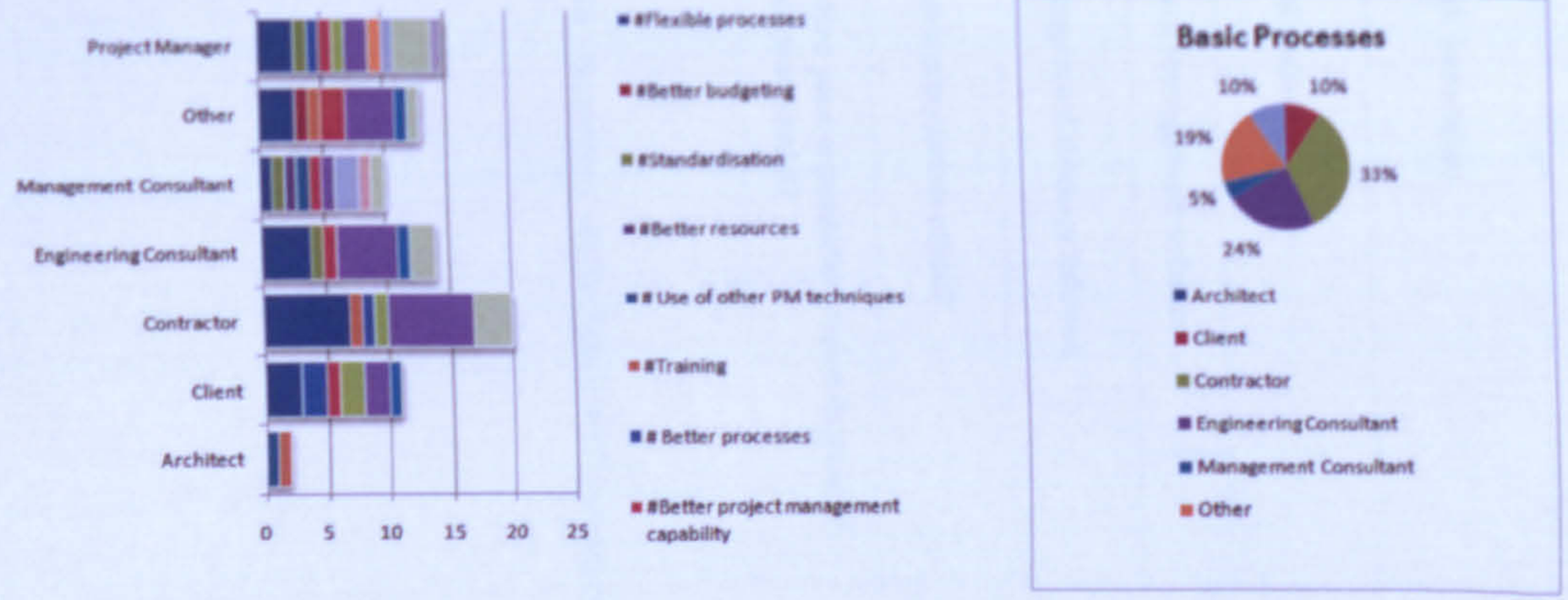
Figure 7-64 Question 22, Questionnaire survey results

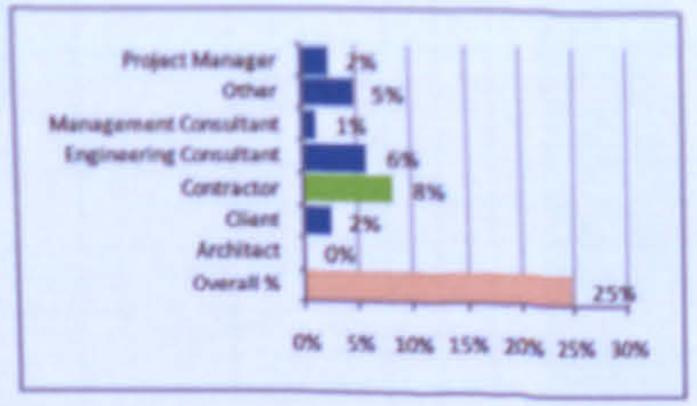
Analysis

This open-ended question generated many responses. All responses were recorded and they were grouped in accordance with the categories shown in figure 84. Further details of the comments can be seen in Appendix A6.

It is evident that respondents want more *basic and* flexible processes.

6.0 Which classification best describes your organisation?	Data #Flexible processes	#Better budgeting	#Standardisation	#Better resources	# Use of other PM techniques	#Training	# Better processes	#Better project management capability	#Meaningful processes	# Basic processes	#Better teamwork	# Project management Recognition	# Better Client Awareness	#Qualified Project Managers	#Better communications	#Shared Good Practice
Architect					1	1										
Client	3						2	1	2	2	1					
Contractor	7					1	1		1	7					3	
Engineering Consultant	4		1					1		5	1				2	
Management Consultant	1		1	1	1			1		1			2	1	1	
Other	3	1				1		2		4	1				1	
Project Manager	3		1				1	1	1	2		1	1		3	1
Grand Total	**21**	**1**	**3**	**1**	**2**	**3**	**4**	**6**	**4**	**21**	**3**	**1**	**3**	**1**	**10**	**1**





"25% of scores recorded by respondents indicate that they would like to see more basic processes and procedures. Contractor (8%) represent the largest group from this sample (n=70)."

Figure 7-65 Detailed analysis of Question 22

Interpretation

The results of this question demonstrated that all groups wanted to see more basic processes in place. The reason could be that most projects processes evolve into a complex network of processes and procedures leading to frustrations and even demotivated staff.

7.4 Summary of results from the questionnaire survey

A summary of the answers to all questions is shown in figures 7-66 to 7-68 inclusive.

Nr	Question Aim	Cronbach's Alpha	Response Summary
1	Name		
2	Organisation		
3	Department details		
4	Employees		*59% of respondents work for an organisation that employs more than 1,000 employees.*
5	Turnover		*86% of respondents indicate that their organisation has a turnover of more than 1,000,000 per annum.*
6	Organisation classification		*31% of respondents indicate that their organisation is mainly involved in projects as 'project manager'.*
7	Type of work undertaken		*33% of responses received indicate that the respondents undertook project management services as part of their regular service offering.*
8	Professional institutes		*18% of the total responses received, relate to membership of the UK's Association for Project Management (APM).*
9	Use of project management software		*47% of responses are recorded against the use of Microsoft Project.*
10	Project management ideology followed		*51% of responses recorded against the use of in-house processed /procedures for their project management needs.*
11	Do you have a programme office?		*30% of respondents indicate that they have a programme office within their organisation.*
12	How often does your organisation review its project management procedures?		*60% of respondents indicate that they only review their process and procedures when there is a business need to do so.*

Figure 7-66 - Summary of Questionnaire Survey results

Nr	Question Aim	Cronbach's Alpha	Response Summary
13	5 statements relating to project management issues	0.326 ×	
	Developing a high performance team		*58% Disagree*
	Having the right calibre of staff		*58% Disagree*
	Minimising changes to the project scope		*53% Agree*
	Managing the client's expectations		*93% Agree*
	Having the righ balance between process & project administration		*79% Agree*
14	What do you consider to be the common symptoms of project failure ?		*21% of responses are recorded against the 'lack of front end planning'. Respondents see this as the major cause of project failure.*
15	What are the main reasons why organisations follow a project management process ?		*30% of responses are recorded against 'to minimize risk to the organisation'.*
16	How were your project management procedures developed ?		*47% of responses are recorded against 'following in-house research and development work' category.*
17	Have you undertaken a project management maturity assessment of your organisation ?		*Only 6% of respondents indicate that they have undertaken a project management maturity assessment of their capabilities.*
18	Which project management ideology / methods are you familiar with ?		*18% of responses were recorded against the use of Earned Value in comparison to Critical Chain Project management (6%), Theory of Constraints (4%) and eXtreme Project Management (1%).*
19	Preferences regarding 8 most common methods / project management thinking	0.777 ✓	*Aggregate total of (41%) of respondents actually apply APM Body of Knowledge thinking to their projects.*

Figure 7-67 - Summary of Questionnaire Survey results (Cont'd)

Nr	Question Aim	Cronbach's Alpha	Response Summary
20	7 statements relating to project management issues	0.589 ×	
	There is too much emphasis on project management processes to the extent that it becomes an unnecessary administration burden		*39% Agree*
	Traditional project management methods are no longer appropriate for today's projects		*44% Disagree*
	The volume of procedures on projects is driven by client requirements		*49 % Agree*
	The volume of procedures on projects is driven by internal company policy		*68% Agree*
	Project success can be improved by the use of more agile solutions rather than relying on traditional project management methods		*80% Agree*
	Better calibre of project resource is required to ensure that projects are delivered successfully		*85% Agree*
	Project teams should be given more freedom to devise their own project management processes rather than forcing them to comply with standard procedures		*47% Agree*
21	How satisfied are you with your organisations project *management procedures?*		
	Rating (1) Least Satisfied		*0%*
	Rating (2)		*0%*
	Rating (3)		*8%*
	Rating (4)		*3%*
	Rating (5)		*17%*
	Rating (6)		*19%*
	Rating (7)		*22%*
	Rating (8)		*17%*
	Rating (9)		*8%*
	Rating (10) Most Satisfied		*6%*
22	Improvements they would like to see		*Basic and flexible processes*

Figure 7-68 Summary of Questionnaire Survey results (Cont'd)

7.5 Summary of the answers with the highest scores

The following provide a summary of the answers with the highest scores only:

Q	Question summary	Singular	Multiple	n	Overall %	Architect	Client	Contractor	Engineering Consultant	Management Consultant	Other	Project Manager
4	Number of employees > 1,000	●		67	59%	○ 0%	◔ 6%	◑ 12%	◕ 16%	○ 4%	◑ 15%	◔ 6%
5	Approximate turnover > £1,000,000	●		66	86%	○ 3%	◔ 8%	● 21%	◕ 17%	○ 5%	◕ 18%	◑ 15%
6	Organisation classification	●		67		○ 3%	◔ 7%	◕ 21%	◕ 21%	◔ 10%	◕ 21%	◕ 16%
7	Normal work undertaken		●	70		○ 0%	◔ 10%	◑ 12%	◕ 19%	◑ 14%	◕ 19%	● 26%
8	Professional bodies membership		●	70	36%	○ 0%	○ 2%	◔ 9%	◑ 14%	○ 2%	◔ 6%	○ 5%
9	Use of Microsoft Project		●	70	47%	○ 2%	○ 3%	◔ 10%	◔ 9%	○ 5%	◔ 9%	◔ 10%
10	Bespoke in-house processes /procedures		●	70	51%	○ 2%	◔ 6%	◑ 12%	○ 5%	◔ 6%	◔ 10%	◔ 10%
11	DONT have a programme office	●		63	70%	○ 3%	○ 3%	◑ 13%	◑ 13%	◔ 10%	◑ 14%	◑ 14%
12	Where there is a business need to do so	●		65	60%	○ 2%	○ 5%	◕ 17%	◑ 14%	○ 5%	◑ 12%	◔ 6%
13a	Developing a high performance team	●		64	58%	○ 2%	○ 5%	◑ 11%	◑ 13%	◔ 8%	◑ 13%	◔ 8%
13b	Having the right calibre of staff	●		65	58%	○ 3%	○ 5%	◑ 14%	◑ 11%	◔ 8%	◔ 9%	◔ 9%
13c	Minimising changes to project scope	●		64	44%	○ 2%	○ 2%	◔ 8%	◔ 8%	◔ 8%	◔ 9%	◔ 8%
13d	Managing the Client's expectations	●		66	44%	○ 1%	○ 3%	◑ 11%	◔ 7%	◔ 6%	◔ 7%	◔ 8%
13e	Having the right balance between process & administration	●		65	48%	○ 1%	○ 5%	○ 5%	◔ 10%	○ 5%	◑ 14%	◔ 8%
14	Lack of front end planning		●	70	21%	○ 1%	○ 2%	○ 4%	○ 4%	○ 2%	○ 5%	○ 4%
15	To minimise risk to the organisation		●	70	30%	○ 1%	○ 3%	○ 6%	○ 5%	○ 3%	◔ 7%	○ 5%
16	PM processes developed following in-house research and development work		●	70	47%	○ 1%	○ 5%	◔ 10%	◑ 11%	○ 3%	◔ 9%	◔ 9%
17	HAVE NOT carried out a PM maturity assessment	●		63	94%	○ 3%	◔ 6%	◕ 18%	◕ 19%	◑ 11%	◕ 19%	◕ 18%
18	Familiarity with earned value		●	70	18%	○ 1%	○ 2%	○ 2%	○ 2%	○ 1%	○ 5%	○ 4%
19a	Never use PRINCE2	●		47	55%	○ 2%	◔ 9%	◕ 19%	◔ 6%	○ 0%	◑ 11%	◔ 9%
19b	Never use MSP	●		47	55%	○ 2%	◔ 9%	◕ 19%	◔ 6%	○ 0%	◑ 11%	◔ 9%
19c	Never use PMI BoK	●		44	55%	○ 0%	◔ 7%	◕ 20%	○ 5%	○ 5%	◔ 9%	◔ 9%
19d	Never use APM BoK	●		67	55%	○ 3%	◔ 8%	● 23%	◑ 13%	○ 5%	○ 3%	○ 0%
19e	Never use BS6079	●		48	54%	○ 2%	◔ 6%	◕ 17%	◔ 10%	◔ 6%	◔ 8%	○ 4%
19f	Never use CCPM	●		43	72%	○ 2%	◑ 12%	◕ 19%	◑ 12%	◔ 9%	◔ 9%	◔ 9%
19g	Never use XPM	●		39	90%	○ 3%	◑ 13%	● 26%	◑ 15%	◔ 10%	◑ 13%	◔ 10%
19h	Never use TOC	●		39	82%	○ 5%	◑ 13%	● 23%	◔ 10%	◔ 8%	◑ 13%	◔ 10%
20a	Too much emphasis on process that it becomes a burden	●		64	34%	○ 0%	○ 3%	◑ 11%	◔ 8%	○ 3%	◔ 6%	○ 3%
20b	Disagree - Traditional PM not longer appropriate to today's projects	●		64	44%	○ 0%	○ 5%	◔ 8%	○ 2%	○ 5%	◑ 11%	◑ 14%
20c	Volume of procedures is driven by client requirements	●		64	38%	○ 0%	○ 3%	◔ 8%	◔ 9%	○ 3%	◔ 8%	◔ 6%
20d	Volume of procedures is driven by internal company policy	●		64	59%	○ 0%	○ 3%	◑ 14%	◑ 13%	◔ 8%	◑ 14%	◔ 8%
20e	Project success can be achieved by more agile methods than traditional	●		64	58%	○ 0%	○ 2%	◑ 11%	◑ 14%	◔ 8%	◑ 13%	◑ 11%
20f	Better calibre resources required	●		64	47%	○ 0%	○ 5%	◔ 9%	◔ 8%	○ 5%	◔ 6%	◑ 14%
20g	Project teams should be given greater freedom	●		64	38%	○ 2%	○ 5%	◔ 9%	◔ 9%	○ 3%	◔ 6%	○ 3%
21	% of respondent scoring 7 for their organisations PM	●		64	22%	○ 0%	○ 2%	◔ 6%	◔ 6%	○ 0%	○ 3%	○ 5%
22	Basic Processes		●	70	25%	○ 0%	○ 2%	◔ 8%	◔ 6%	○ 1%	○ 5%	○ 2%

7.6 Summary of results

Emerging themes from the questionnaire survey

From the survey undertaken the following themes have emerged:

- 59% of respondents have over 1,000 employees working in their organisation. *Engineering Consultant (16%) represents the largest group from this sample (n=67).*

- 86% of respondents have a turnover greater than £1,000,000. *Contractor (21%)* represents the largest group from this sample (n=66).

- 36% of scores indicated that respondents belong to 'other' professional bodies. Engineering Consultant (14%) represents the largest group from this sample (n=70).

- 47% of scores indicate that respondents use Microsoft Project. Both Contractor (10%) and Project Manager (10%) represents the largest groups from this sample (n=70).

- 51% of scores indicated that respondents follow bespoke in-house processes / procedures. Contractor (12%) represents the largest group from this sample (n=70).

- 70% of respondents stated that they DO NOT have a programme office within their organisation. Project Manager (14%) and Other (14%) represents the largest groups from this sample (n=63).

- 60% of respondents stated that they only review their procedures when there is a business need to do so. Contractor (17%) represents the largest group from this sample (n=65).

- 58% of respondents agree that developing a high performance team is important. Engineering consultant (13%) and Other (13%) represents the largest groups from this sample (n=64).

- 58% of respondents agree that having the right calibre of staff is important for successful projects. Contractor (14%) represent the largest group from this sample (n=65).

- 44% of respondents agree that changes to the project scope should be minimised. Other (9%) represents the largest group from this sample (n=64).

- 44% of respondents agree that managing client's expectations is important. Contractor (11%) represents the largest group from this sample from this sample (n=66).

- 48% of respondents agree that there must be the right balance between process and administration. Other (14%) represents the largest group from this sample (n=65).

- 21% of scores indicated that respondents believe that lack of front end planning is the cause of project failure. *Other (5%) represents the largest group from this sample* (n=70).

- 30% of scores indicate that respondents use process to minimise risk to their organisation. Other (7%) represents the largest group from this sample (n=70).

- 47% of scores indicate that PM processes have been developed in-house. Engineering Consultant (11%) represents the largest groups from this sample (n=70).

- 94% of respondents indicate that they have NOT carried out a PM maturity assessment within their organisation. Engineering Consultant (19%) and Other (19%) represents the largest groups from this sample (n=63).

- 18% of scores indicate that respondents are familiar with Earned Value. Other (5%) represents the largest group from this sample (n=70).

- 55% of respondents state that they NEVER use PRINCE2. Contractor (19%) represents the largest group from this sample (n=47).

- 55% of respondents state that they NEVER use MSP. Contractor (19%) represents the largest group from this sample (n=47).

- 55% of respondents state they NEVER use PMI BoK. Contractor (20%) represents the largest groups from this sample (n=44).

- 55% of respondents state that they NEVER use APM BoK. Contractor (23%) represents the largest groups from this sample (n=67).

- 54% of respondents state they NEVER use BS 6079. Contractor (17%) represents the largest group from this sample (n=48).

- 72% of respondents state they NEVER use CCPM. Contractor (19%) represents the largest group in this sample (n=43).

- 90% of respondents NEVER use XPM. Contractor (26%) represents the largest group from this sample (n=39).

- 82% of respondents indicate that they NEVER use TOC. Contractor (23%) represents the largest group from this sample (n=39).

- 34% of respondents state that there is too much emphasis on process that it becomes a burden for projects. Contractor (11%) represents the largest group from this sample (n=64).

- 44% of respondents DISAGREE that traditional PM is no longer applicable to today's projects. Project Manager (14%) represents the largest group in this sample (n=64).

- 38% of respondents agree that the volume of procedures is driven by client requirements. Engineering Consultant (9%) represents the largest group from this sample (n=64).

- 59% of respondents agree that the volume of procedures is driven by internal company policy. Contractor (14%) and Other (14%) representing the largest groups in this sample (n=64).

- 58% of respondents agree that success can be achieved by more agile methods than traditional methods. Engineering Consultant (14%) represents the largest group from this sample (n=64).

- 47% of respondents agree that better calibre of resources are required for project success. Project Manager (14%) represents the largest group from this sample (n=64).

- 38% of respondents agree that project teams should be given greater freedom to conduct their tasks. Engineering Consultant (9%) and Contractor (9%) represent the largest groups in this sample (n=64).

- 22% of respondents gave a score of 7 in relation to their organisation PM procedures. Engineering Consultant (6%) and Contractor (6%) representing the largest groups in the sample (n=64).

- 25% of scores recorded by respondents indicate that they would like to see more basic processes and procedures. Contractor (8%) represent the largest group from this sample (n=70).

For further details can be found in Appendix A4.

7.7 Conclusion

This chapter provided an overview of the questionnaire survey that was conducted in 2008. The survey had a response rate of 55%.

22 questions containing a mixture of open, closed and Likert-type were asked of respondents. Whilst the majority of respondents resided in the UK some were from Ireland, USA, Spain and Pakistan. To assist in the analysis of the data from this survey, respondents were divided into the six categories i.e. Project manager, Management consultant, Engineering Consultant, Contractor, Client, Architect and Other.

Where considered appropriate further analysis in terms of hypothesis testing was performed using Pearson's Chi Square test of equality of proportions. Alternative statistical methods could have been used if more data were made available from the questionnaire survey.

The main findings from this survey that support the main research area of this thesis are:

- Most firms developed their project management processes as a result of in-house development.

- Project management procedures were only updated when there was a business need to do so.

- Not many firms were familiar with methods, tools and techniques that fell under the Adaptive Project Management category.

- The majority of firms surveyed, did not have a programme management office within their organisation.

- It was considered important to develop a high performance team for project success.

- The vast majority of firms surveyed have not undertaken a project management maturity of their organisation.

- Respondents agree that the volume of procedures is driven by internal company policy.

- Respondents agree that project success can be achieved through the use of more agile methods.

8 KEYWORD ANALYSIS

8.1 Introduction

In addition to the questionnaire survey, an analysis of keywords was undertaken to see changes in project management trends over the years.

All academic journals and papers contain keywords. These keywords provide readers with a quick glance at specialist topics discussed within the paper and also provide a means for searching these topics when using electronic databases. The analysis of keywords consisted of recording all keywords that appeared in journals within a certain time period, counting them and ranking them in terms of highest count. This exercise was carried out using the online researching tool and recording such words in an excel spreadsheet. The results of this exercise are shown in the following sections.

The objective of conducting this analysis was to see how the range of topics published in project management journals, have changed over the years.

It was decided to use the International Journal of Project management (IJPM) for the keyword analysis as it is seen as the leading body for the publication of project management literature. Using the Science Direct portal through Kingston University, we were able to review all journals from 1983 to 2010 inclusive. Figure 8-1 shows a summary of the number of papers and keywords reviewed during the 28 year timeframe.

Keyword Analysis (International Journal of Project management)*	1983-1989	1990-1999	2000-2009	2010**	Overal Total
Time frame	7 Years	10 Years	10 Years	1 Year	28 Years
Number of papers	493	392	672	306	1,863
Total Number of key words	890	1,567	2,956	363	5,776

* Analysis based upon journals available on Science Direct International, 2010

** Only one year of data

Figure 8-1 Keyword Analysis Summary

The methodology adopted for the key word research was as follows:

- Record the title of the paper along with the keywords on a spreadsheet.
- Sort and filter common keywords applicable to multiple papers.
- Count the number of keywords and rank them in order of highest occurring keywords.

Figure 8-2 shows a brief extract of a spreadsheet that was used to collate data for the keyword analysis.

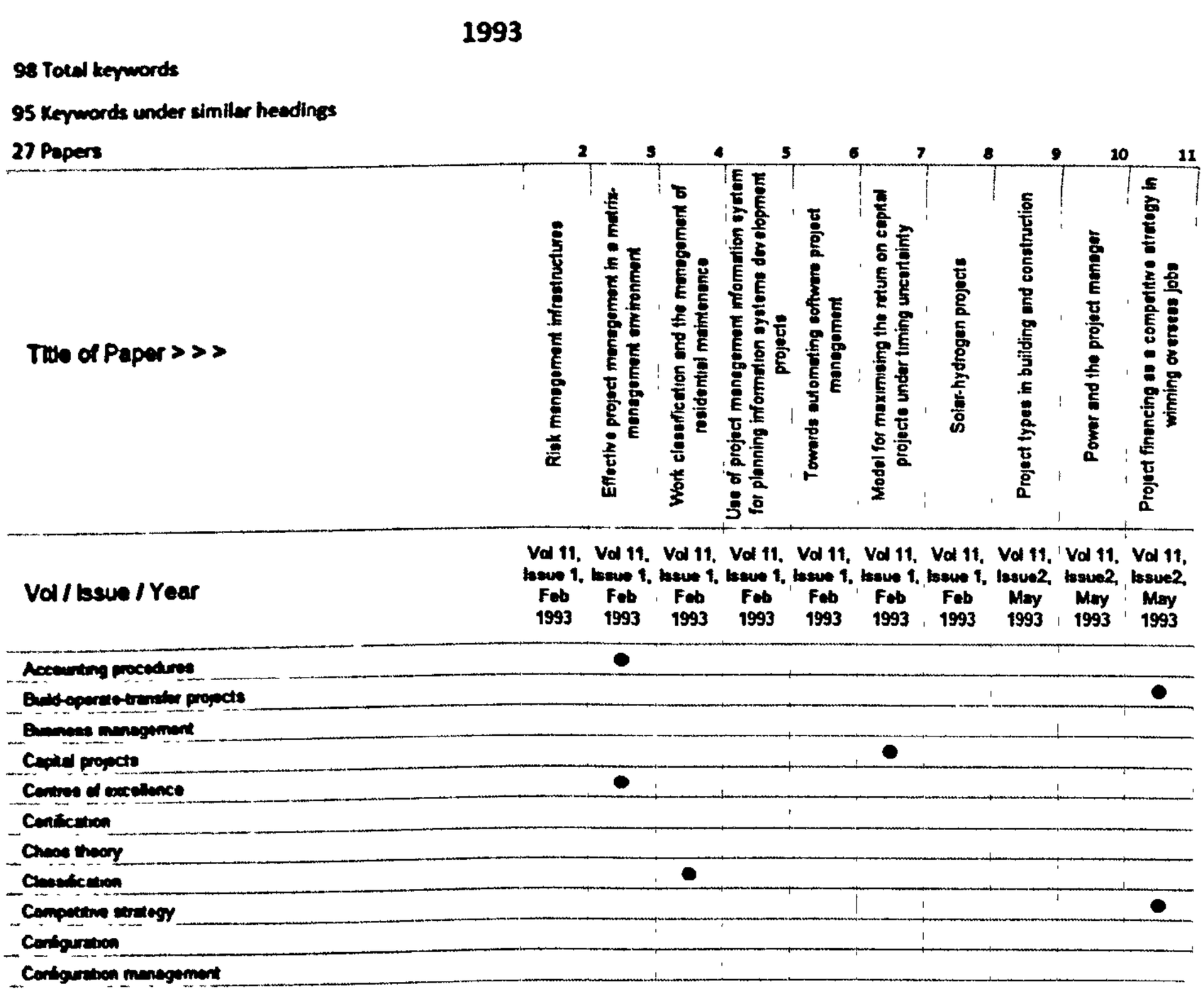


Figure 8-2 Extract from the spreadsheet used for the Keyword Analysis

- The analysis was further broken down into four categories, Keywords, Tools & Technique, Industry, and Country / Region.
- The Top 10 keywords for each year were then displayed for each category.

The results from the analysis were modified because the highest occurring keyword was 'project management'. This was removed so as to get a better idea of which topics ranked the highest.

From the analysis conducted the following are the main findings:

- The most popular keyword is 'Construction'.
- The most popular tool & technique is 'Planning'.
- The most popular industry is 'Construction'.
- The most popular region is 'China'.

The entire 28-year results from the above can be seen in the following charts in figures 8-3, 8-4, 8-5 and 8-6.

Trends regarding the use of keywords (1983 – 2010)

During the 28-year period the most popular keywords have been in relation to the construction industry and that the main focus of most papers has been on the 'hard' tools and techniques of project management. In 2010 the most popular keyword is 'change' possibly indicating a slight shift in emphasis to more 'softer' project management issues.

Trends regarding the use of tools & techniques (1983 – 2010)

The keywords during this time frame have largely focused around construction, planning, risk management and management techniques.

Trends regarding the Industry (1983 – 2010)

The majority of keywords have been in relation to the construction industry. One possible reason for this is that the construction industry has been instrumental in applying the traditional project management *principles* to its projects. It provides a steady test bed for the implementation and evaluation of new ideas.

Trends regarding Country / Region (1983 – 2010)

A good coverage of the countries has been represented by the papers in the IJPM. 'China' is the most occurring keyword *followed by 'Australia' and then the* developing nations.

During the time frame under investigation, China's economy has been growing and again this has presented an opportunity to write papers about the latest *developments in projects* in this region.

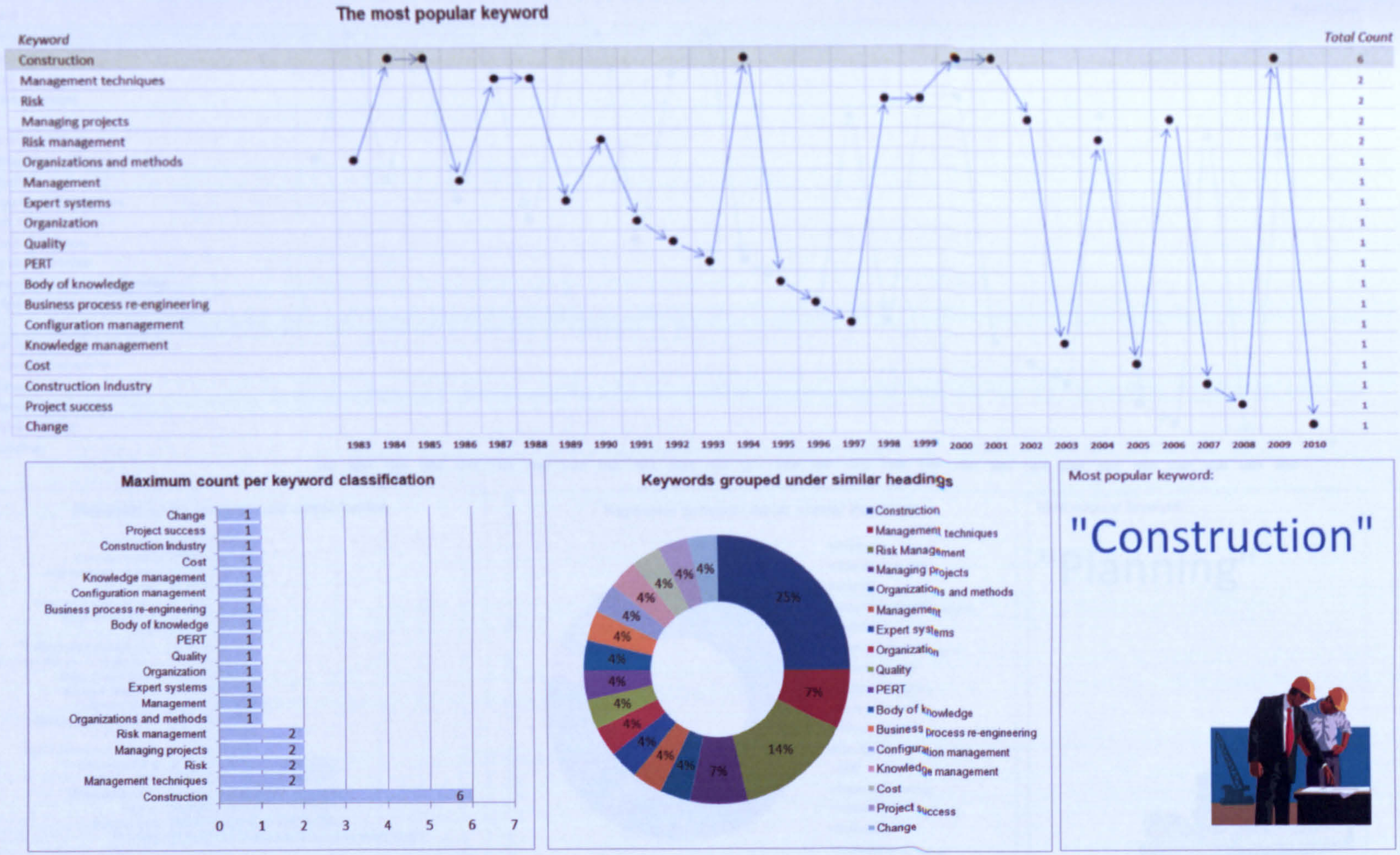
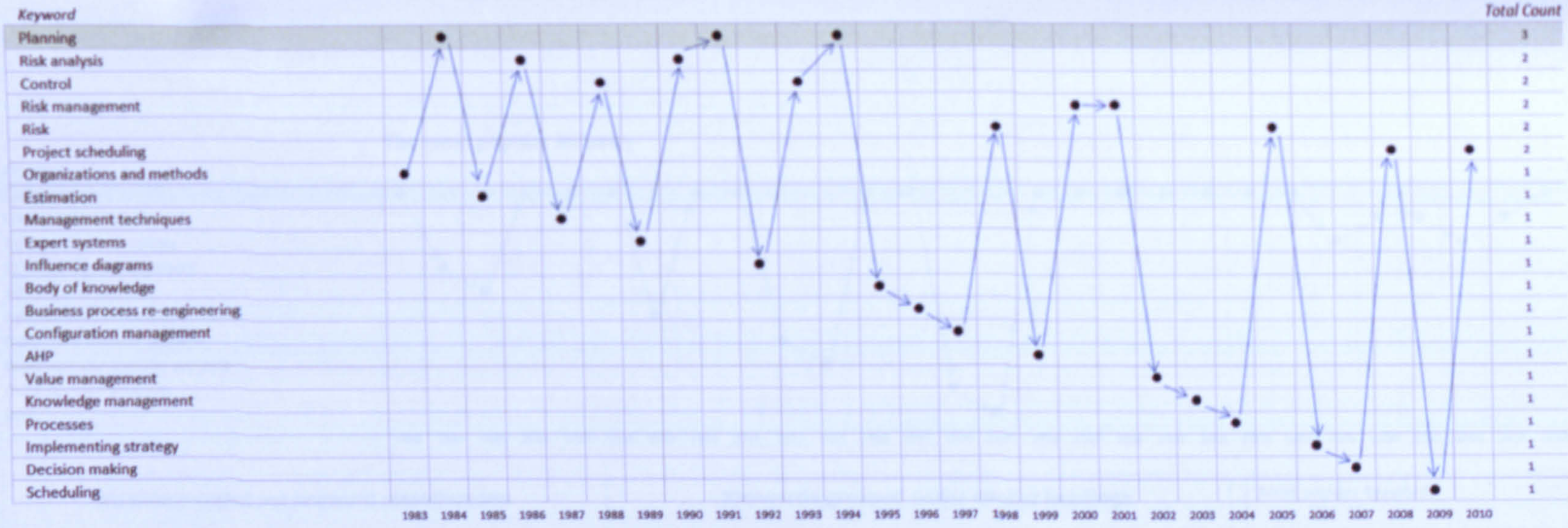
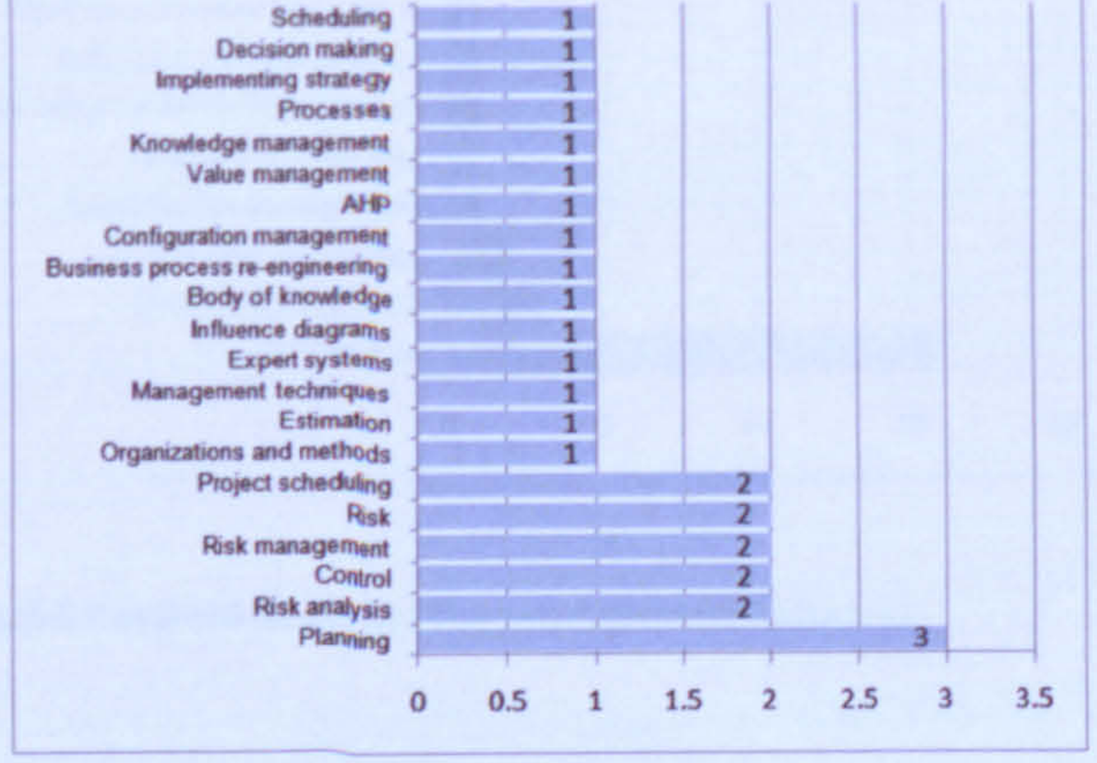


Figure 8-3 Keyword Analysis (The most popular keyword)

The most popular tool & technique





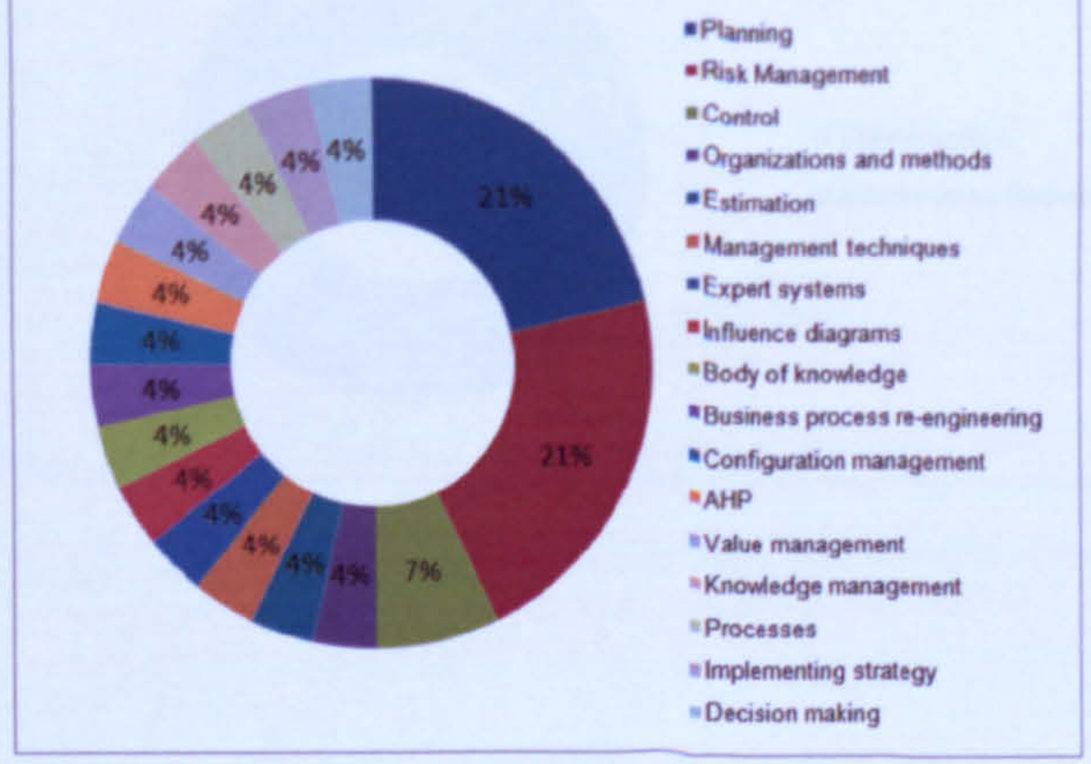


Figure 8-4 Keyword Analysis (The most popular tool & technique)

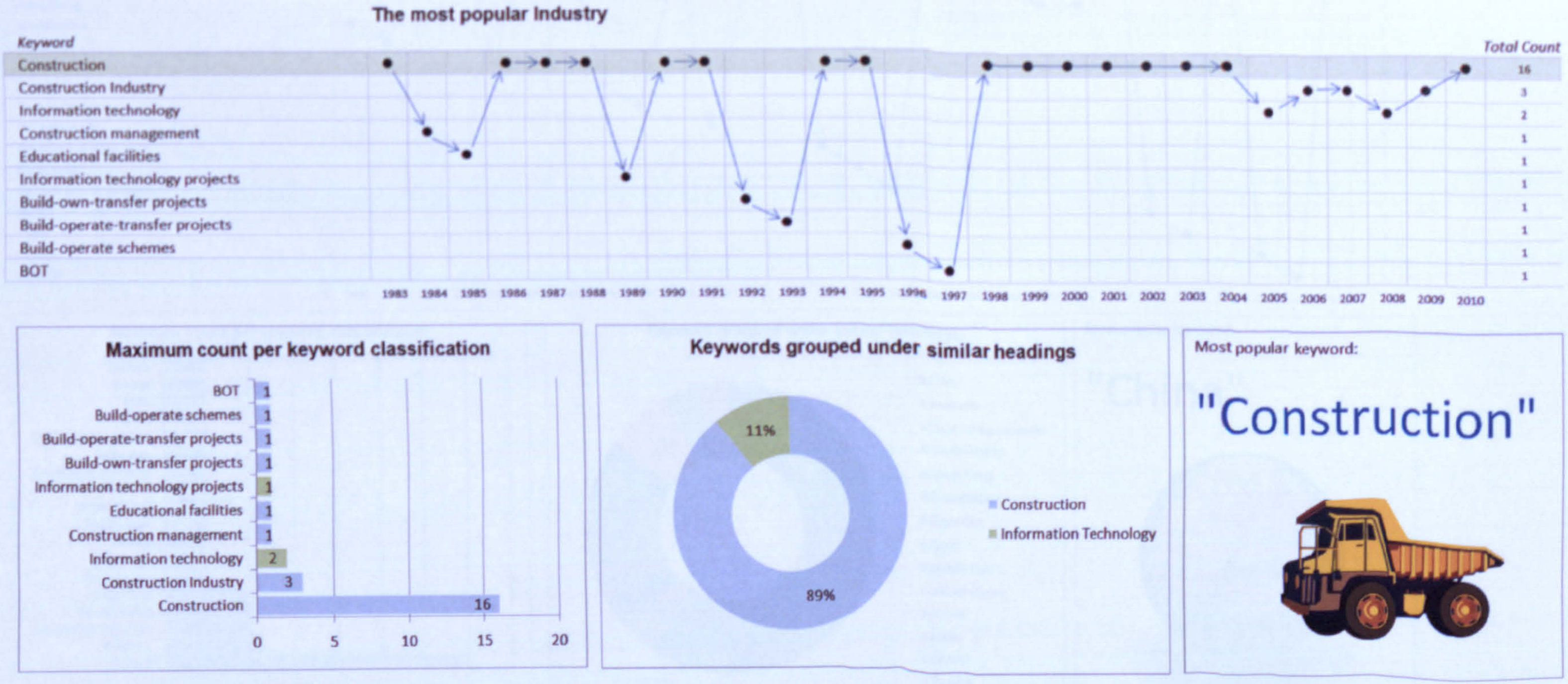


Figure 8-5 Keyword Analysis (The most popular industry)

The most popular Region / Country

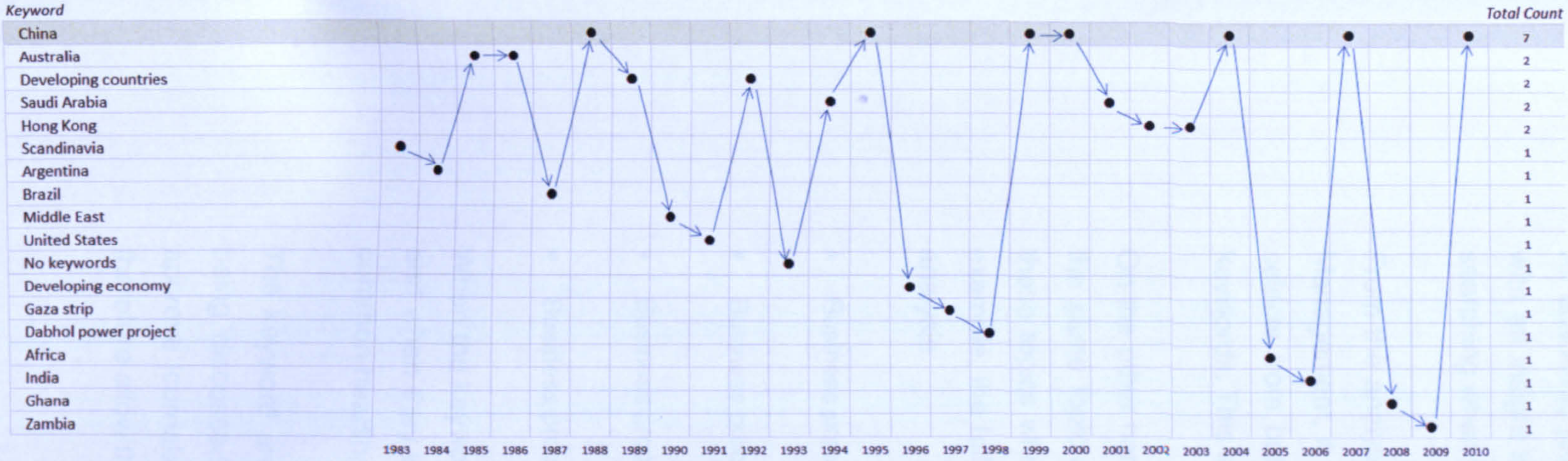


Figure 8-6 Keyword Analysis (The most popular Region / County)

8.2 Limitations of the Keyword Analysis

All academic journals and papers contain 'keywords' so as to provide the reader with an insight into the key topics in the paper and also to serve as a means for searching when using electronic database systems.

From the analysis of the journals published by the International Journal of Project Management, it was noted that there is not a fixed list of keywords that an author selects from but that the author has some degree of freedom to introduce new keywords. This allows for a wide range of keywords under a subject area.

On the other hand this can also lead to some inconsistency in terms of describing the same topic under different headings which will tend to distort the ranking of these topics when using the keyword analysis as described in this research. For example, the following keywords were encountered whilst conducting the keyword analysis:

- Business process modeling
- Business process monitoring
- Business process re-engineering
- Business process engineering

When the keyword analysis was carried out the above were counted individually as and when they were recorded in other journals, they were not grouped under the common heading of say 'Business process'.

The keyword analysis can be seen a crude measure to gauge change in topics being discussed. The reason for this is that the researchers / academics who approve journals for publication may have a vested interest in certain areas and therefore allow the publication of certain topics i.e. risk management.

8.3 A new pictogram for project management

Based upon the review of the keyword analysis and the feedback from the questionnaire survey, the author concluded that there is a need for a new pictogram.

Traditionally, the iron triangle has been used for students of project management. This pictogram is over simplistic and could be further enhanced in order to demonstrate the salient parts of good project management.

In addition to this, the key player in project management is the 'individual'. It is important to have a pictogram that starts with and focuses on the individual and then builds upon this to a much fuller picture of the wider aspects of project management.

At the heart of good project management is the 'individual'. The individual, as a single person, has the ability to make the difference between project success and failure.

In today's climate, there is too much emphasis on 'copying' others and applying the same techniques and principles on projects in order to mimic the same or achieve better results. Whilst there is a great deal to learn from other projects the same results may not be emulated due to the attitude and behavior of individuals making up a team.

The basis of good project management starts within oneself.

Our values and beliefs dictate how we behave and it is this positive behavior that needs to coexist in project teams so that the challenges can be faced effectively and with creativity.

The individual should be made to feel motivated and energised to perform better. This is a necessity if challenging projects are to be delivered to Client and team expectations.

A poem by Jalalud'din Rumi, one of the world's most revered mystical poets of the 13th Century, can be used to emphasise the need for superior performance by the individual.

You were born with potential

You were born with goodness and trust

You were born with ideals and dreams

You were born with greatness

You were born with wings

You are not meant for crawling, so don't.

You have wings

Learn to use them, and fly.

The project manager must act and influence so as to create the ideal conditions within which each individual performs at the top of their capabilities.

The new pictogram has 6 zones as depicted in figure 8-7.

Zone 1 – The Individual

The Individual is ultimately central to the effective and efficient use of project management principles, methodologies, tools and techniques. It therefore follows that the individual must be open and receptive to new ideas and challenges whilst learning from past successes and mistakes. This is paramount if the Individual is to ultimately grow into a project management position.

The Individual must constantly strive to develop a full set of attributes that allow him or her to effectively participate as a team member and ultimately prepare themselves *for the position* of project manager. The Individual must have drive and enthusiasm to take on new challenges and *develop a sense of perception* so that they know when to use project management knowledge appropriately.

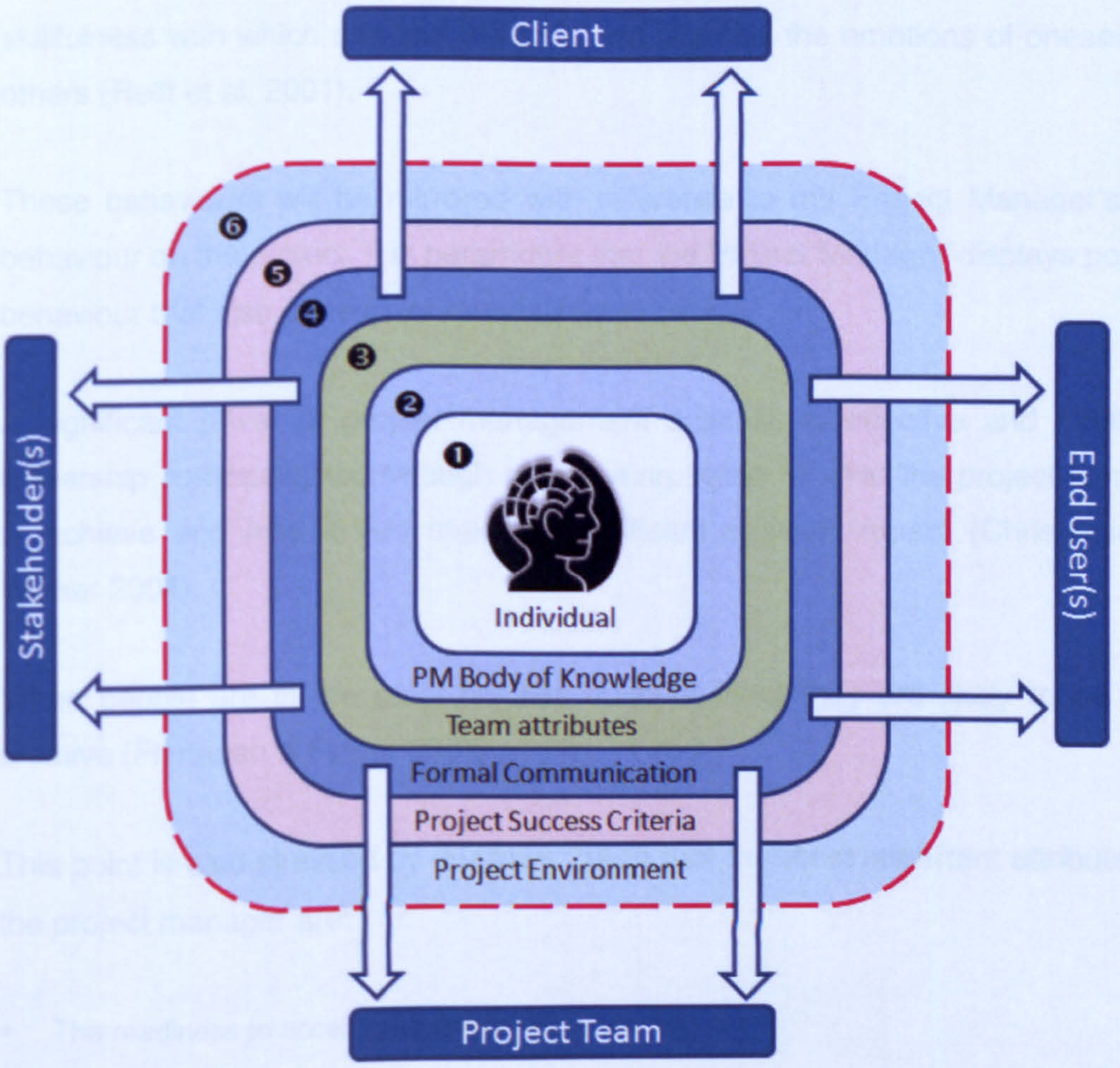


Figure 8-7 A revised pictogram for project management

Zone 2 – The Project Management Body of Knowledge

For the Individual to be effective there is a need to understand the basic building blocks of project management. This basic understanding can be obtained from any one of the leading BoKs from the leading institutions e.g. PMI BoK

Zone 3 –Team Attributes

The Individual may now be working as a Team Member on a project. This may involve interaction with other team members and stakeholders. It is important that as Team Member, the Individual displays positive attitudes and behaviours.

The individual needs to have good levels of emotional intelligence in order to work effectively with peers and colleagues. Emotional intelligence refers to the skillfulness with which one can mediate and regulate the emotions of oneself and others (Reiff et al. 2001).

These behaviours will be mirrored with reference to the Project Manager's own behaviour on the project. It is paramount that the Project Manager displays positive behaviour that also engenders enthusiasm in others.

A significant driver of project management success is effective and intelligent leadership communicated through an inspiring vision of what the project is meant to achieve and how it can make a significant positive impact (Christenson & Walker 2004).

When people are in the most positive state of mind they are likely to be most creative (Flanagan & Finger 2003).

This point is also stressed by (Hallows 2002) that the most important attributes for the project manager are:

- The readiness to accept ownership of a situation
- Persistence
- A positive attitude
- Good planning and organisational skills
- The ability to delegate authority
- The ability to tailor communications to the audience
- The ability to establish and maintain focus
- The ability to evaluate before judging
- The willingness to escalate issues

Zone 4 – Formal Communication

In this zone, the critical exchange of information takes place between the four main groups. The Client's expectations must be managed and a good rapport must be established by the Project Manager.

Stakeholders must be consulted and their concerns and issues must be logged, track and resolved as far as reasonably possible. The Client must be made aware of all issues and any consequences that may ensue as a result of not complying with stakeholder requirements.

End Users must be notified well in advance of how the project will impact them and what measures they should be taking in order to maximise their benefit from the project.

The project team must be managed so that morale is at the appropriate level for maximum team creativity and problem solving.

Zone 5 – Project Success Criteria

This zone is where the original Iron Triangle comes into play. Instead of Cost, Time and Performance, we have called it Cost, Time and Standards. Standards can imply Quality, Health & Safety, Environment or any other standard deemed important for the project.

Critical Success Factors or Project Success Criteria can also be considered in this zone.

Zone 6 – The Project Environment

The last zone relates to the project environment. The project team cannot operate separately from this environment. The complexity and unknowns lie in this zone and must be managed accordingly by the project team.

Keywords grouped under the headings of the new pictogram

The individual headings of the new pictogram can also be used to see how the keywords have varied over the years in relation to this. In figure 8-8, the results are shown and it is interesting to note that very little has been written about the role of the individual in relation to project management. Topics such as leadership, emotional intelligence and coping with stresses and strains of working in a pressurised project environment would prove to be useful.

Traditionally topics in journals have concentrated on the hard aspects of project management. How to plan better; with more accuracy and how to overcome the human side of it seem to be regular features over the past years.

There is ample process and procedures regarding project management and the focus should now shift to the soft skills of the project manager and team member. People deliver projects and they will know when to take evasive action. Their behavior cannot be predicted and every movement cannot be prescribed to them in minute detail.

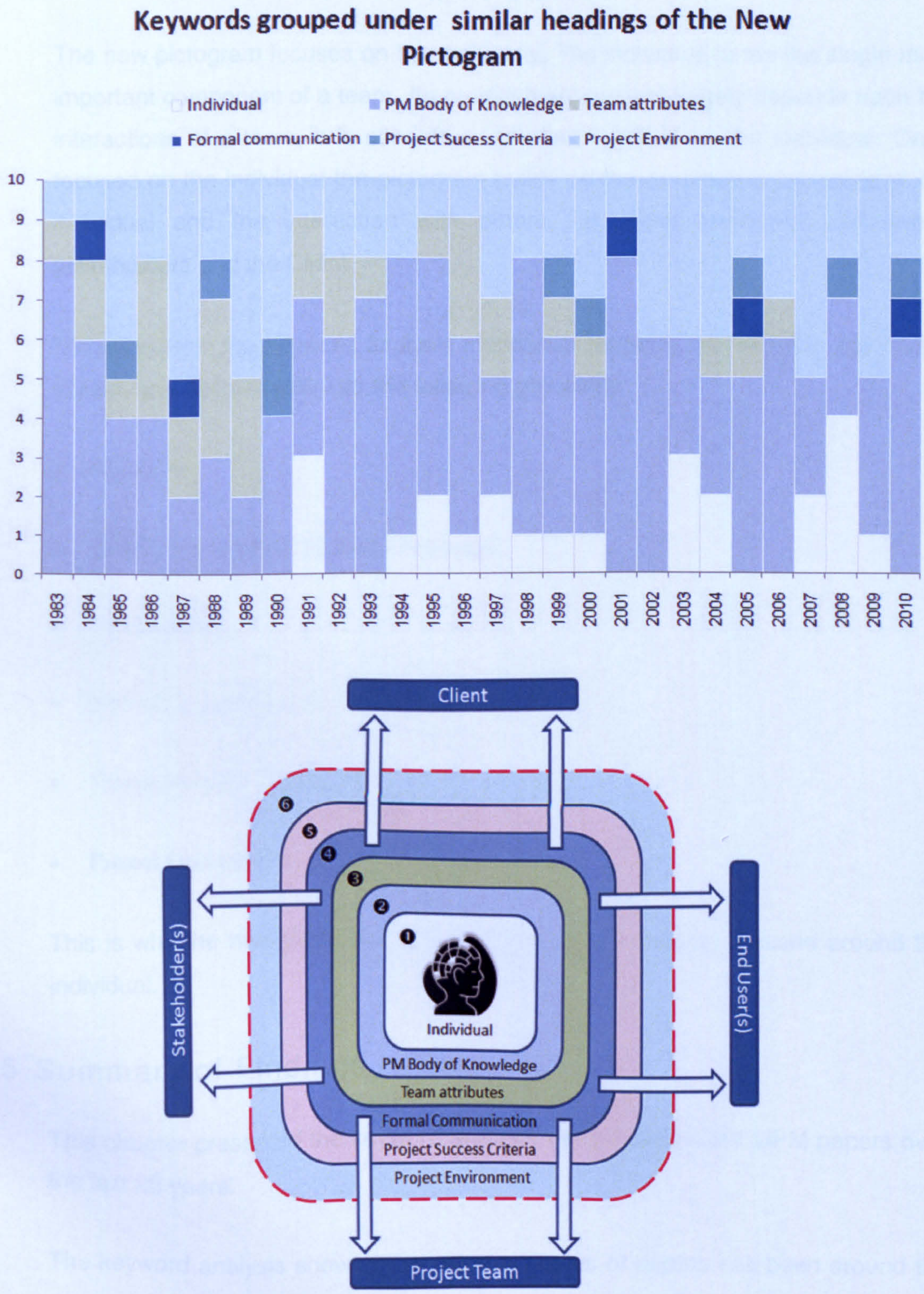


Figure 8-8 Keywords group under the headings of the new pictogram

8.4 Justification for the new pictogram

The new pictogram focuses on the individual. The individual forms the single most important component of a team. As project management largely depends upon the interactions of a team, it is considered prudent to focus on the individual. Once focused on the individual the pictogram builds on the developmental needs of the individual and the interaction with others, i.e. team members, end users, stakeholders and the Client.

Following from the keyword analysis mentioned earlier in this chapter, the review of keywords fell naturally into the following groupings:

- Individual
- Project Management Body of Knowledge
- Team attributes
- Formal communication
- Project Success Criteria
- Project Environment

This is why the new pictogram contains the above headings focused around the individual.

8.5 Summary of Findings

This chapter presented the keyword analysis carried out on the IJPM papers over the last 28 years.

The keyword analysis showed that the main focus of papers has been around the construction industry and around the hard skills like planning and risk management. Some articles have been written on the softer side of project management but not as much as other topics.

The positive output from the keyword analysis is that it allowed the author to develop a new pictogram that can be used for educational purposes. It can be used to educate students of project management and equally for the induction of project team members, before they are officially assigned to a project.

The individual is the most important player in the project team. The right individual with the right drive and attributes can become an invaluable team member and one day rise to the rank of project manager. Employing and empowering individuals to perform better is critical for project success and the project manager is instrumental in promoting this whenever he or she can.