Project Risk Management in Smaller Software Teams

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"If you are not managing risk, you are managing the wrong thing."

- Rear Admiral Bill Carson. (Hobbs & Brown, 1987)

Preamble

The reader may find it useful to have an understanding of my background and motivation to do this work. My experience in the Information Technology domain spans more than 22 years. It includes many facets of Information Systems practice. For much of this time I worked in project teams before actually leading them. I have over 10 years experience in managing projects for various types of organisations. I also have several years experience in designing project management procedures.

I found that my colleagues and I would often wrestle with similar issues. The same sorts of project management problems appeared to repeat themselves in different organisations over a prolonged period of time. These experiences generated my interest in these issues. I was aware that these were not new problems to either practice or academia yet the same sorts of issues continued to arise in the field. I pondered whether academia could be contributing more to the improvement of the practices actually used by practitioners. Thus I became motivated to do this research.

When I began my studies my knowledge of the current state of the academic literature was very limited. I completed the equivalent of 3 master's level papers on background work into the state of knowledge in the literature before beginning this thesis. This thesis itself suggests further areas of potential research. My quest for knowledge and improvement in practices in this important area is an ongoing one.

Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material which to a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

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The participants in this research deserve special thanks. Without their time and efforts this research would not have been possible. Unfortunately they must remain anonymous. However it is hoped their contributions will aid our understanding of this important topic.

I wish to thank my family who supported and encouraged me throughout. I also appreciate the various people in the school who helped and supported me, particularly Krassie Petrova, the postgraduate programme leader.

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Abstract

This thesis investigates project risk management issues in smaller software teams. Certain gaps in the literature are identified. There is limited literature on what risk management techniques software practitioners use. The studies that are published tend to focus on large software teams. This thesis investigates what risks these smaller teams consider to be important. It also investigates what techniques are perceived to address these risks and how effective those techniques are considered to be. One of those risks is found to be of primary importance, yet this risk is not suggested by the project management literature. This thesis goes on to conduct a more in-depth exploration of that specific risk in the context of these smaller teams

Interviews were selected as the most appropriate method to achieve the objectives of the thesis. Nineteen interviews in eight software organisations are conducted to collect data for this thesis. Three different perspectives on project risk were investigated. Those were the perspectives of the; service managers, project managers and developers. Hence a large store of rich information is collated. The results are analysed and a rich set of information is presented in this thesis.

As a result of this research it is suggested that smaller software teams may find it useful to consider the 16 risks discussed in this research and how applicable those risks are to their individual organisation. Service managers may need to do more to raise the awareness of the importance of risks associated with ‘customer relationship issues’ within their own organisations.

Three risks stood out as areas where future research might be most fruitful. They were; customer relationship issues, introduction of new technology and unrealistic schedules and budgets. Risks related to customer relationship issues were of particular significance and have tended to be over looked in the project management literature. It is submitted that research into standard project risk management approaches may need to be combined with business risk management approaches to gain a full understanding of the risks faced and addressed by these smaller teams.

Chapter I: Introduction

1.1 Brief background

In our contemporary world, software plays a part in almost every aspect of our lives. This includes government administration, telecommunications and virtually every sector of the economy. Government and business have become so reliant on software it is hard to see how they would function without it. Software is crucial to the productivity of wealthy countries. The public have an increasing, direct exposure to software, particularly commoditised applications. In short, software has become pervasive.

As common and pervasive as software is, it is not a simple thing to create. A fundamental reason that software is hard to create is that modern computers are such primitive tools. Although the entertainment industry continues to portray a future with truly intelligent computers, the reality is that some of the simplest animals are far more intelligent than any computer yet created. Many so called artificial intelligence programs are misnamed, since they are simply reactive routines rather than systems that have any intelligence. The vast majority of all computer systems simply perform whatever task they have been programmed to perform. Software programs bridge the gap between intelligent humans and the simple tool we call the computer. This is a large gap indeed, placing increasingly significant cognitive demands on those charged with the task of undertaking or managing software development.

Software development projects are particularly difficult to manage because they have some inherently complex characteristics not always common or evident in other types of engineering or construction projects (to which software projects are commonly compared). These include the extent of human interaction (Baines, 1998), the impact of abstraction, the very high levels of complexity (Jurison, 1999) (Garvey, 1997), and the volatility of artifacts. All of these characteristics make the task of managing risk particularly difficult in software development projects. The difficulty arises because risk management involves prediction and anticipation, yet the problems just described hinder one's ability to view the future with certainty. (These issues are discussed in further detail in the next chapter.)

1.2 Rationale for the study

The importance of risk management in software development can hardly be overstated. Software development projects have been widely recognised as being highly risky for some years. Studies show that as little as 15 per cent of all software projects are successful (Klein, 2001), yet business increasingly relies on software. To further compound matters more companies are entering into the software development arena, meaning that greater proportions of economies are becoming exposed to the high levels of risk associated with software development (Addison, 2002).

Due to the increasingly high level of unknown influences and risks in these endeavours, a project may not deliver what was originally agreed to. Technically such a project may be termed a failure. It can be argued that this traditional view of project success is not suitable for an endeavour such as software development. Film makers create story boards and scripts. However it is always assumed that the final film will vary from these original plans. Film projects often experience delays and budget blow outs, yet may still be considered successful (Brett, 2006). In many respects, such as creativity, uniqueness and intangibility, software development is more like a film project than a civil engineering project. It therefore seems that traditional measures of success may be misleading when considering software projects.

Variation in what will be delivered is the cornerstone of development methodologies such as agile development. Unfortunately under these development methodologies the customer may in fact be taking ownership for an excessive amount of the risk. Whatever approach is adopted, it is likely that some compromise will be required in order for both parties to classify a project as a success. If both supplier and customer work towards an outcome that both parties can agree is a success then perhaps that is a better measure of project success than whether or not what was delivered is completely the same as what was originally specified. Anything that threatens project success (in this broad sense) may be termed a project risk. Thus the nature of supplier and customer relationships becomes very important when considering risk management in software projects.

The customer-supplier relationship sets the context within which risk is managed for a particular project. In a typical situation one supplier will have several customers. Thus

the context of the project risk may vary from project to project. This means that these relationships have a bearing on the risk management at a project level, not just a business level.

As discussed above one of the things that make software projects inherently difficult is that it is a human endeavour where human interaction is crucial. Surprisingly the software project management literature is very weak in this area. Even before new software is fully implemented, it begins to change the way people work. Software implementations by their nature tend to go hand in hand with organisational change (Doherty & Doig, 2003). The organisational change literature discusses the importance of human interaction and relationship management at some length. Modern software development practices include consideration of the implementation issues. For example, there is recognition of the importance of involvement of end users during the design and development stages. The fact that this issue of human relationships tends to get glossed over in the software project management literature may well be a significant deficiency.

Therefore there is a strong motivation to explore the area of customer-supplier relationships as it pertains to risk management. Due to the lack of a foundation in the body of knowledge, this research needs to first establish whether practitioners consider this issue to be important.

Given broader consideration of risk (in terms of negotiated relationships among stakeholders) it might also be asserted that traditional risks do not apply in contemporary software development, and that the recent literature would demonstrate that modern organisations perceive and treat risk differently. While there has been considerable research into risk management in software projects since the 1970s (Keil, Cule, Lyytinen, & Schmidt, 1998), there has been limited attention paid to what risk management is actually put into practice (Freimut, 2001). Indications are that much of what is known about risk management may often not be applied in software development projects (Dey, Kinch, & Ogunlana, 2007). This is partly because the methods suggested in the literature have severe theoretical and practical limitations (Kontio, 1999).

The management of project risk is an established field within the project management discipline. Possibly the leading authority on project management is the Project

Management Institute. This organisation has set out to promote common terminology and principles across all project management disciplines. They categorise four types of risk management activities as risk identification, risk quantification, risk response development and risk response control (PMI, 2000). Several researchers have identified which risks are most commonly identified by experienced software project managers (Addison, 2002).

What is less well covered in the literature is the risk management activities that software suppliers use to manage risk in the context of negotiated relationships. In fact, the PMI classification of risk management activities may not be appropriate for software development at all. Furthermore, the PMI term 'risk management activity' is itself rather vague since an activity could be an action rather than a process. Hence this research discusses risk management techniques. This term incorporates different categories of risk management whilst also denoting repeatable processes. Furthermore, the 'typical' definition of risk as it applies to other types of projects does not apply particularly well to software. Therefore project risk management techniques that rely on the classic definition of risk are likely to be of limited benefit in the software arena. This could be a further reason why many of the techniques found in the research literature are not used in practice (Verner & Cerpa, 2005).

This research is therefore focused on what *is* done in practice. When one considers practice one is placing the theory of risk management into a context. Hence this research takes the position that one must understand at least some of the contextual factors that practitioners work with. More significantly in terms of this thesis, most prior research has been on and is targeted towards large software projects (see, for instance, Zafiropoulos, Metaxiotis, & Askounis (2005)), due to the belief that these projects are more risky. In fact, size has been used frequently as a proxy for complexity - yet smaller projects are also risky. It is wrong to simply *assume* that smaller projects inherently carry less risk. Even if that were true, it does not mean that these projects carry such little risk that they are not worth studying. Particularly in New Zealand, small software projects are important and more common than large projects. In the Statistics New Zealand 2004/2005 Information and Communication Technologies Supply Survey it was reported that small business make up 86 percent of the ICT industry (Statistics New Zealand, 2006). Small businesses dominated all sectors of the

ICT industry. As a whole the contribution of these many small businesses is significant: published software alone is approaching a one billion dollar segment of the industry.

In short, there is a wealth of information in the literature on risk management in software projects, yet there are two significant gaps in this literature:

1. There appears to be limited literature on project risk management as it is commonly used in software practices
2. There is a dearth of literature on what risk management techniques are applicable to smaller software projects.

The writer's contention is that it is important to understand what risk management practices are used in smaller projects and what practices are effective within the context of smaller software projects.

1.3 Objectives of this research

This thesis has one primary objective and one secondary objective:

1. Research Objective 1 (Primary): To determine what project risk management techniques are used in smaller teams and how effective these techniques are.
2. Research Objective 2 (Secondary): To explore the project risk management issues that relate to relationship issues between customers and suppliers.

Within these objectives certain issues are selected for study.

1.3.1 Research Objective 1

To determine what project risk management techniques are used in smaller teams and how effective these techniques are.

Issue 1: The risk management practices of smaller teams.
Issue 2: The risk management controls these smaller teams use and the extent to which they are perceived as being effective.

Note that while the latter issue is considered in terms of effectiveness, the primary concern of this research is what practitioners find efficacious. If they do find something to be efficacious then a rough measure of effectiveness is of interest.

1.3.2 Research Objective 2

To explore the project risk management issues that relate to relationship issues between customers and suppliers.

Issue 1: Identification and avoidance of customer-supplier relationship risks.
Issue 2: Responses to customer-supplier relationship risks.
Issue 3: Risk management styles for customer-supplier relationship risks.

1.4 Research scope

Consideration of the following issues enables boundaries to be placed on the research to ensure that it achieves outcomes relevant to the research objectives.

1.4.1 Smaller organisations

Project team size is a useful surrogate indicator of software project effort. In response to dissatisfaction with software projects in the late 1970s, the US Department of Defence commissioned the US-based Software Engineering Institute (SEI) to provide a standard way of assessing the capability of software teams. This became known as the Capability Maturity Model (CMM). At that time the primary focus was on very large and complex projects. According to the CMM a small project team comprises fewer than 70 people, a big one more than 200 people. Contemporary software project teams are much smaller. Batista and Dias de Figueiredo point out that in the current industry, most software teams have fewer than 10 people (Batista & Dias de Figueiredo, 2000). Setting an arbitrary number is problematic, thus the writer prefers to discuss ‘smaller’ projects rather than small projects. As a guide, a project team of fewer than 20 to 30 people could be considered ‘smaller’ in today’s environment.

Specifically this study seeks to determine whether smaller software projects address the same types of risks as those described in the literature. In smaller organisations with limited resources there could be a trade off between what may be best practice and what is efficacious practice. This research aims to explore which risks practitioners in smaller teams consider to be important enough to regularly use a risk management technique to control. In addition this work explores in greater detail the relationship between suppliers and customers and how that may impact risk management in these smaller organisations.

1.4.2 Business systems

Not all software projects are the same from a risk management point of view. Many software errors and performance issues that are unacceptable in a real time environment may be able to be worked around in less time-critical environments. In addition, the incidence of inaccuracy in many medical and defence systems can place people's lives at risk. For the purposes of this research such life-dependent systems are excluded from study. This research is focused on business systems, which may include non-critical health systems.

1.4.3 Forms of development

This work considers both bespoke software development projects as well as customisations/enhancements and modifications to packaged software. Small software teams work on both types of projects. Maintenance of software is considered in this work only where there is a specific release of software which forms a pre-defined project. Typically, such releases are a mixture of software maintenance and new functionality. The literature highlights that novelty is a key indicator of how risky a project might be (discussed further in the following chapter).

1.4.4 Supplier focus

For ethical and commercial reasons, this research is focused on the supplier point of view. This does not imply that the customer point of view is less valid. It is simply a constraint of the issues inherent in discussing commercially sensitive issues (such as risk management practices) with both suppliers and their customers.

1.4.5 Perceptions of practice

This research is designed to consider practitioners' perceptions. For example, the participants' perceptions of efficacious practices are explored. It is beyond the scope of this study to find empirical, positivist evidence to 'prove' that these perceptions can be substantiated. What this study does explore, however, is the perceptions that different roles within the supplier organisation have regarding the same issues.

1.5 Intended research approach

An appropriate research approach for this study is to interview practitioners. Structured interviews enable the collection of 'targeted data' while also allowing depth to be explored in areas of interest as they arise. A range of practitioners from several organisations are interviewed to form a multi-site field study. Initial interviews (with high-level managers) are highly structured. This is achieved by having prepared questions and by filling out a worksheet as the interview progresses. This provides a sense of the practices employed in general whilst the use of interviews provides rich insights into practices utilised in specific organisations.

A second phase of interviews achieves two purposes. First, it enables the views of people holding different roles within the organisations to be considered in light of the results from the first phase of interviews. Second, a further interview with some of the high-level managers participating in Phase I allows time to explore the relationships between suppliers and customers.

1.6 Outline of thesis

The next chapter explores the relevant literature in detail. It addresses risk management literature as it relates to project team size, practitioners' perspectives and the gap in the literature about what risk management is actually practiced. Chapter 3 discusses the research methodology and the methods used. It also describes the development of the research instruments used and how the research objectives are operationalised in terms

of specific constructs and questions. Chapter 4 presents the results and the analysis. It also includes some discussion of the findings. The conclusions are presented in Chapter 5, along with reflections on the practical and research implications arising from the work. The detailed data can be found in the appendices.

Chapter II: Background and Related Work

2.1 Introduction

This chapter considers the state of current research as it relates to the objectives of this thesis. Important gaps in the literature are identified. These gaps then suggest the research objectives of this thesis. By considering contextual factors, the specific research questions within these objectives are derived.

2.2 Importance of software project risk management

Project risk management is an important aspect of software engineering practice. Its importance is due to the notoriously high rate of software project failures over an extended period of time (Addison, 2002; Barry, Slaughter, & Mukhopadhyay, 2002; Boehm, 1991; Butler, 2004; Currie, 2003; DeMarco & Miller, 1996; Dey et al., 2007; Ewusi-Mensah, 2003; Freimut, 2001; Hall, 1998; Jurison, 1999; Karolak, 1996; Kontio, 1999; Small, 2000; Smith & Keil, 2003; Verner & Cerpa, 2005; Zafiropoulos et al., 2005). This section defines software project risk management and considers why software projects are so risky. Important gaps in the literature are then identified.

2.2.1 The general notion of project risk

The Project Management Institute (PMI) is recognised as the largest project management professional organisation in the world. One of their most significant contributions to the profession is the adoption of common terminology as set out in their guide to the Project Management Body Of Knowledge (PMBOK). In the guide, project risk is defined as follows: “Project risk is an uncertain event or condition that, if it occurs, has a positive or a negative effect on a project objective.” (PMI, 2000)

The obvious flaw in this definition is that if a project objective has not been defined sufficiently well, then that in itself is a project risk. In that case, one cannot be certain that the project objective has been achieved, which means the success of the project is in

doubt. Given that the setting of objectives in software projects is known to be problematic (Addison, 2002; Barry et al., 2002; B. Boehm, 1991; Briand, 1993; Butler, 2004; Ewusi-Mensah, 2003; Hall, 1998; Karolak, 1996; Moynihan, 2002; Nakamura & Matsuda, 2003; Ovaska, Rossi, & Smolander, 2005; Pressman, 1997), a question arises over the adequacy of such a definition in the context of software projects. In the case of software projects perhaps a project risk is something that threatens the success of the project, however that might then be defined.

2.2.2 Project risk management

The PMBOK definition of project risk management is: "Risk management is the systematic process of identifying, analysing and responding to project risk. It includes maximising the probability and consequences of positive events and minimising the probability and consequences of adverse events to project objectives." (PMI, 2000)

One flaw in this definition is that it does not address incomplete knowledge. In some kinds of projects, such as software projects, it may be common to have several unknown factors (Andrew, 2003; Baskerville, 1996; Boehm, 2002; Chapman & Ward, 2000; Pender, 2001; Smith & Keil, 2003). In software projects, there may be factors which can be identified as potential risks but there may be no way to determine the probability of the risk occurring. Pender identifies that risk management in the PMBOK Guide is based on probability theory which relies on certain assumptions that do not apply to software projects (Pender, 2001). For example, probability theory assumes randomness and repeatability, but these characteristics do not apply to software development. Software projects are constrained by human limits and by uncertainty and imprecision, aspects that are not well supported under probabilistic analysis. In addition, changes occur and new knowledge is acquired throughout a software project, often before the consequences of a given risk are realised.

Therefore the PMBOK does not address aspects of risk management that are (at least potentially) very significant to software projects.

2.2.3 Software project risk

Gluch (Gluch, 1994) gives the following definition for risk within software projects:

"In the context of software engineering and development, risk can be defined as the possibility of suffering a diminished level of success within a software-dependent development program. This prospect of loss is such that the application of the selected theories, principles or techniques may fail to yield the right software product."

This definition sees risks as only negative. More recent thinking views risks as including both threats and opportunities (Hillson, 2002). In the writer's experience, the older viewpoint still prevails. Risks in software projects tend to be viewed as synonymous with threats. However certain methods, such as agile programming, have been adopted with the specific intent of taking advantage of possibly risky opportunities.

Anecdotally, it would appear that practitioners are managing risks as both threats and opportunities, but in different ways. It seems that generally threats are referred to as risks, whereas opportunities appear to be referred to as unplanned or loosely planned progress. It could be that more formal planning techniques are being used to manage negative risks and agile methods are being used to manage positive risks. Boehm supports this view when he opines that combining plan-driven methods with agile methods will be preferable for most projects depending on the types of risks that are characteristic for a given project. (Boehm, 2002).

Although it is understandable that practitioners view risks as synonymous with threats, there is a danger in adopting this definition. Opportunities that are not subjected to risk management may not only become lost opportunities, but in software projects, they can evolve into problems. For example, providing 'good idea' features can be of real value in a software project; however, if *excessive time* is spent on this (a practice known as 'gold plating' (Addison, 2002)) at the expense of providing 'required' features then problems arise. Hence there seems good reason to include positive risks in the definition for software project risks.

2.2.4 Why is software development so risky?

Software development projects are particularly difficult to project manage since they have some inherently complex characteristics. These include:

1. Human interaction – Software development is a predominantly human endeavour and many of the risks relate to the nature and qualities of people and how they interact. The writer has observed these risks in every single software project that requires more than one person to deliver the result. Baines points out that software development resources are 90 to 100 per cent people resources rather than material resources and that people resources can be shown to carry higher risk (Baines, 1998).

2. Abstraction – Software itself is an abstract entity. Software represents items or concepts. Software that is yet to be developed or is incomplete is described in an abstract way. Thus when considering software requirements one is considering an abstract representation of an abstract entity that does not yet exist.

3. Complexity – Software in today's world is usually specialised and almost always complex to the point where it is difficult for people (and certainly individuals) to comprehend it. This creates technical and management problems (Jurison, 1999) (Garvey, 1997).

4. Volatility – An advantage of software is that it is easily changed. However this leads to a moving target and quality problems for a software development project. This is commonly referred to as requirements (or scope) creep. Pressure to change requirements is so common and intense that the writer has observed that most software development projects assume from the outset that the requirements will change to some degree. In Jurison's words, "…change is a way of life in software development" (Jurison, 1999).

All of these characteristics make the task of managing risk particularly difficult in software development projects. The difficulty arises because risk management involves prediction and anticipation, yet the problems described above hinder one's ability to view the future with certainty. If a customer cannot view future requirements with certainty, and the supplier cannot define the future effort with certainty, then these stakeholders share the problem of uncertainties preventing them from predicting successful outcomes. This places the supplier and the customer into a position were they are stakeholders in a project and both may need to negotiate and compromise in order to achieve a project outcome that they both can call a success.

2.2.5 Variation of software project outcomes

Because software project outcomes may vary from what was originally agreed to but the project still be called a success by both parties, customer relationships are of particular importance to software project risk management.

Software project outcomes are a factor of time, cost, functionality and quality (Karolak, 1996; Whitenack & Bounds, 1995). Traditionally expectations regarding these outcomes are specified and agreed to before a software development project is begun. This pre-specification is often difficult to finalise and to communicate. Even where the specifications have been agreed to by customer and supplier it is common for customers to make repeated requests for changes (Nakamura & Matsuda, 2003). Often these changes will require either the supplier or the customer or perhaps both parties to compromise in one area of time, cost, functionality or quality in order to succeed in the other areas (Brennan, 1996; Stephenson & Gardner, 1996). In fact, a failure to modify the project objectives can actually create a risk. For example, a project may deliver everything as it was specified and yet the customer may not consider the project to have been successful (Lahodynskyyj, 2001). Conversely a software project may exceed a customer's expectations even if delivered late (Ovaska, Rossi, & Smolander, 2005).

The constructive negotiation and compromise that informs the changing of parameters of project success require an element of collaboration and trust between the supplier and the customer (Butler, 2004). There is some evidence, though not extensive, that customers and suppliers are seeking to take a partnership approach to software projects (Boehm, 1988; Clemens, 1999). In addition there is some recognition of the important role a good working relationship between supplier and customer plays in changing the objectives and still being able to reach a successful conclusion to the project (Olesen & Johansen, 2002; Opperthauser, 1998).

2.3 Contextual factors

2.3.1 Does size make a difference?

There is a wide spread belief that project size is one of the most, if not the most, significant indicators for software project risk. Certainly project size is a factor; however its importance may be being overstated in contemporary projects.

Conventional thinking says that the larger the size of a software project, the more risk that will be involved. This idea is often repeated in the literature, in many cases without citing empirical evidence (DeMarco & Miller, 1996). While there is some truth to this size-risk relationship it may only be at a superficial level. A more careful examination of this concept shows that size is really a proxy for complexity. Often it is the complexity of the project rather than size itself that determines or influences project risk. The novelty of the project to the project team is a significant project risk, regardless of the project's size. Boehm wrote a seminal article on the principles of software risk management in 1991 that is still relevant today (Boehm, 1991). The top 10 software risk items in this article do not include size. They do include "straining computer-science capabilities". This phrase appears to cover both the skills of the team and the novelty of the technology. Even when Boehm discusses cost drivers, he combines size and complexity together as 2 dimensions of the same factor – which he labels as "size".

Complexity is a relative and subjective factor that is hard to measure. More importantly, in software projects, it is difficult and time consuming to predetermine how complex the project will be with any certainty. Project size is a much more convenient indicator and there is an assumption that size is easy to measure. Project risks can arise, however, when one overlooks that size has been used as an indirect indicator of complexity.

The challenge of new or changing technology is another factor. It is common practice when adopting a new technology to identify a small or pilot project as the initial foray into the technology. This is specifically to reduce the consequences of the inherent risks in such projects. This indicates that the size of the project can magnify the consequences of the risk. However the size of the project is relative to the organisation[s] involved in the project. If a supplier agrees to participate in a pilot as a condition for the sale of a

large system, then the consequences of the risk in that pilot are much higher for the supplier than the scope of the project. In addition, when implementing ERP or certain infrastructural systems it may not be possible to reduce the size of the project beyond certain modules in order to obtain the desired benefits.

Larger projects tend to be more complex. The more people involved in a project the more communication and management effort is required to maintain quality and productivity. Conversely, larger projects tend to be of sufficient size to more easily justify the overheads of risk management and may therefore be more effective at dealing with risks and complexity. The more common area of communication deficiency is with parties external to the project team (Muller, 2003). A smaller project team is not necessarily better equipped to communicate with these external parties than a larger team. In a larger project there may be better definition of who these external parties are as well as a better definition of the communications channels, expectations and responsibilities.

Most software projects involve a small team of IT professionals delivering a system that affects a much larger number of people. A large number of people using a particular system can increase the software complexity; however this may only require the software to be scalable and lead to a relatively minor increase in complexity for the project.

Larger projects involve larger amounts of money. Apart from certain medical, industrial and infrastructural applications that pose dangers to human life, risk is usually measured in dollars. Even hospitals and government budgets place a certain dollar value on a human life when considering risks. With larger amounts of money at stake, larger projects could be considered more risky. However, this approach is rather simplistic. A project risk of $100,000 may not be visible on the balance sheet of a multi-billion dollar company, yet it might destroy a small business. The amount of money allocated to a project does not help us identify what the specific risks are. When risks are identified it is often difficult to place a monetary value on some of those risks. In addition the amount of money budgeted for the project may not reflect the monetary risk of the project. Some monetary project risks may have little business risk and there may be a danger of automatically equating the two. Many software projects are designed to achieve intangible benefits. Could the project be considered successful if it stayed

within budget but failed to deliver the benefits? Clearly there are software project risks that do not directly relate to the monetary budget. Furthermore, the money budgeted for a project may be revised – however this does not necessarily mean that the project risk has changed. Money may be a useful measure of the overall project risk to the business but it may not be useful or appropriate as a measurement of risks to the project.

A software project may be considered larger if it comprises substantial functional value. However a small software project can have significant and/or substantial functionality. A software project may involve some core functionality that is repeated many times with minor variations. It may even have an agent that generates new functions when new data is downloaded. Such systems may have large values for measures of functionality and yet be relatively simple. Some systems may have low values and yet be very challenging to develop. Often functional measurement is not conducted, and when it is the project may be well under way. Thus while functional assessment may be a useful pointer to the number of tasks in a software project it may be only a limited indicator of the size or scale of that project.

In addition to the complexity of a software project, the duration of the project is important when considering risk. In software projects, almost all factors can be affected by the passage of time. Change is an inherent part of the software development environment. With the passage of time, changes are more likely to affect the project. In addition a software project that takes a long time has additional overheads and risks (van Solingen, Berghout, & van Latum, 1998). A small project spread over a long time will suffer from reduced productivity. The team members will need to spend time reminding themselves what they knew and where they had got to with the project each time there is a gap in activity on the project.

Barry et al. performed an empirical study of software project duration and effort (Barry et al., 2002). The work considered the problem of scope creep and the dynamic environment within which software projects are conducted. In other words, the authors looked into the true context in which software projects are conducted. The authors focused on project duration – that is, elapsed time. They found that project size and team skill were not particularly influential in terms of meeting schedule targets. In fact the clearest example was the smallest project. That project had been estimated to take 275 hours over 77 days. However various delays meant that this project spanned a total

of 1041 days. As a result of the extended duration the actual effort required was 508 hours and the costs of the project were double that expected.

This finding indicates that the historical assumption that smaller projects require less risk management, is misleading, or at least it does not apply uniformly to all projects. By making a clear distinction between estimated effort and actual project duration Barry et al. have shown that changes, often external to the project itself, are far more significant to project risk than project size.

The issue is further complicated by organisational context. Russ and McGregor suggest that a small project within an organisation that runs hundreds of projects is likely to be able to make use of infrastructural services and advice that is not likely to be available in an organisation with only a few projects each year (Russ & McGregor, 2000).

What more can be learnt about the context that smaller projects are conducted within? The context of a project can be framed in terms of different stakeholders' perspectives of that project. In order to manage project risks, we then need to consider how to reconcile various stakeholders' perspectives with the goals of the project.

2.3.2 The dynamic nature of smaller software teams

The social aspects of software projects are arguably the most important in terms of risk management. This study is focused on smaller software teams and thus consideration of the literature on the social aspects of such teams is appropriate to create context for this study. Furthermore, while this study is primarily concerned with risk management practices rather than social interactions, these practices operate within a social context.

Contemporary business environments are constantly changing (Mous, Ko, Lee, Tan, & Lee, 2007; Su & Mylopoulos, 2006; Yu, 2006). This creates challenges for business software development projects. The challenges are twofold for software organisations. First, it takes considerable effort and time to create and implement quality software yet the business requirements or context may change while a project is in progress (Barry et al., 2002; Boehm, 2002; Dalcher, Reed, Woodman, & Benediktsson, 2003; Dey et al., 2007; Ewusi-Mensah, 2003; Mous et al., 2007; Small, 2000). In addition, software

development businesses are themselves changing as much as any other contemporary business (Dhillon & Hackney, 2000).

Software development projects are by their nature complex projects. This complexity arises due in part to the metaphysical nature of software (Naur, 1986), the technical complexity of the development environment (Butler, 2004; Dey et al., 2007; Dhillon & Hackney, 2000; Iversen & Mathiassen, 2003; Kautz & Nielsen, 2004; Taylor & DaCosta, 1999) and the social aspects of projects (Lee & Xia, 2005). Most software project failures are due to management-related issues rather than technical issues (Ahituv, 1999; Barry et al., 2002; Boehm, 1991; Boehm, 1988; Freimut, 2001; Garvey, 1997; Hall, 1998; Hesse, 1996; Jurison, 1999; Karolak, 1996; Muller, 2003; Padayachee, 2002; Russ & McGregor, 2000; Verner & Cerpa, 2005; Verner, Overmyer, & McCain, 1999). This reflects that these projects are not simply technical processes but socio-technical processes (Davidson & Chiasson, 2005; Luna-Reyes, Zhang, Ramon Gil-Garcia, & Cresswell, 2005). In addition both the social and the technical aspects change frequently during software projects making the management of these projects particularly challenging (Lee & Xia, 2005).

Lee and Xia maintain that, as a consequence of the above, one important reason for the low success rates of software projects is a lack of project teams' ability to manage not only technical issues but also organisational issues (Lee & Xia, 2005; Schmidt, Lyytinen, Keil, & Cule, 2001). Failure to address these socio-technical changes often results in an incongruence between the system and its socio-technical context, which in turn may lead to project failure (Lee & Xia, 2005).

Several researchers have therefore viewed business and technology changes as critical software development risks (Addison, 2002; Barry et al., 2002; Butler, 2004; Dey et al., 2007; Ewusi-Mensah, 2003; Hall, 1998; Jurison, 1999; Karolak, 1996; Luna-Reyes et al., 2005; Moynihan, 2002; Padayachee, 2002). Boehm (Boehm, 1991) ranked business requirement changes as a top software project risk. According to Schmidt et al. (Schmidt et al., 2001), software project risks include various business and technology changes such as unstable corporate environments, changing project scope/objectives, introduction of new technology and instability of technical architecture.

In this respect flexibility may be a key factor. There is some evidence that project performance tends to increase as the software team becomes more flexible and effective in responding to business and technology changes (Lee & Xia, 2005). Academics and practitioners both promote the concept that flexibility is a requirement for contemporary practice (Lee & Xia, 2005; Overby, 2001). The actual level of flexibility within these organisations may vary but there are insufficient published studies to determine if this variation is relative to project team size. Benamati and Lederer (Benamati & Lederer, 2001) reported in an earlier study that IS organisations were not effective in responding to technology changes.

Smaller software teams may, by their very nature, be more flexible than larger teams (Batista & Dias de Figueiredo, 2000; Russ & McGregor, 2000; Taylor & DaCosta, 1999). This idea is supported by the evolution of agile programming methodologies (Boehm, 2002; Mous et al., 2007). This may in turn give smaller teams a competitive advantage in this respect which may help to balance any disadvantages they suffer due to lacking certain resources or specialist roles. Although it seems inherently logical that smaller teams would comprise fewer specialists and may be more exposed to resource availability issues, this does not appear to be established in the academic literature. A small niche-sector developer, for example, may have more than enough high quality resources for their purposes. These issues are explored in this research.

2.3.3 Stakeholder perspectives

Compared to many disciplines, software engineering is a young and immature profession. This is both disadvantageous as well as advantageous. Although a more mature discipline may have developed solutions to some long-standing issues, new ideas and solutions tend to be readily explored and accepted in software engineering.

Every software development project has a range of stakeholders involved, from developers, project managers and senior management on the supplier side to clients and shareholders on the customer side. Ideally all of these groups have motivations which intersect at some common goal, such as increased productivity. Although a distinction needs to be made between project risk and business risk it must be remembered that a project exists within the context of this common goal.

Often the largest and possibly most important of these groups are the customers and end users of the software. The majority of issues relating to customers are dealt with during the evaluation and implementation stages rather than the development stage. However there are significant issues of usability, testing and functional acceptance where direct user involvement is highly desired during development (Jiang, Klein, Chen, & Laura, 2002). In addition, involving users during the entire project lifecycle is a key way to reduce risk in these projects (Addison, 2002). Traditionally it has not been viewed as the customer's role to be involved in risk management of the project. In part this was due to perceived conflicting goals – the customer naturally desires more for less whereas a software project manager will need to supply deliverables within certain resource constraints. Therefore their perspectives on risk management diverged. However as IS practice has matured, IT savvy customers have become aware of software project risks such as the consequences of making excessive demands. In contemporary practice, as the writer has observed it, experienced customers and developers recognise the need to work collaboratively, making compromises in order to achieve a successful outcome. The evolution of agile development methods is an indicator of this trend.

As far as the writer has been able to determine, the literature does not investigate whether this customer maturity is true for smaller software projects. A small software project could be for a SME market which tends to imply a lower degree of IS experience (Taylor & DaCosta, 1999). A small software project could also be of a highly specialised nature targeted towards customers with a high level of IS experience (Batista & Dias de Figueiredo, 2000). Hence the context of the project could be of primary importance in this respect.

Developers have their own perspectives of projects which create some well known and high priority risks, such as gold plating (Addison, 2002) and a lack of effective documentation (Raz & Michael, 2001). These issues continue to be significant problems in practice even though academia has been aware of them for many years. This has resulted in questions being raised about the teaching of developers.

2.4 What is done in practice?

2.4.1 Important risks

There is actually broad agreement in the literature on what risks are important to software projects. Much of this literature is based on what experienced project managers had found to be the most important risks. The research by Addison and Seema, for instance, produced a list of 14 risks that experienced project managers considered to be important enough to require controlling on most software projects (Addison, 2002). In no particular order those risks are:

- Lack of senior management involvement
- Continuous requirement changes
- Unclear objectives
- Misunderstood requirements
- Resource usage and performance
- Unrealistic schedules and budgets
- Failure to manage user expectations
- Introduction of new technology
- Failure to gain user involvement
- Sub-contracting
- Inadequate knowledge/skills
- Lack of effective project methodology
- Gold plating
- Developing wrong software functions

Other researchers have reported similar results (Boehm, 1991; Clemens, 1999; Ewusi-Mensah, 2003; Hall, 1998; Karolak, 1996; Moynihan, 2002; Opperthauser, 1998; Padayachee, 2002; Pressman, 1997; Schmidt et al., 2001). In fact, most lists of risks identified in the literature are subsets of the risks listed in Addison's research. As a result this study uses Addison's list as a starting list of risks to investigate.

2.4.2 Individual and organisational attitudes to risk

The literature, and the writer's experience, indicate that developers seldom adhere to methods as they are described by academia. In addition the competencies of successful developers are significantly more advanced than those represented in these methods. The writer concurs with Mathiassen and Purao's assessment that once students have been provided with a baseline in methods, their understanding needs to be further developed by combining this knowledge with reflective study of practices in use (Iversen & Mathiassen, 2003). The current practice of simply documenting lessons learnt in one practical project is unlikely to be a sufficient reflective study to enable students to avoid common risk traps. IT managers tend to compound this deficiency by not providing formal training in risk management (Padayachee, 2002).

Experienced project managers are always in demand since both the literature and practice recognise the ability of these people to effectively manage project risk (Padayachee, 2002) (Moynihan, 2002). There is also a trend within the industry towards recognised best practices. For IT project managers this is indicated by an increasing number of professionals becoming certified under the PMI's Project Manager Professional [PMP] programme (Revathy, 2003).

Business and government has become more dependent than ever on IT. Shareholders and law makers have driven the need for better IT governance. Thus there are greater expectations on IS managers to deliver IT projects on time and within budget. The result is a greater awareness for the need for IS managers to monitor and control IT projects (Jurison, 1999). In addition, IS management must weigh the advantages of being innovative with the consideration that using familiar environments and developing familiar applications will reduce project risk (Padayachee, 2002).

Senior management also have a significant role to play in fostering a risk aware culture in the organisation as opposed to a risk averse culture (Padayachee, 2002). Risk averse cultures tend to deny the existence of risk, since there is a desire to report only good news. Organisations with risk averse cultures are likely to experience repeated IT project failures (Smith & Keil, 2003). Typically, risk averse cultures arise out of misconceptions and thus active steps are required to change such cultural thinking (Padayachee, 2002).

2.4.3 Best practices

Various industry bodies have worked to establish best practices for software engineering. Unfortunately it seems these practices do not fit well into smaller organisations without extensive modification (Batista & Dias de Figueiredo, 2000). In addition, even where best practices have been implemented, what is actually practised may not be not the same as what is 'supposed' to be practised (Hesse, 1996). There is little research into whether industry best practices are suitable and advantageous for smaller teams working on business software. In addition it has been suggested that what works for one organisation may not work for another (Benamati & Lederer, 2001; Boehm, 2002).

2.4.4 Measuring effectiveness

There is some literature that points out the importance of adopting *effective* risk control techniques (Addison, 2002; Dey et al., 2007; Smith & Keil, 2003; Taylor & DaCosta, 1999; Wysocki, 2000). Various researchers provide case studies (or more commonly, field studies) to demonstrate that a proposed control technique can be effective. Yet one such study does not prove a technique to be effective for all organisations. In addition, there is little if any literature that describes in sufficient detail just how the effectiveness of such techniques should be evaluated. This issue is further explored in this study.

2.5 Conclusion

Software project risk management is an important subject due to the high failure rate of software projects. There is a wealth of information in the literature on risk management in software projects, yet there are two significant gaps in this literature:

1. There appears to be limited literature on project risk management as it is commonly used in software practices
2. There is a dearth of literature on what risk management techniques are applicable to smaller software projects.

The writer's contention is that it is important to understand what risk management practices are used in smaller projects and what practices are effective within the context of smaller software projects.

Chapter III: Methodology, Research Design and Implementation

3.1 Introduction

This chapter considers the research context of the topic in terms of method. It explains the research objectives and (therefore) a suitable methodology. The design of the selected research methods is explained before a short description of how the research is implemented. This chapter begins by establishing the wider methodological context for the research.

Risk management is recognised as a core knowledge area within project management. For example, the Project Management Institute, a leading authority on project management, defines nine core knowledge areas as illustrated in Figure 3.1. One of these areas is project risk management (PMI, 2000). This thesis is concerned with project risk management in software projects.

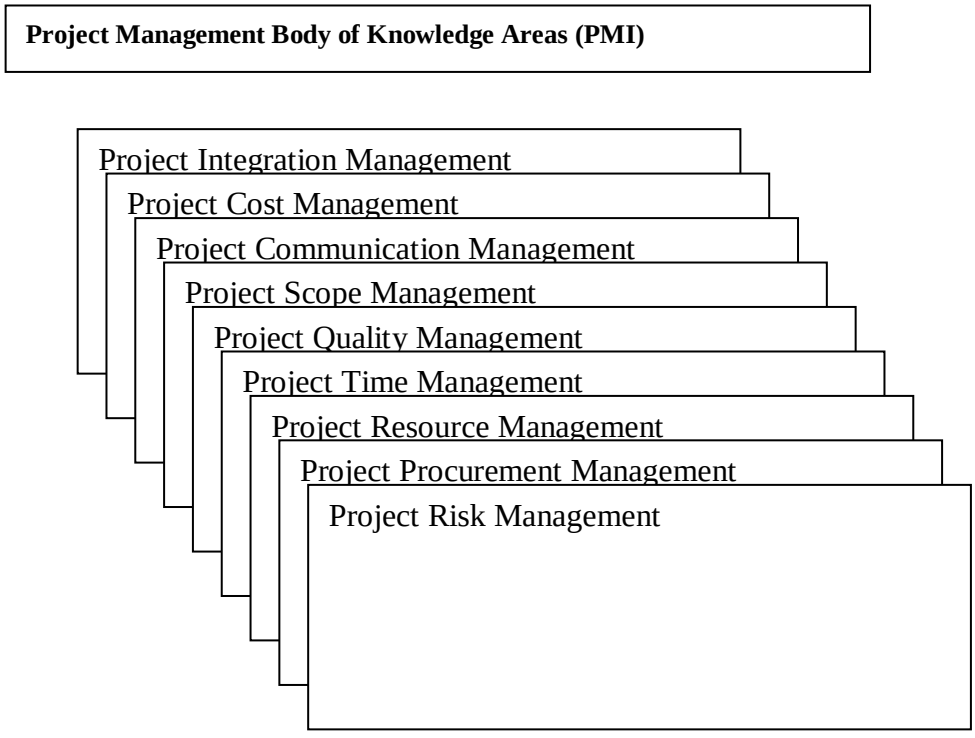


Figure 3.1 Project management knowledge areas

3.1.1 Gaps in the literature and the research context

Software risk management is a topic of great importance due (in part) to the high rate of software project failures (Boehm, 1991; Ewusi-Mensah, 2003; Hall, 1998; Karolak, 1996; Kontio, 1999; Smith & Keil, 2003). There is a great deal of literature on software project risk management. However, much of that literature focuses on large software teams (Charette, 1996; DeMarco & Miller, 1996; Dey et al., 2007; Zafiropoulos et al., 2005). The literature seems to assume (albeit implicitly) that their findings apply to small software teams. This thesis explores that assumption.

Due to the lack of information on the risks that smaller teams face and how they address those risks (as identified in the preceding chapter), this thesis seeks to investiagte these issues. This information can then be built on to explore other risk management issues in smaller teams. As initially proposed the goal of this research was to discover what risk management techniques practitioners in smaller teams found efficacious. Unfortunately the lack of prior research with a focus on smaller software development teams means that some more fundamental questions need to be addressed before effectiveness can be investigated. It may be erroneous to assume that smaller software teams use the same techniques that larger software teams use, since the majority of the literature focuses on larger teams and does not address this assumption.

For example, prior literature has collated the risks found to be of most concern to experienced project managers (Addison, 2002). Is it reasonable to assume that smaller software teams are led by experienced project managers? What kind of experience and background do these project managers have? In smaller organisations it may not be possible, or even advisable, to employ a specialist for every function that the organisation requires. It certainly cannot be assumed that a project undertaken by a small team is seen by senior management to require an experienced software project manager. Even if this need were recognised, one cannot be sure that such projects are able to attract a professional experienced with larger projects or that such a person would be the best qualified for the position. Therefore it can not be assumed that smaller software teams would have project managers with the same level or kind of experience as seem to be found managing larger teams.

Hence there is a relevant pool of knowledge in the literature, a potentially relevant pool of knowledge regarding large software project teams and a smaller pool of knowledge

addressing smaller teams. It is contented that although these pools of knowledge overlap, there are significant gaps in coverage. These pools of knowledge are shown conceptually in Figure 3.2

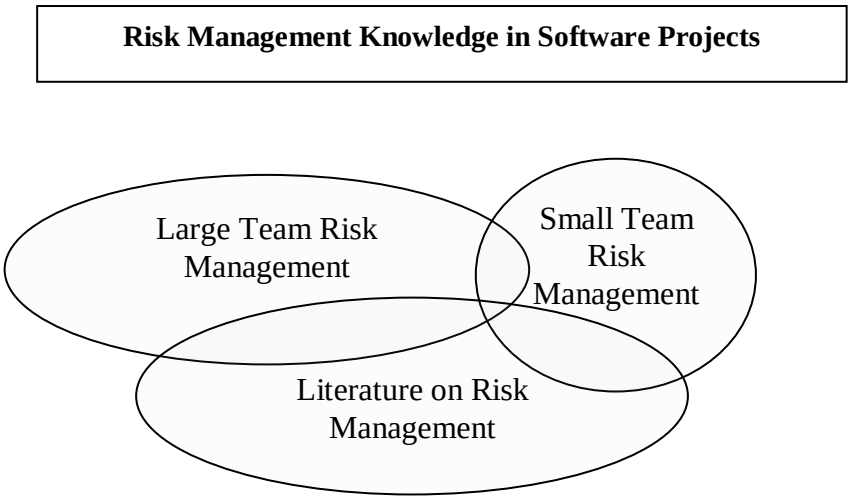


Figure 3.2 Risk management knowledge in software projects

As a baseline it is important to establish what is used and what is effective in current practice before suggesting improvements to practice. Unfortunately there is very little prior evidence on what risk management is *actually practiced* in contemporary software teams. The literature tends to identify perceived, specific niche problems within software risk management and then suggest solutions, frequently without reference to general current practice (Baskerville, 1996; Binder, 1997; Boehm, 1988; Chiang & Menzies, 2002; Clemens, 1999; Currie, 2003; Dalcher et al., 2003; Freimut, 2001; Hulett, 2003; Jiang et al., 2002; Ruhe, Jeffery, & Wieczorek, 2003; Whitenack & Bounds, 1995; Zafiropoulos et al., 2005). A more logical (or at least an alternative) approach would be to evaluate the effectiveness of the practices in place before proposing solutions. It may seem surprising that so many researchers leap into suggesting solutions, but it is understandable in context. That is, most of the research in this area is motivated by the reported poor performance of software projects. This leads researchers to suggest what should be done, rather than establishing what is done in successful projects. It also fits a more generally common characteristic of software engineering research in that much of the literature proposes new techniques, methods or tools while comparatively little literature evaluates the use of these techniques, methods or tools in practice (Glass, 2007).

Hence this research is intended to investigate what risk management techniques are in fact used in these smaller teams – which in turn assumes that at least some smaller teams/organisations actually use some risk management techniques. Unless an organisation has achieved some recognised standard of practice such as that assessed using the CMM, it is not easy to determine what knowledge or experience they might have in project risk management. Since smaller software organisations outside of industries such as defence appear to be less likely to have some official recognition of an industry standard practice (Batista & Dias de Figueiredo, 2000; Taylor & DaCosta, 1999), one cannot make the assumption that formal risk management techniques are used in these smaller teams. Therefore this research may have a broader definition of what constitutes a risk management technique than some other research.

Much of the literature does not make it clear that risk management in smaller software projects is even considered particularly important unless there is a degree of novelty inherent in the project (Boehm, 1991; Butler, 2004; Charette, 1996). Failures of very large software projects attract attention in the media, particularly if they are government funded (Small, 2000). However smaller software project failures, outside critical industries such as health, defence and space, are unlikely to attract media attention, even if they result in the failure of the software organisation. Therefore there is a need to provide at least some anecdotal evidence that this is an important subject for those smaller projects. This may be evident in the willingness of organisations to set aside time to participate in this research.

3.1.2 Risk topics of interest

General project risk management is typically described as a structured process with discrete steps (Project Management Institute, 2000) as shown in Figure 3.3. This model has severe shortcomings when considering software projects, as discussed in Chapter 2. However this model is sufficiently general to be useful in a description of the aspects of risk management on which this research is focused.

The recognised first step in managing risk is to identify the risks to a project (Boehm, 1991; Chapman & Ward, 2000; Hillson, 2002; Jurison, 1999; Karolak, 1996; Patterson & Neailey, 2002; PMI, 2000; Ward, 1999; Wideman, 1992; Wysocki, 2000). Addison (2002) suggests 14 risks that are considered to be important in large software projects

according to experienced project managers (Addison, 2002). This thesis seeks to investigate what risks are important to smaller project teams.

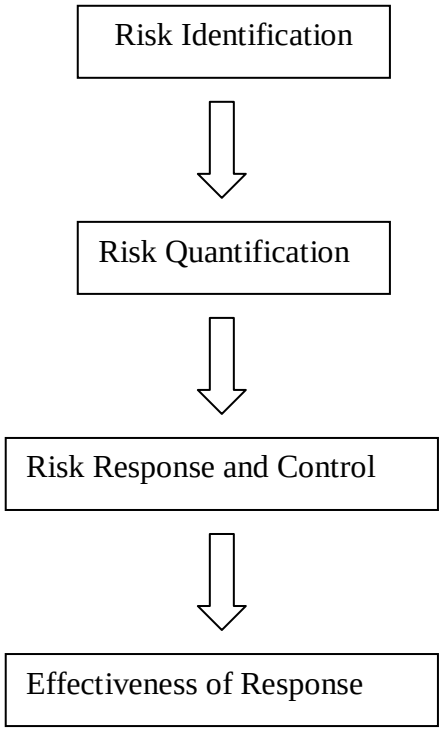


Figure 3.3 General risk management theory

Standard project management literature (i.e. presumably for all industries) defines the next step as quantifying the likelihood and potential impact of each risk identified (Chapman & Ward, 1997; Foster, 2001; Patterson & Neailey, 2002; Phan, 1998; PMI, 2000; Ward, 1999; Wideman, 1992; Wysocki, 2000). In software projects there is so much uncertainty that it is very difficult to quantify project risks before they occur (Briand, 1993; Gluch, 1994; Hall, 1998; Hulett, 2003; Keil et al., 1998; Pender, 2001; Raffo, Harrison, & Vandeville, 2000; Smith & Keil, 2003). While of related interest to the work undertaken here, this step of quantifying project risks does not form part of this thesis.

The next recognised step in risk management is the response to the risk or the control of the risk (Boehm, 1991; Butler, 2004; Chapman & Ward, 1997, 2000; Currie, 2003; Dey et al., 2007; Glass, 2007; Hall, 1998; Hulett, 2003; Jurison, 1999; Karolak, 1996; Patterson & Neailey, 2002; PMI, 2000; Pressman, 1997; Ward, 1999; Wysocki, 2000; Zafiropoulos et al., 2005). In plain language this refers to the techniques used to address the risk.

As previously stated, it is contented that before improvements to practice are proposed, it is important to first understand the effectiveness of techniques already in use. This is a view supported by some of the literature (Addison, 2002; Barry et al., 2002; Chapman & Ward, 2004; Glass, 2007; Moynihan, 2002; Muller, 2003; Nakamura & Matsuda, 2003; Ovaska et al., 2005; Padayachee, 2002; Taylor & DaCosta, 1999). Consideration of the perceived effectiveness of the techniques employed in smaller software projects is included as part of this research.

3.1.3 Experiences and perceptions

The socio-technical character of project risk management is an embedded element of this research. It is the objective of this thesis to investigate what practices are actually used, based on a contention that useful insights can be gained by researching the experiences of practitioners. The human endeavour under study here – software systems development and its management – is generally performed by teams of skilled people. At least in part, their specific contributions depend on and are governed by their experience. In some cases they bring a wide and deep level of experience to the table. The practices they use are formed, performed and modified based on experience. That pool of experience is a valuable resource (Padayachee, 2002) and it goes to the heart of the objectives of this research.

Of core interest to this study is what practitioners find efficacious. In the writer's experience, most organisations and particularly smaller ones do not measure such things in fine detail. However they do reflect and act on both old and new experience of similar situations. In the software development domain, where so much may be unknown (Andrew, 2003) and/or performed for the first time, making judgements based on experience is fundamental to the management of such projects.

When considering risk management in practice this study supports the belief that those engaged in these practices have the most relevant view of those practices. This is the belief also implied by published research in this area (Addison, 2002; Barry et al., 2002; Moynihan, 2002; Muller, 2003; Nakamura & Matsuda, 2003; Padayachee, 2002). For example, when considering the risks faced in software development projects, some

researchers start from surveys of experienced project managers' views on what they consider to be the most important risks (Addison, 2002).

This thesis is concerned with the views that software project practitioners have on risk management. Since project risk is a shared responsibility, this thesis considers the views not only of project managers but also of other roles within or associated with the project team. These perspectives are discussed in detail later in this chapter once the detailed objectives of the thesis have been described.

Whitman and Woszczynski explain that many researchers promote the concept that the approach taken to any research endeavour should be driven by the research objectives (Whitman & Woszczynski, 2004) rather than by any preconceived stance. Hence the remainder of this chapter describes the thesis objectives and specific research questions before discussing the methodology being adopted. The chapter then describes in detail the research methods utilised in order to operationalise these questions.

3.2 Objectives of the research

This research has the primary aim of investigating general risk management issues in smaller software teams. It also has a secondary aim to explore one of those risks more broadly. Specifically, the objectives are:

1. To determine what project risk management techniques are used in smaller teams and how effective these techniques are.
2. To explore the project risk management issues that relate to relationship issues between customers and suppliers.

For the primary objective, the intention is to investigate what techniques are used and how effective these techniques are, in a structured way. For the secondary objective, the intention is to explore customer relationship issues more openly in the hope that the work should not only provide insights but also suggest areas of particular interest for future research.

For each objective certain issues are selected for study. Each issue is investigated by posing one or two specific research questions. The breakdown of the objectives into issues and then research questions is presented in Tables 3.1 and 3.2.

Research Objective 1

To determine what project risk management techniques are used in smaller teams and how effective these techniques are.

Issue for research	Research question(s)
The risk management practices of smaller teams.	RQ1 What risks are considered important to smaller teams?
The risk management controls these smaller teams use and the extent to which they are perceived as being effective.	RQ2 What risk management techniques are used in smaller teams?
	RQ3 How effective are these risk management techniques perceived to be?

Table 3.1 Research questions – Objective 1

Research Objective 2

To explore the project risk management issues that relate to relationship issues between customers and suppliers.

Issue for research	Research question(s)
Identification and avoidance of customer-supplier relationship risks.	RQ4 What is done to identify and avoid risks?
Responses to customer-supplier relationship risks.	RQ5 What risk responses do these practitioners use?
Risk management styles for customer-supplier relationship risks.	RQ6 In the suppliers' estimation, do customers prefer a formal risk management style or a flexible style?
	RQ7 What trends do suppliers perceive there are in the compromises customers are willing to make?

Table 3.2 Research questions – Objective 2

It should be evident from the preceding description that the form of the objectives and questions varies from the highly structured to the open ended. The implication of this variance for the actual conduct of the research is that these objectives/questions can and should be addressed in different ways, using a mix of specific methodologies and methods appropriate to each. This approach is discussed in the next section.

3.3 Methodology

As stated in the previous section, the focus of this research is twofold. First, it is intended to determine whether smaller organisations face the same risks as those described in the literature (and generally derived in relation to larger teams and projects). Hence the stance taken in addressing this aim is largely confirmatory, whilst allowing for expansion as needed. For this aspect of the research it is appropriate to adopt an essentially positivist approach, since this work makes observations about practices in current use and reports those observations. These are phenomena which could be observed.

Second, this research is concerned with perceptions regarding development and management practices in the software industry. As previously discussed in the introduction to this thesis, software development is a human endeavour that is at least partially creative. It also includes a high degree of abstract representation. Furthermore, this part of the research is focused on perceptions rather than observed 'realities'. A purely positivist paradigm cannot account for such personal and metaphysical experiences. Thus a certain degree of interpretation is required for this part of the study.

By being grounded in a positivist paradigm, a measure of scientific rigour can be achieved. At the same time by leaning towards an interpretivist paradigm this work considers those social and metaphysical aspects that are so important to software development practices. Beachboard (2004) describes the traditional existence of two contentious issues when considering IT practices in academia:

1. There is a desire for scientific-style rigour in research, yet there is a pressing need to address issues relevant to practitioners.
2. There is debate concerning the suitability of positivist versus non-positivist approaches to what is a branch of social science research.

Beachboard further discusses these issues and consequently promotes a multi-paradigmatic approach to research on IT practices. This thesis also leans away from a singularly positivist paradigm towards an interpretivist paradigm. It should be considered that any particular view of the world sits on a sliding scale of recognised ways to view reality. A certain degree of the interpretivist paradigm needs to be included for the purposes of this research to gain the rich insights potentially available from practitioners.

The appropriateness of a mixed-method approach is further reinforced if the uniqueness of software projects is considered. To elaborate: the object of this research is to consider current practices, a practice being a process that is generally followed. A practice might be considered a code of conduct. That is, a series of steps or actions that is expected to be followed in most situations. Studies have shown that in software teams, what is actually practiced is not the same as what was defined as the practices to be followed (Hesse, 1996; Verner & Cerpa, 2005). Smaller organisations, that are the subject of this study, are more likely to have more loosely defined practices (Batista & Dias de Figueiredo, 2000; Kautz & Nielsen, 2004; Taylor & DaCosta, 1999). Furthermore, by definition, no two bespoke/customisation projects are ever the same – the development of such software inherently contains some degree of creating something new. In other words these projects each have a certain degree of uniqueness, novelty and are not repeated. In software development every instance of a project practice could potentially be different in order to cater for the differences in each project. A purely positivist paradigm would struggle to provide meaningful insights into something so vaguely defined and that continually varies.

Having established the methodological basis for the work the following section describes the method selected for this research (being interviews) and the reasons for its selection.

3.4 Data collection method

3.4.1 Structured interviews

This research employs structured interviews to address the research questions and, in turn, the research objectives. Structured interviews have six advantages over other research methods for this research project.

1. Interviews are an appropriate method to use when exploring practitioners' perspectives due to the qualitative nature of this information (Whitman & Woszczynski, 2004).

2. One can begin with 'open' questions and then establish issues of interest by following with 'closed' questions. An example of an 'open' question would begin with "Please describe….". This type of question promotes a monologue response without providing limitations on what the response should be. Thus an opportunity for discovery is created. An example of a 'closed' question would be "Is that your policy?". This type of question promotes a Boolean response such as yes or no. Thus a fact (or at least a definitive opinion) is established. By combining these types of questions one can explore an area in a way that avoids pre-conceptions as well as establishing facts about that area. This is rather like troubleshooting a problem. Of course, no question should suggest a right or wrong answer.

3. In interviews one can establish a rapport. This is important since there is a need to establish a level of trust before practitioners will discuss the pros and cons of how they manage risk in day-to-day practice. For example, a practitioner may be well aware of what techniques she/he *should* be using but the research is primarily interested in what is actually being used.

4. A great deal of communication is provided by audio-visual cues, such as body language and tone of voice. This is a double-edged sword. On the one hand an interviewer may inadvertently suggest the answer being sought. For example, if one was to ask "Is that your policy?" with wide open eyes and an incredulous voice, then one is creating pressure on the interviewee to answer a certain way. Thus an interviewer needs

to guard against such pitfalls. On the other hand this risk can be outweighed by the large amount of information to be gained. For example, a response of "The policy is to do it like that" could be conveyed in such a way as to suggest that the policy is almost never followed or it could be conveyed in such a way as to suggest that there are dire consequences should anyone deviate from the policy.

5. Interviews have the advantage of enabling the investigator to 'drill down' on issues that come up. For example, it may be mentioned that a novel mechanism is used to determine what level of risk management a proposed project will be given. Such a mechanism can be pursued, even if this means a deviation from the originally prescribed interview plan.

6. In addition, the research can be directed into specific areas that present themselves. For example, it may be identified that projects with certain characteristics are avoided.

In order to research the state of practice, the obvious starting point is to research the practitioners and those with whom they work. Software development is a creative team process that is abstract and open to interpretation. Managing risk in this environment requires flexibility and requires a human touch that does not lend itself well to simple measurements.

For example, one could hypothetically collect statistical data on the success of projects and devise some way to relate this to risk management practices. However such an approach would have to deal with several challenges. First, one cannot assume that most small software teams have or could create historical records of their projects. Thus one would need to consider a longitudinal study across multiple organisations. Such a study is beyond the time frame available to this research project.

Second, given the nature of modern software projects, one might have difficulty in defining what constitutes a successful project. In the writer's experience, any combination of budgets, timeframes and requirements may or may not be flexible in any given software project. This is precisely why agile development techniques are now more widely recognised and practised.

Third, there is the problem of defining indicators which would link project success to specific risk management techniques. One is likely to be able to find examples where some costly project failures have resulted in the adoption of a specific risk management technique. However it is a more difficult proposition to find examples where project successes can be attributed to a specific risk management technique. Even if this were achieved, less high profile yet highly effective techniques may not be discovered.

Moreover, the practical difficulties in conducting a quantitative data collection exercise that would be truly representative of even the relatively small software industry in Auckland, New Zealand are daunting. In addition, such research would be not an exact match with the paradigm adopted since it is not of primary interest to this study, recognising as it does the bespoke nature of projects and, therefore, practices. This research is just as interested in the perceptions of risk management as in its usage. These dual aims to establish some basic, positivistic truths about the state of practice and the desire to explore how such practices are perceived have driven the selection of research method.

Much of the literature reports the adoption of case study techniques in such circumstances (Dube & Pare, 2003; Freimut, 2001), an approach that addresses many of the issues raised above. However, as previously stated, this potentially is symptomatic or contributory to the lack of literature addressing the actual practices of software development practitioners. Moreover, there is an absence of research that establishes the importance and usage of project risk management techniques in smaller projects. A case study would provide only anecdotal evidence and would not provide a general picture of current practice. Given the potential variation of organisational demographics, one cannot assume that lessons from a case study are transportable. Given the particular focus of this work the main selection criterion for subject organisations is the size of their software project team. However, in considering practice there are many other factors to consider such as: organisational maturity, experience of project manager, servicing of different industry sectors, novelty of projects and so forth. A single case study would not enable the impact of variability in such factors to be considered.

One might consider a survey that used a mixture of quantitative and qualitative questions. This technique would address most of the issues raised above. Surveys provide useful quantitative information that is more likely to be able to be generalised.

The use of surveys has been reported previously in the literature as informing, for example, lists of the most important risks faced by project managers (Addison, 2002; Boehm, 1991). In adopting this approach one would need to consider which role(s) within the subject organisations would be appropriate to target. Clearly in this case one would wish to survey the project managers. However some kind of triangulation or cross check would be advantageous to confirm the answers given.

The primary disadvantage of a survey in relation to the aims of the study at hand is the need to pre-define all of the questions before obtaining any answers. For this research, such an approach in neither feasible nor appropriate, since subsequent questions depend on establishing preceding facts or opinions. For example, there is an intention to establish which project risks are important in these organisations. If certain risks are not important to these organisations, then there is little point in asking detailed questions about specific risk management techniques used to mitigate those risks.

Drawing from the above discussion, the method chosen is to conduct face to face, one on one, structured interviews. Structured interviews allow this research to establish certain facts and/or perceptions and then delve deeper into the topics that apply in each organisational context, as each will have specific insights to be drawn out. Often such insights are difficult to gain without a two way interaction between researcher and subject. A subject may need to be gently prompted to expand on particular topics. From the writer's own experience, there is awareness that there is little time for practitioners to reflect objectively on the state of the organisation's practices. It can be difficult to bring about organisational change and so when a practitioner identifies a need for change they are likely to focus on the most pressing issue. For these reasons, important insights may lie dormant or unformed in the mind of the practitioner until she/he is prompted to reflect on specific topics.

Surveys only go a small way towards prompting these reflective insights for such practitioners. When in a face to face meeting, a practitioner is more likely to apply her/his critical thinking to topics of practice management, provided she/he feels comfortable discussing them. Partly this is due to the simple expedient, that the practitioner is able to make her/himself unavailable for other distractions.

Interview effectiveness is also partly dependent on the qualities and background of the interviewer. In the writer's experience software project managers rarely have an opportunity to discuss their practices with colleagues. They do not often meet in professional groups dedicated to project management and they are usually highly constrained about what they can discuss by commercial and professional sensitivity issues. One can anticipate that these professionals may be glad to have the opportunity to discuss such issues with a peer that has had similar experiences. An interview, more so than a survey, can enable the investigator to establish some rapport with the practitioner. In a study such as this, in which rather sensitive issues could be traversed (e.g. project failures, a lack of effective risk management), a degree of trust built on rapport is particularly important.

Apperance and body language can be influential in this respect, and a great deal of non-verbal communication occurs in a face to face, one on one discussion. This is highly advantageous for the purposes of this study. The interviewer can use this communication to: set the subject at ease, direct the interaction as a meeting of peers, establish trust, demonstrate an interest in what the subject is saying and encourage expansion of certain ideas without placing words in the subject's mouth. The interviewer can also pick up meanings, inflections, emphasis and impressions from the subject that are not verbalised. These clues provide important information for the interviewer to understand what is meant, what is important and what topics might be fruitful to explore further.

Interviews are also particularly useful for this study because the lexicon of project risk management varies from project manager to project manager and from organisation to organisation (Wideman, 1992). Attempts to create a standard risk management terminology by such groups as the Project Management Institute have had limited success. Partly this is because much of the standard project management techniques defined by these groups is of limited applicability in software projects. In an interview situation, the interviewer is able to clarify terms and meanings of practices used.

One of the most compelling reasons for using interviews is that a large part of this work is exploratory. There is a need to dig deeper into areas of interest as they arise. It is important for this study to gain the rich depth of data that interviews can provide. To avoid the shortcomings of a single case study, several organisations are included here.

Furthermore, in order to consider alternative viewpoints within organisations, interviews are conducted with people in equivalent roles across the different organisations.

As mentioned previously, only the supplier perceptions of the customer-supplier relationships are explored in this particular study. These perceptions are considered, however, in a far more open ended way than the other parts of the study, in keeping with a non-positivist approach. These relationships concern human interactions on several levels and may have social and political dimensions. It is possible that this area has been rather neglected in the IT project management literature partly because it falls well outside positivist thinking.

In addition this topic represents somewhat uncharted territory. A far more exploratory approach is appropriate when considering these issues since we cannot predict what aspects may be considered of greatest significance to practitioners. Hence the interviews addressing these issues are far less structured, allowing the researcher more freedom to explore points of interest as they arise.

It is important to reiterate that this study is interested in and reports on practitioners' *perceptions*. There is no intention to seek actual empirical evidence of their practices. In terms of establishing what techniques are used, this study accepts that the techniques described by the participants are taken to be the techniques used. Participants are asked to describe these perceptions in subjective terms. However they are also asked questions designed to require them to justify these subjective measures. This provides some rigour in order to judge the validity of the answers given. The questions used and more information about the design of those questions are described later in this chapter.

Finally, it is relevant to comment on those to be interviewed. Karolak (1996) states that there are six perspectives to consider in software development risk management:

1. Operational – the daily operation of the business.
2. Strategic – future and direction of the business.
3. Technical – technology aspects of the enterprise.
4. Business – financial, value and competition dimensions.
5. Industry – commonality of the business.
6. Practitioner – software development.

For the purposes of this research project, the primary concern is with the practice of software development. This work seeks input from three different roles within selected organisations. These roles can be described as Service Managers, Project Managers and Developers. The service managers are senior managers who bring strategic and business perspectives while also being concerned with the operational aspects of their organisations. In some cases these service managers are also directors of the business. The project managers provide operational, industry, practitioner and some business perspectives. The developers provide technical and practitioner perspectives.

These three different roles have been selected because they have different motivations and therefore one might expect them to have different perspectives on project risks, as set out in Table 3.3. Yet the they are all part of project teams on a day to day basis and have a vested interest in having consistently sucessful project outcomes.

Role	**Responsibility**	**Desired Priority Outcome**
Service manager	Responsible for practice development	Business objectives
Project manager	Responsible for practice enforcement	Project outcomes
Developer	Has to ahdere to the practice	Deliver product

Table 3.3 Different roles, responsibilities and priorities

3.4.2 Justification of a two phase interview approach

This study uses two phases of interviews. In general this represents a strategy through which ideas are collected in the first phase in order to inform the conduct of the second phase. While not widely used in comparison to single-phase or consensus oriented Delphi approaches, it is a not uncommon method, as evident in relevant literature.

For instance, Beise and colleagues found a two staged interview process useful in their research of group support practice (Beise, 1992). They used pilot interviews as a means to refine their "…data collection instruments" before conducting in-depth interviews for their main body of data. Like this research, they also used a combination of qualitative and quantitative analysis methods. The pilot was so useful they were able to present their preliminary work before the in-depth interviews were initiated.

Amoroso et al. found reviewing the design of field research before completing their study most helpful (Eriksson, 2000). Their work has particular relevance for emerging topics in information services where there are "…many opportunities to shape directions and priorities". For example, they discuss how some field researchers tested their approach and tools during a pilot stage.

A similar technique was used by Tuikka in his research into co-operative design (Tuikka, 1997), finding that the background material gained in the initial interviews formed a useful part of the research results. Grinter also used two phases of interviews to good effect in her study of practitioners' interaction across organisational boundaries (Grinter, 1999). She used the information gathered from the first phase of interviews to devise a guide for semi-structuring the second phase of interviews.

Finally, Wixon and Ramey's research into field research techniques encouraged similar practices, suggesting that the two phased technique works best when the respondents are provided with feedback as soon as possible after the initial interviews (Wixon, 1996).

The first phase of interviews in this research is not intended as a pilot stage. Rather, the methods are to be reviewed after the first few interviews to check that they are operating as expected and that the research questions are being answered by this process.

The first phase of interviews investigates the service managers' perspectives on risk. The second phase of interviews is split into two separate styles and serves two distinct purposes. In the second phase the perspectives of the project managers and the developers are investigated. Separate to this exercise, the service managers are re-interviewed to explore the customer relationship risk issues.

As described previously, interviewing these different groups is primarily designed to consider different perspectives. By investigating these different perspectives this research gains more depth of knowledge in this topic. This method may give the results more impact. It may give greater strength to a particular view of organisational practice. Whitman and Woszczynski contend that such an approach may also help to alleviate common method variance problems, that are inherent in research based on self-reports (Whitman & Woszczynski, 2004).

(Note that the precise research questions to be put before the service managers in the second phase are not determined until the first phase is complete. This is because the precise questions would be guided by what the practitioners considered to be important, as identified in the first phase.)

3.5 Instrument development

3.5.1 RQ1a - Risk identification

The first research question (RQ1) is: *What risks are considered important to smaller teams?* In order to answer this question subjects are provided with an augmented list of risks based on those identified by experienced project managers as reported by Addison and Seema (Addison, 2002). Participants are asked to consider the importance of these risks in relation to the projects they undertake.

One aim of this resarch is to investigate which risks are relevant for smaller teams. The literature review identified a number of articles that asked experienced project managers what they considered to be the most common/important risks. The work of Addison and Seema (Addison, 2002) included most of the risks discussed elsewhere. This therefore provides a basis for the list of risks used here, with another commonly encountered risk added by the researcher on the basis of personal experience. (Participants are also able to add further risks to the list should they be considered important.)

If needed, participants could be given some clarification as to the definition of each risk. However in general the intent is that they view each risk in a broad rather than narrow sense. For example, some risks could apply to the development team or to the customer. In these cases the participants should consider both perspectives. Likewise participants should take a broad view of what could be considered a 'technique'.

It should be evident that this is a confirmatory exercise. The study prompts the participants to suggest any other risks they consider important but only after working through the suggested list. The concept is to have practitioners reflect on their practices in an ordered and time efficient manner. It is appropriate to adopt a highly structured and positivist approach to answering this question.

Such an approach is designed to prompt practitioners to consider their practices from a risk point of view. It provides a great deal of structure so as to help them focus on each risk in turn. This work does not seek to rank the risks. A less structured approach – by leaving the list of risks to the practitioner – could have the drawback of revealing only those risks in the forefront of the participant's mind at the time of the interview.

Standard project management theory suggests the first aspect of risk management is to identify risks to the project (PMI, 2000). This study does not prompt the participants to explain the processes they use to identify project risks (with the exception of customer relationship related risks, addressed in Phase II). This research simply prompts participants to reflect on their practices and the risks they to be most important.

3.5.2 RQ1b - Importance of risks

A central aim of this study is to determine the importance of each risk cited in the literature with particular reference to smaller software teams, as well as to identify any other risks practitioners believe to be important. When considering importance the primary interest in this research is in efficacy. Hence only the most basic measurement of importance is sought. The indicator to determine this basic level of importance is whether a risk is considered worth controlling or not by practitioners. In addition this study aims to investigate what techniques are actually used to address risks. This leads to a further division of options: in addition to "Usually not worth controlling" two other options are provided: "Worth controlling but a technique [to control the risk] is often not used" and "Worth controlling and a technique is used".

The provision of just these three options for risk importance is derived from a logical consideration of the research questions. This research has arisen due to the lack of prior research on this topic, hence the ratings cannot be drawn from the existing literature. There is no intention to rank the risks; hence a more granular scale is not required. The consideration of risk importance drives the exploration of what risk management techniques are used, hence the obvious division between those risks worth controlling and those not worth controlling. A risk that is worth controlling may often not be well addressed in a given organisation, for a variety of reasons. Hence a distinction is sought between those risks where a technique is used and those which are often not controlled.

It is also not the purpose of this research to search for relationships between risks. However the questions can be structured in a way that allows some of this information to be exposed. For example, a question might reveal that one technique is used to address multiple risks. By using interviews the study is able to delve into specific important issues of efficacy as they arise.

It is envisioned that the different roles to participate in this research may have different views on the relative importance of project risks. This expectation stems from the different motivations inherent in each role, as described previously. Thus each interview is intended as a one on one activity so that each participant is not influenced by other viewpoints.

3.5.3 RQ2 - Techniques used

The next research question (RQ2) considered is: *What risk management techniques are used in smaller teams?* As described previously, this work has placed some limitations on how that question might be answered. This work focuses on the practitioners' views rather than observing their daily work. In addition this work asks the participants to approach the topic by first considering what risks are important and then asks them to describe the techniques they use to control these risks.

At this point the research takes on a far more interpretive stance. The participants are not prompted on what techniques might be suitable. In addition they are not constrained in what they might consider to be a technique. For the purposes of this study, informal chats around the water cooler or a recorded steering committee meeting are both examples of techniques that could be mentioned and would be considered valid.

The participants' responses are also not guided in a way that might conform to groupings of techniques suggested in the literature. While such an approach would make it easier to undertake a comparison with the literature it may also fail to identify valuable information that does not conform to such groupings.

3.5.4 RQ3 – Effectiveness of techniques

The next research question (RQ3) is: *How effective are these risk management techniques perceived to be?* At this stage the study returns to a very structured style and asks the participants to rate each technique according to a pre-set scale. However the scale does include clearly subjective terms such as "mostly" and "satisfactory". This reflects the focus on the participants' views as well as a desire to use a very simple scale. A simple scale is appropriate since the primary interest is on what the practitioners find efficacious. Only a basic indication of each technique's effectiveness is sought since there is no intention to rank these techniques and because of the focus on perceptions. A very small range of subjective measures is appropriate for this research and allows for comparisons between the participant groups to be made.

In the first phase of interviews the participants (service managers) are also asked to justify their rating of effectiveness by explaining how they determine if each technique in use is proving to be effective. This justification is requested to seek further insight into whether their views on effectiveness might be able to be measured in a more positivist manner. However, this research does not assume that these views of effectiveness can be readily measured or justified.

The second phase considers the perspectives of project managers and developers from the same organisations regarding the effectiveness of the techniques identified by service managers in Phase I. However, partly due to time limitations, those second phase participants are not asked to justify their perceptions. This study seeks the participants' views and treats their views as valid opinion whether or not they can provide a justification for those views. This work accepts that the participants' views are based on their experience.

As discussed previously the focus of this research with respect to the techniques used is their efficacy. Thus the primary design criterion for measuring effectiveness is whether a particular technique could be considered efficacious. Inversely, if the risk still often occurs then clearly the technique is not viewed as efficacious. Hence for the purposes of this research this indicator can be used as a basic measurement node on a Likert-type scale of effectiveness.

Since the inception of Likert scales in 1932 they have been used extensively in the behavioural sciences (Busch, 1993). Since this work is based on practitioners' perspectives, subjective measures are being used. A very limited set of options is provided to the participants so that meaningful comparisons can be made when analysing the data. The provision of three levels of effectiveness for the rating of techniques considered to be efficacious serves two purposes. First, by only using three labeled options of "Almost always...", "Mostly..." and "Satisfactory" there is less room for ambiguous responses. Second, this simple scale provides participants with a level of comfort that they can select from several subjective descriptions and a sense of rating effectiveness along a continuum.

The option of "Often, risk still occurs" is added to the three labels explained above to form a four-choice rating scale for effectiveness, the latter item being more an indication of ineffectiveness. The options are presented in a worksheet provided to participants overlaid on a graphic as shown in Figure 3.4, to indicate that the options lie on a continuum.

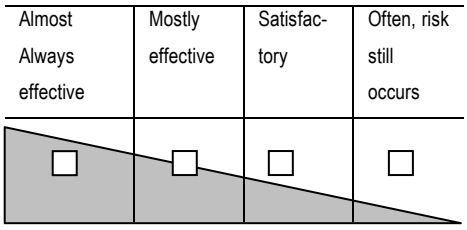


Figure 3.4 Basic rating of effectiveness

3.5.5 Interview worksheet

The following page shows an example of the worksheet used for the interviews (in Figure 3.5). The worksheet was designed to be filled out alongside the participant as the interview progressed. (The full worksheet is shown in Appendix A.)

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one]				**How is it determined if each technique in use is being effective? How is the technique evaluated?**
			Always effective	Mostly effective	Satisfac-tory	Often, risk still occurs	
Unclear or misunderstood scope / objectives.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐	☐	☐	☐	
Misunderstan-ding the requirements	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐	☐	☐	☐	
Unrealistic schedules and budgets.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐	☐	☐	☐	

Figure 3.5 Interview worksheet

3.5.6 Phase II interview questions

At the inception of this research it was known that an exploration of customer-supplier relationship issues that have a bearing on project risk management would be included in Phase II of the work. The precise questions to ask the participants were to be formulated out of the discussions held in the first phase of interviews, these Phase I questions having been designed in a structured way. To begin with, a certain base of knowledge is discussed in these interviews, then selected issues of interest are explored further.

The base of knowledge meant exploring customer-supplier relationship risks in terms of standard project risk management models used for project management in general, such as in the model published by the PMI (PMI, 2000). From these models three areas of interest were to be explored, namely risk identification, risk avoidance and risk response. These are expressed as the research issues shown previously in Table 3.2.

These research issues in turn lead to the following Phase II questions:

RQ4. What is done to identify and avoid risks?

a. A multiple level contact approach can be used to manage customer relationship issues which threaten project success. What other things do you do to keep a positive customer relationship and to identify any emerging challenges?

b. When these interactions occur, what do you and your colleagues do/say to draw out/discover issues?

RQ5. What risk responses do you [these practitioners] use?

From this base the research then explores two questions which arose partly from the first phase of interviews and partly selected as topics of interest from the writer's experience in this domain, addressing aspects of management style in regard to risks:

RQ6. Do customers prefer a formal risk management style or a flexible style?

RQ7. What trends do you [suppliers] perceive there are in the compromises customers are willing to make? Have attitudes of clients changed over the last 10 years in respect to trade offs between time/requirements/money and how to resolve these issues once a project is underway?

3.6 Data analysis methods to be used

Given that this work has a largely exploratory element to it, a straightforward data analysis approach utilising frequencies, proportions, means and medians is appropriate. The data collected can be considered in three parts:

1. Phase I survey style demographic questions
2. Phase I highly structured interview questions
3. Phase II exploratory interview questions.

A database was designed to store the responses to the demographic questions. Various queries could then be run against this database to search for patterns. It was anticipated that certain demographics, such as experience in project management, could have a bearing on participant perspectives. However, as the literature does not provide strong guidance as to what demographic groupings might be significant, the selection of demographics is acknowledged as being somewhat arbitrary.

The data collected using the Phase I highly structured interview questions relate to the first research objective: *To determine what project risk management techniques are used in smaller teams and how effective these techniques are.* Practitioners answers are to be recorded and collated into a combination of databases and spreadsheets. To work towards the research objectives it is appropriate to analyse these answers through the use of descriptive statistics employing frequencies and proportions. Various graphical representations such as pie charts and bar charts are also to be used. The latter are particularly useful when seeking any patterns within or across organisations, roles and such groupings as is an aim of this research.

The more exploratory interview data are aligned with the second research objective: *To explore the project risk management issues that relate to relationship issues between customers and suppliers.* This objective is addressed by conducting loosely structured interviews and exploring areas of interest in more depth as they arise. This is to be done selectively to demonstrate points of interest identified by the researcher rather than systematically (such as through coding under a grounded theory method). Hence an informal narrative analysis with quotations to illustrate key points is to be used in considering this data.

3.7 Implementation

3.7.1 Preparation for the interviews

Prior to the interviews the participants were sent information about the interview and the questions to be asked. The purpose of doing this was to encourage the participants to think about the subject and to aid them to feel more comfortable with what to expect. It also mirrors the professional practice of preparing someone for a meeting. All of these preparatory activities were carried out in order to optimise the chances of a successful interview.

In order to set each participant at ease the interviews were begun by 'warming up' the subject. This was achieved by prompting the participants to talk about themselves and their organisation. In the writer's experience such professional people like to do this and/or have done this a lot and are comfortable doing it.

3.7.2 Confidentiality and ethics

Efforts were made to interview the participants as peers, as recommended by Bowman and Newman (Newman, 2006). All interviews were held strictly one on one behind closed doors to ensure the participants' anonymity. Anonymity is generally important in this sort of research in terms of increasing the likelihood that more honest answers can be obtained from participants. In this study, each organisation and each participant was provided with a written contract and related information to protect their anonymity and the confidentiality of responses. Each participant also had the right to revoke their consent after being interviewed so that they could appear to have taken part in the research yet still prevent their answers being used (a right not exercised in the study). As part of this contract each participant was given several channels to raise concerns about the process either with or independently from the interviewer.

In addition to the University's standard ethical practices for research, this study provided each organisation with a written contract to protect all respondents' privacy and confidentiality as well as any commercially sensitive information. This is important when searching for willing organisations. It is also useful as a tool to help to allay any concerns the respondents may have about their interviews being taped.

3.7.3 Organisation selection

Once approval for this research was obtained from the AUT University Ethics Committee [AUTEC Reference number 06/77], candidate organisations were selected. Potential organisations were found from two databases: Kompass (kompass.com, 2007) and the New Zealand Business Who's Who (New Zealand Business Who's Who, 2007). Organisations were selected based on their (low) number of employees and their involvement in software development. Invitations to participate in this research were sent out to 110 selected organisations by standard mail.

When selecting organisations, those that may be described as micro-organisations were omitted. The New Zealand government's Ministry of Economic Development makes a distinction between enterprises that employ zero employees, 1-5 employees and more than 5 employees (Medasani, 1999). For this research, organisations that employed 5 or fewer people were not selected. It was thought that these organisations would be unlikely to have a project manager role. In addition, they may not have the capacity to undertake projects that are sufficiently complex to encounter the range of risks that are the topic of this study.

Of the organisations contacted, nine were willing to participate. After giving initial consent, however, one of these organisations found it too difficult to set aside the time required for the interviews. Thus eight organisations participated in the first phase of interviews. Of these, four organisations participated in the second phase of interviews, based on the availability of other roles in the organisation and on the split of organisation types: two of these organisations supplied ERP applications and two organisations provided applications to niche industries. In one of those four organisations it proved too difficult to arrange a time to interview a senior developer, in spite of repeated attempts. Thus only the managing director (representing the service manager role) and the project manager were interviewed in that organisation.

The interviews in the first phase were intended to be two hours long each, with those in the second phase planned to be one hour long each. These times were adhered to as closely as possible so that the participants had some degree of predictability in order to plan their day, recognising that their valuable time was limited. They were willing to allocate this amount of time; however they would have been much less likely to allocate more time (as advised by participants during phone calls to set up the interviews).

In total nineteen interviews were completed in this research (comprising eight Phase I and eleven Phase II interviews). Extensive notes were taken during each interview and each was audio recorded. This resulted in the collection of an extensive set of rich data.

3.8 Conclusion

This chapter has explained the contextual background to the research undertaken and reported in this thesis. It has described and justified the selection of the methodology and methods based on the research objectives. This chapter has also explained how these methods were implemented in a way that would support the research objectives. Two phases of interviews were conducted to collect the desired data. The next chapter deals with the results of those interviews. It includes the analysis of that data and some discussion of the findings.

Chapter IV: Results, Analysis and Discussion

4.1 Introduction

This chapter presents the results of the research. It also provides an analysis of the data and some discussion of the implications of these findings.

Immediately following introduction there is a small section that addresses the demographics of all the participants in this research. The chapter then includes five major sections. The first of these, section 4.3, comprises the results and analysis of risk importance from Phase I of the research. Section 4.4 comprises the data, analysis and observations on techniques used, also from Phase I of the research. The third major section, section 4.5, comprises the results, analysis and observations arising from that part of Phase II where the service managers' responses are compared with the responses from project managers and senior developers. The fourth major section, section 4.6, makes selected observations from the Phase II interviews with service managers on risks related to customer-supplier relationship issues. The fifth major section of this chapter, section 4.7, is a discussion of the salient findings from this research.

The risks discussed with all participants (as derived from the work of Addison and Seema (2002)) are listed in Table 4.1. They were always described to the participants in the same terms. For formatting and brevity reasons, however, some risks may be worded differently or in short hand in this chapter.

Unclear or misunderstood scope/objectives
Misunderstanding the requirements
Unrealistic schedules and budgets
Failure to gain user involvement
Inadequate knowledge/skills
Lack of effective project management methodology
Lack of senior management commitment to the project
Gold plating
Continuous requirement changes
Developing the wrong software functions
Sub-contracting
Resource usage and performance
Introduction of new technology
Failure to manage end user expectations
Staging problems *(Implementing developed software into the test environment)*
Customer relationship issues

Table 4.1 Risks presented to the participants (adapted from Addison and Seema (2002))

4.2 Demographics

Each participant was asked questions concerning themselves and their organisation (as per page 1 of the worksheet, shown in Appendix A). These questions included: the types and number of projects undertaken, the experience of the person being interviewed, and the novelty of the projects that they tend to work on. An analysis of these demographics was performed which included searching for patterns between this information and the data concerning risks and techniques.

The organisations studied performed varying numbers and sizes of projects. They all faced a degree of novelty in their projects but that degree of novelty varied. With only one exception the participants had more than five years of project experience. In several cases participants had over 20 years of experience. There was no clear pattern or relationship between the demographic information and an individual's perception of risk, perhaps due to having too small a sample of data. However it was useful to have this information as it enabled the research to reflect that data had been collected from a variety of small software organisations.

Since all but one participant had more than five years of project experience, the demographic information does also suggest that these smaller software teams included experienced service managers, project managers and senior developers. An illustrative example of this data is shown in Appendix B.

4.3 Phase I results and analysis

This major section is based on interviews with the service managers of eight different smaller software organisations. The term ‘service manager’ is used here to describe the role that these participants placed themselves in when responding to the questions. In other words, their official position varied from managing director to development manager. However they were all responsible for the management of services to their customers and so the label ‘service managers’ best describes them as a group.

This major section has two main sub-sections. First, risks are considered by their importance. In the second main sub-section, the techniques used to control these risks are considered with a focus on technique effectiveness.

4.3.1 Identification and importance of risks

This sub-section considers the identification and perceived importance of risks by the eight organisations which participated in Phase I of the research. As explained in Chapter 3, the importance of each risk was rated on a simple scale of three options:

(a) worth controlling and a technique is used [to control the risk]

(b) worth controlling but a technique is often not used [to control the risk]

(c) [the risk is] usually not worth controlling.

The following discussion addresses the risks and proceeds from a consideration of the more contentious issues to those for which there was general agreement. As discussed, a simple yet repeatable indicator is used to determine if a risk is considered important; that is, whether or not the risk is worth controlling. By this measure there is, very broadly speaking, agreement that the risks investigated (as listed in Table 4.1) are considered to be important by the service managers interviewed.

4.3.1.1 Developing the wrong software functions

A notable exception to the general trend on importance is the risk of ‘developing the wrong software functions’. As Figure 4.1 illustrates, opinion was evenly split between those who considered this risk worth controlling and those who did not.

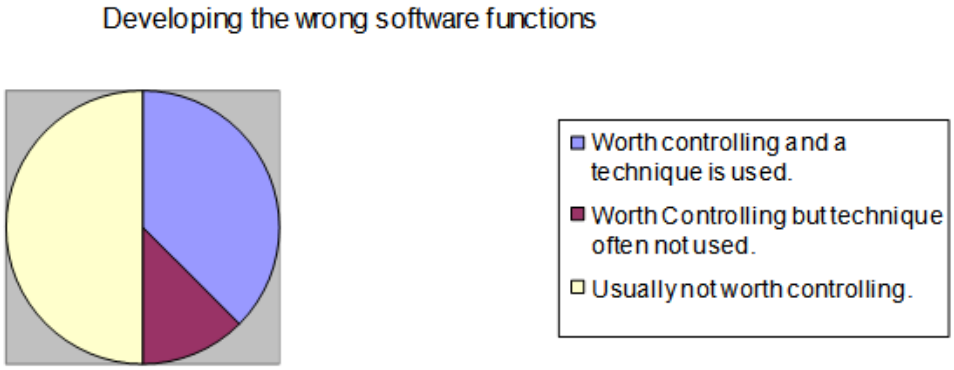


Figure 4.1 Importance of risk 'developing the wrong software functions'

One respondent thought that this risk was worth controlling but often no technique was used to control it. In that case there was a reliance on the technical architect to ensure that the correct functions were developed. This suggests that the service manager being interviewed made a distinction between the responsibilities of the technical architect role and a project management technique. In other words, assigning responsibility in itself does not constitute a project risk management technique. The participant made the point that there needs to be some kind of mechanism to implement this responsibility before one can consider that a technique is used to control the risk. When no mechanism exists the implementation of risk control may be erratic, at best, as implied by this response. This suggests that regardless of how informal such a mechanism may be, it needs to be repeatable and to be implemented on a regular basis to be considered a risk management technique.

4.3.1.2 Sub-contracting

The responses to some other risks may at first glance appear to suggest they are not viewed as particularly important. In fact, these responses depend on different interpretations of the questions. The use of interviews rather than surveys allowed these responses to be clarified. This clarification may be illustrated by considering specific risks. For example, Figure 4.2 conveys the results regarding the importance of risks associated with 'sub-contracting'.

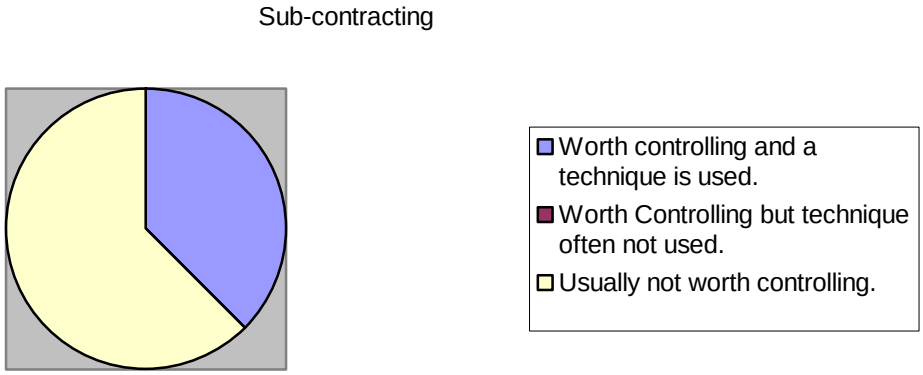


Figure 4.2 Importance of risk 'sub-contracting'

The results for this risk appear to be polarised. Three out of eight interviewees thought this risk was worth controlling and used a technique to control it. Five out of eight interviewees thought that this risk was not worth controlling. However in a sense, all eight subjects held a common view of sub-contracting. The subjects that did not consider this a risk either avoided sub-contracting or else they had effective employment structures in place to the extent that they considered their sub-contractors of no more risk than any other employee. One could argue that this was a form of project risk management yet the interviewees did not perceive the employment structures as project risk management. This might be an indicator that there is a clear distinction between project risks and business risks. It also demonstrates that sometimes definitive steps may be taken to avoid perceived risks yet the participants do not consider these steps in terms of a risk avoidance technique.

4.3.1.3 Lack of senior management commitment

Another example where the empirical data could be misleading is when considering the risk of 'lack of senior management commitment to the project'.

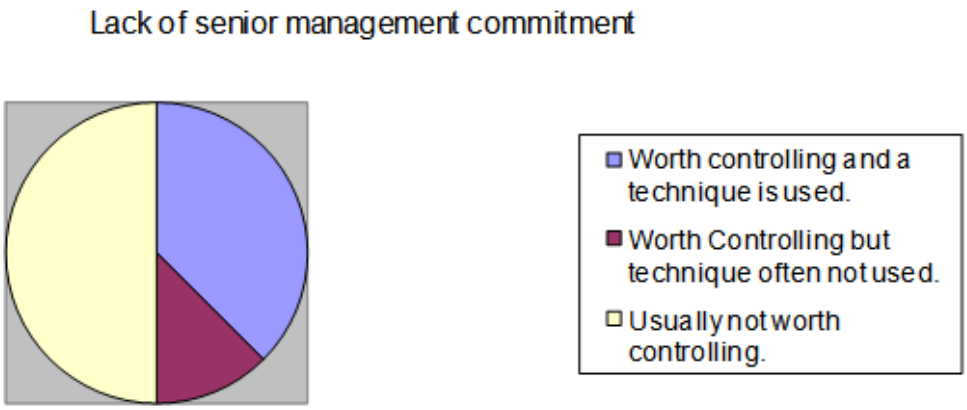


Figure 4.3 Importance of risk 'lack of senior management commitment to the project'

As depicted in Figure 4.3, there were mixed results when considering the importance of this risk. Only three out of eight interviewees thought this risk was worth controlling and used a technique to control it. Another respondent thought that this risk was worth controlling but no technique was established, the inevitable result being that unplanned escalation of issues would occur. Four out of eight subjects considered that this risk was not worth controlling. However for three of these, the reason why it was not worth controlling was because, being a small organisation, senior management were *always* involved in any significant projects. This is another example where an informal process had been established within the organisation and thus the risk was described as not worth controlling. Only one interviewee considered that this risk was not worth controlling because these were sales issues outside the scope of the projects themselves. Put another way, six out of eight interviewees either had senior management involved always or else had a technique in place to ensure senior management involvement.

A more subtle example of answers being dependent on interpretation of the question is when a technique is so effective at controlling a risk and so embedded into the organisation's practice that the service manager considered the risk not worth controlling. That seemed to be the case when considering 'lack of senior management commitment to the project'.

4.3.1.4 Lack of effective project management methodology

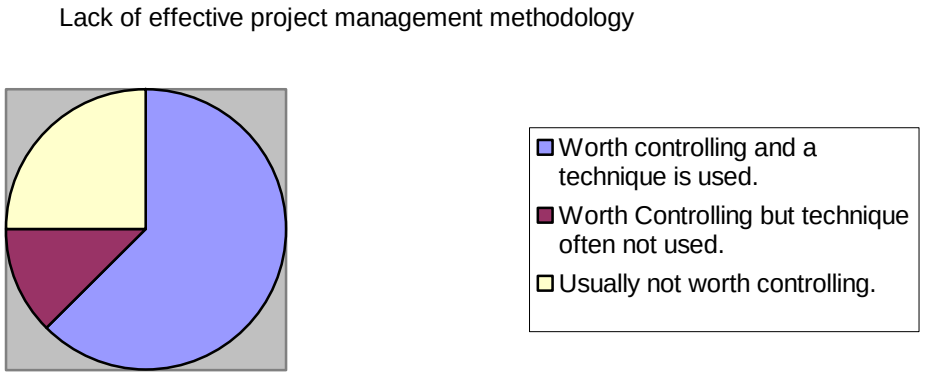


Figure 4.4 Importance of risk 'lack of effective project management methodology'

Superficially there were mixed results when considering this risk (as portrayed in Figure 4.4). However when the verbal answers were reviewed more carefully, it was recognised that this was as a result of different interpretations of the question. Five of the interviewees thought this risk was worth controlling and used a technique to control it. Essentially this involved sticking to the methodology. One thought that this risk was worth controlling but that the documented guidelines were usually not used. Two considered that this risk was not worth controlling, indicating that the project methodology was effective.

One participant thought it not worth controlling because the methodology was working. On reflection it seems that the five that thought it worth controlling and used a technique are in fact in agreement with the two that thought it not worth controlling. By using interviews the writer was able to recognise that the two groups were in fact in agreement about this risk. Thus seven out of eight are happy with their methodology and its usage.

Some risks were important in certain situations, but not always. Examples include 'gold plating' and the risk of key personnel leaving. This risk of key personnel leaving arose during the interviews, rather than being a risk that was put to each participant. Hence it is not known if this risk is viewed as important by most of the organisations.

4.3.1.5 Gold plating

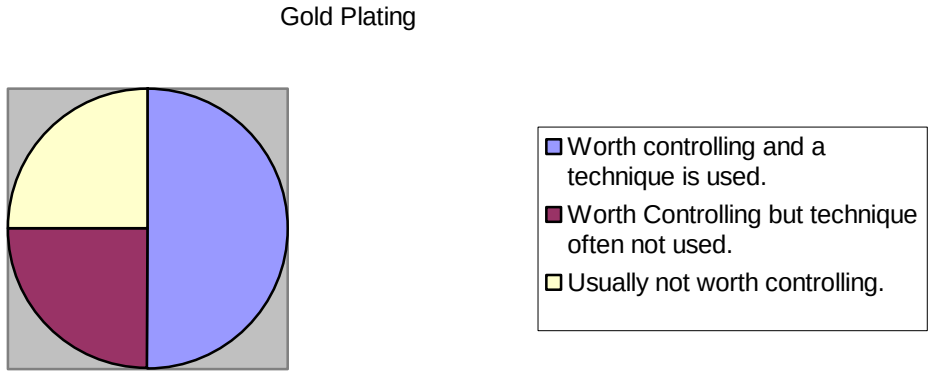


Figure 4.5 Importance of risk 'gold plating'

There were mixed results obtained from service managers when asked to consider this risk (see Figure 4.5). Four out of eight interviewees thought this risk was worth controlling and used a technique to control it. One of these identified that this was a risk at design stage rather than development stage. Two subjects thought this risk was worth controlling but no technique was currently being used. In one of those cases a new system was being planned to remedy the situation. Two out of eight subjects considered that this risk was not worth controlling. One of these thought this was not an issue except for new staff. Further discussion implied that there was some informal process of 'training' staff to avoid such practices. The other subject felt that the industry knowledge of their developers meant that this risk was not worth controlling. This might indicate a reinforcement of the notion that the tendency to employ 'gold plating' fades with experience. The concept of this issue being a "trap for young players" was often repeated during the interviews.

4.3.1.6 Misunderstanding the requirements, inadequate knowledge/skills, failure to gain user involvement, and staging problems

Seven out of eight participants agreed that 'staging problems (*implementing developed software into the test environment)*', 'failure to gain user involvement', 'misunderstanding the requirements' and 'inadequate knowledge/skills' were all worth controlling. However two participants admitted that they did not use a technique to control 'inadequate knowledge/skills'.

When the participants were questioned on the importance of 'misunderstanding the requirements', an interesting exception to the majority view was found. Six out of eight interviewees thought this risk was worth controlling and used a technique to control it. One other thought this risk was worth controlling but no technique was currently used. In that case a new methodology was shortly to be introduced to address this issue.

Of particular interest was that the remaining interviewee considered that this risk was not worth controlling, on the basis that they had sufficient industry knowledge to usually understand requirements. Furthermore, they employed staff who had come from their customers' market and developed IT skills rather than IT people who then had (to attempt) to understand the customers' domain and their requirements. This suggests an advantage of working in a niche or vertical market.

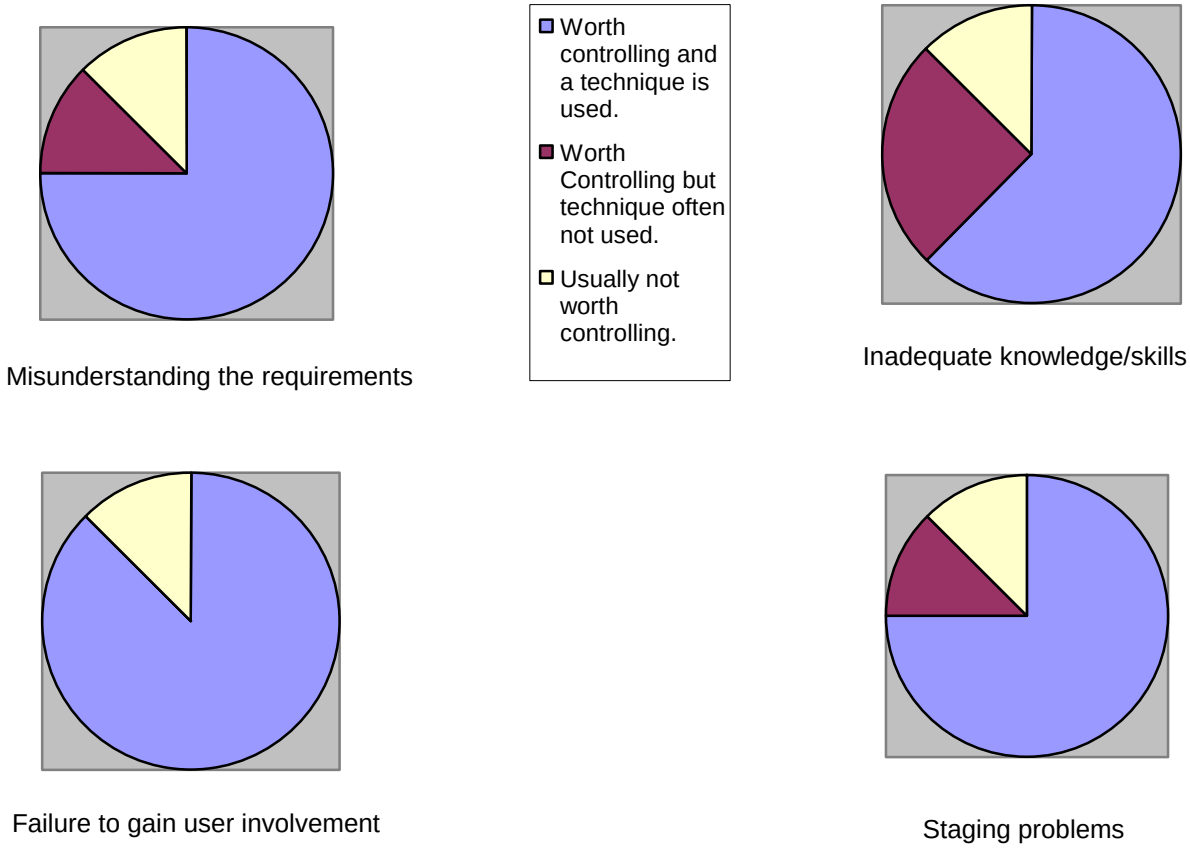


Figure 4.6 Importance of risks 'misunderstanding the requirements', 'inadequate knowledge/skills', 'failure to gain user involvement', and 'staging problems (*implementing developed software into the test environment*)'

When considering 'staging problems', one participant felt that currently no technique was properly used. In other words in theory there was a technique but it was only partially used in practice. In that case a new QA checkpoint to ensure this risk is addressed was to be introduced to their methodology.

From the researcher's experience, it is of note that two participants in the role of service manager admitted that the risk of 'inadequate knowledge/skills' was usually not controlled by a technique. It may be that this risk is not easily assessed or quantified and so is not easily managed relative to other risks. This research was not intended to be able to make generalisations about the industry. A wider study into this risk may be of benefit to education providers and practitioners if it is found that this is a competitive weakness in many software project teams.

One participant considered that this risk was not usually a factor because of inherent abilities to up skills when required, and because they were good at identifying those risks and acting on them. One could argue that this could be interpreted as having a technique – however the interviewee described the risk as not worth controlling. This might again indicate that where there is an informal technique that works well and is embedded into the culture of the organisation, the risk may be described as not worth controlling.

It should also be noted here that this particular risk can be (and was) interpreted in two ways. In the literature it is usually intended to apply to the knowledge and skills of the supplier. However at least one subject identified inadequate knowledge/skills in the client environment as a significant risk.

4.3.1.7 Failure to manage end user expectations, and resource usage and performance

All eight service managers considered 'resource usage and performance' and 'failure to manage end user expectations' as risks worth controlling. However two out of the eight interviewees in each case stated that a technique was not usually used to control these risks (depicted in Figure 4.7).

These observations lead to a consideration of why or why not a risk management technique becomes embedded or institutionalised in an organisation. A discussion on the institutionalisation of risk management techniques follows later in this chapter.

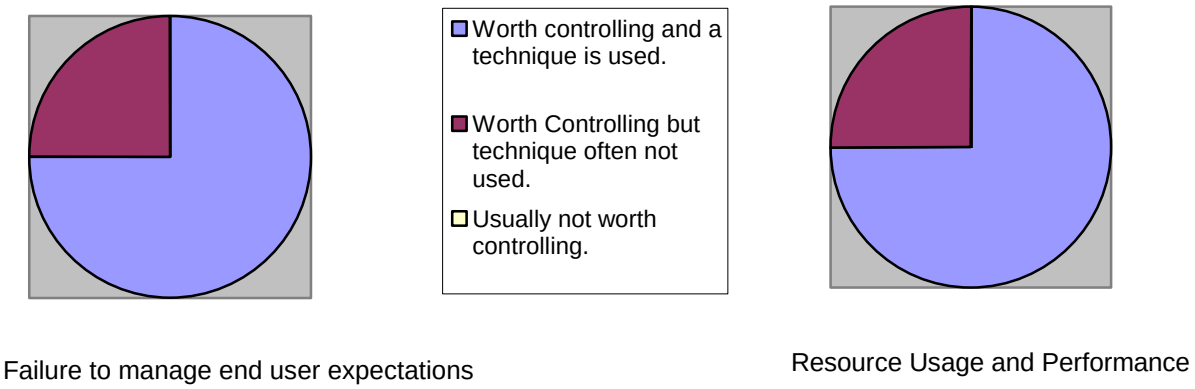


Figure 4.7 Importance of risks 'failure to manage end user expectations', and 'resource usage and performance'

4.3.1.8 Introduction of new technology, unrealistic schedules and budgets, and unclear or misunderstood scope/objectives

The risks of 'unclear or misunderstood scope/objectives', 'unrealistic schedules and budgets' and 'introduction of new technology' were perceived by all participants as being worth controlling and in all three cases all participants but one indicated that a technique was used to control the risk. The results for these three risks are shown in Figure 4.8.

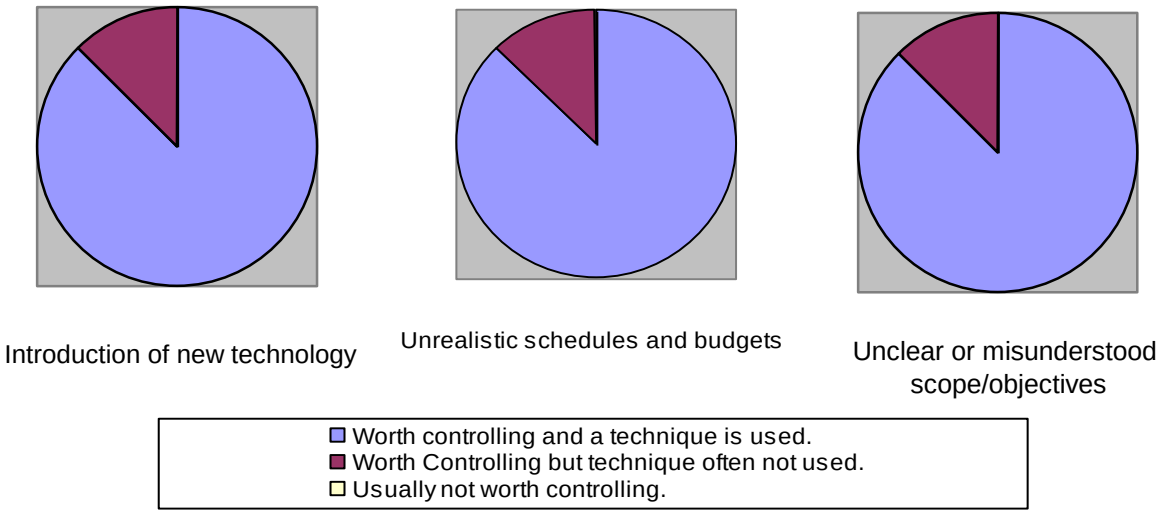


Figure 4.8 Importance of risks 'introduction of new technology', 'unrealistic schedules and budgets', and 'unclear or misunderstood scope/objectives'

When considering 'unrealistic schedules and budgets' most interviewees explained that deadlines were crucial whereas budgets might be able to be modified. However for some organisations they could not go into production with incomplete software, thus the

schedule might have to be extended. Seven out of eight interviewees thought this risk was worth controlling and used a technique to control it. The remaining subject thought this risk was worth controlling but a technique was often not used.

In considering the importance of 'unclear objectives', seven out of eight interviewees believed this risk to be worth controlling and they used a technique to control it. The remaining subject felt that the risk was worth controlling and admitted that no technique was currently used, but then stated that this had already been identified as a flaw in their practices which would be addressed by implementing a new methodology and a system to aid compliance with the methodology.

The subjects were also close to unanimous regarding the risk of the 'introduction of new technology'. Again seven out of eight interviewees felt this risk was worth controlling and used a technique to do so. However one thought this risk to be worth controlling but did not employ a technique to control it. That exceptional organisation did, however, take a conservative approach. In fact, in Phase II of this research the developer in that organisation indicated that part of his job was to evaluate new technologies prior to adopting them – so perhaps a 'technique' was used after all. This may tell us something about the informality of project management in smaller organisations. In some instances they perform risk management processes but they do not realise it or do not express it in the same terms.

4.3.1.9 Continuous requirement changes, and customer relationship issues

The participants were unanimous when considering the importance of 'continuous requirement changes' and 'customer relationship issues' as can be seen in Figure 4.9. All eight interviewees perceived these risks to be worth controlling and used one or more techniques to control them.

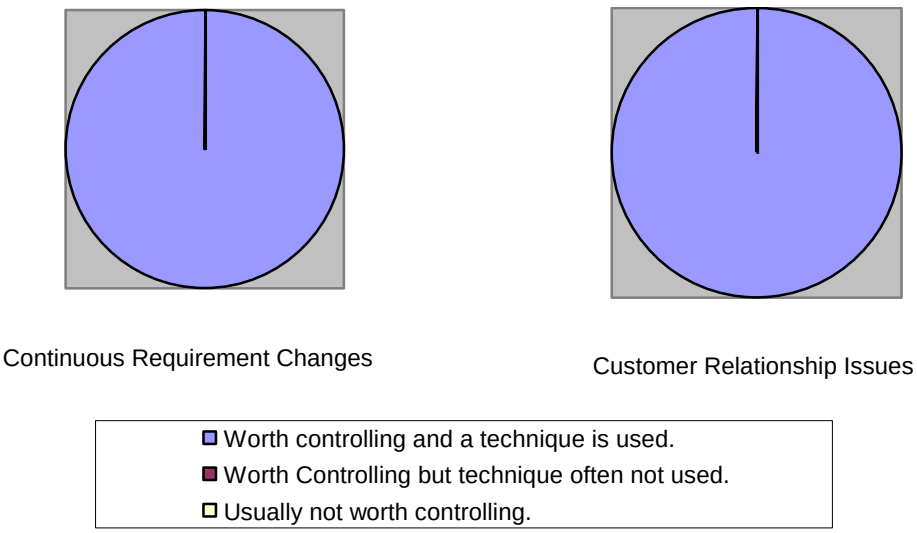


Figure 4.9 Importance of risks 'continuous requirement changes' and 'customer relationship issues'

During the interviews it became clear that 'continuous requirement changes' was a familiar and well recognised risk. This risk was perceived to always require monitoring. It could be said that the participants were highly conscious of this risk. They were also highly aware that they had techniques to control this risk. (Those techniques will be discussed later in this chapter.)

The interviewees were also unanimous in their attitude to risks related to 'customer relationship issues'. In fact they all considered this risk to have the potential to supersede all other risks. They all reported that this risk was worth controlling and one or more techniques were used. This risk was not identified in the consideration of prior software project management literature. Therefore to begin with the subjects were not directly prompted to consider this risk. Hence in the case of the first interview there are not specific answers in the worksheet – however even in that case, comments during the interview demonstrate that the interviewee's views concur with those of others in regard to this risk.

4.3.2 Other important risks identified

The identification of risks is a cornerstone in risk management theory. Hence this study encouraged the participants to identify risks other than those listed that they considered to be important. This generated discussion on a number of risk issues, some of which were controlled by one or more techniques. The issues included the following.

- Developing useful functions outside the requirements could actually have great benefits. This supports the idea that risks can be positive as well as negative.
- Time spent obtaining user requirements is a risk. It could be that other interviewees would have concurred with this risk had they been prompted.
- Consistency of project manager style. In at least two cases this was considered important. However it may be expressed in different terms. For example, one interviewee considered that truly good project managers could have a powerful impact. When queried as to what made them good, the interviewee was able to articulate that most project managers were good at project administration however few project managers were good at identifying where a project was in trouble and addressing the problem quickly. This indicates that there are 'soft' issues in projects that are not easily addressed by a methodology.
- Post project reviews. One organisation was adopting a new system to enforce a practice of learning from previous projects. The underlying risk was that without this technique they may not be improving their practices in spite of recognising previous problems.
- Project selection, that is, the risk of spending time on less relevant areas or requirements for the target market. It is unclear if other organisations would consider this as a project risk.
- One of the organisations also added the risk of people leaving and thus losing valuable project knowledge. Although this risk had low probability and so was not well prepared for, it was a risk that was perceived to have high impact.

Others may have agreed that these risks were important if they had been suggested to them. However apart from customer relationship issues, the only other risks that were suggested more than once were consistency of project manager style and the risk of key personnel leaving.

4.3.3 Perceptions of importance: aggregated results

This section continues to examine the results obtained in respect of risk importance. However, the results are now considered across the group of organizations, and other dimensions of the data are introduced. Rather than attempting to 'second guess' the respondents, their answers are accepted as provided for the purposes of this analysis.

As explained above the participants were unanimous when considering two of the risks. The participants thought that both 'continuous requirement changes' and 'customer relationship issues' were worth controlling and used one or more techniques to control them. These could be considered as the key risks for our participating organisations. As noted previously, issues associated with customer relationship management have not been commonly considered in the traditional risk management literature. The decision was taken to explore these issues more fully in Phase II, as reported later in this chapter.

As explained above, risks where only one participant diverged from the majority were: 'introduction of new technology', 'unrealistic schedules and budgets, 'unclear or misunderstood scope/objectives' as well as 'failure to gain user involvement'. This raises the question of whether one organisation had consistently divergent views from the others across the range of risks.

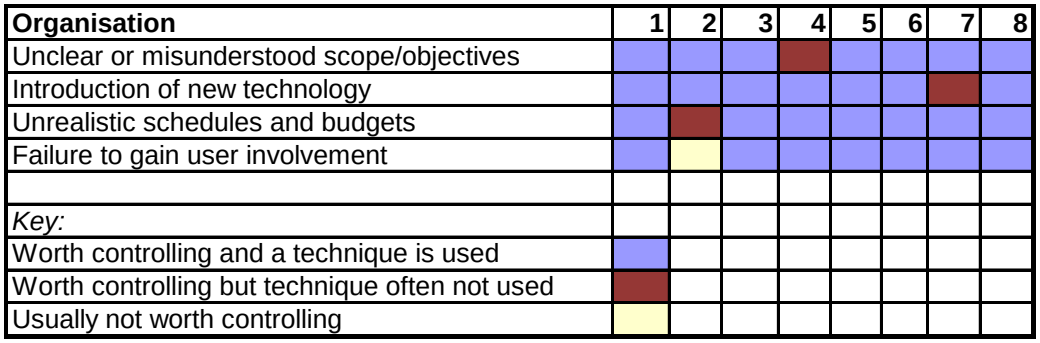


Figure 4.10 Risks generally considered to be important

As can been seen from Figure 4.10 the divergent view was not due to a single organisation, although organisation two tended to diverge a little more than the others. The figure shows that in the case of 'failure to gain user involvement' the divergent view was that this risk was not worth controlling. In all other cases the divergent participant agreed that the risk was worth controlling but they did not often use a technique to control it. Apart from these exceptions, the consensus was that these four risks were worth controlling and one or more techniques were used to do so. Therefore these four risks might be considered as generally well identified and addressed.

The importance of all risks is similarly assessed in Figure 4.11. By considering the lilac and burgundy blocks together, the dominant view is that most organisations considered most of the listed risks to be worth controlling. The risks in the figure have been placed into five ranked groups. The risks that attracted unanimous agreement are grouped together, followed by those with one divergent view, two divergent views and so on.

In terms of extent of agreement the risks associated with 'sub-contracting' could be ranked towards the top, since five out of eight participants expressed the same view. In this case, however, that view was that the risk was not worth controlling. Hence in terms of *importance* 'sub-contracting' is ranked last in the figure. 'Inadequate knowledge/skills' and 'lack of effective project methodology' also show five out of eight participants in agreement. However in these two cases the minority views are mixed. A close look at the final three risks reveals that only half of the participants were in agreement. Interestingly there is no risk where fewer than half the participants were in agreement. What this suggests is that, taken as a group, there is some level of agreement as to the treatment of all the risks considered. (Having said that, the minimum would always be three as there are eight organisations and three options.)

Key:	
Worth controlling and a technique is used	
Worth controlling but technique often not used	
Usually not worth controlling	

Organisation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Continuous requirement changes								
Customer relationship issues								
Unclear or misunderstood scope/objectives								
Introduction of new technology								
Unrealistic schedules and budgets								
Failure to gain user involvement								
Resource usage and performance								
Failure to manage end user expectations								
Misunderstanding the requirements								
Staging problems								
Inadequate knowledge/skills								
Lack of effective project management methodology								
Gold plating								
Lack of senior management commitment								
Developing the wrong software functions								
Sub-contracting								

Figure 4.11 All risks by levels of importance

By considering the perceived importance of risks by each organisation, some insights into the breadth of the risk management portfolio for each – and its exposure – can be shown. By continuing to use the same key but grouping the responses for each organisation together Figure 4.12 is obtained.

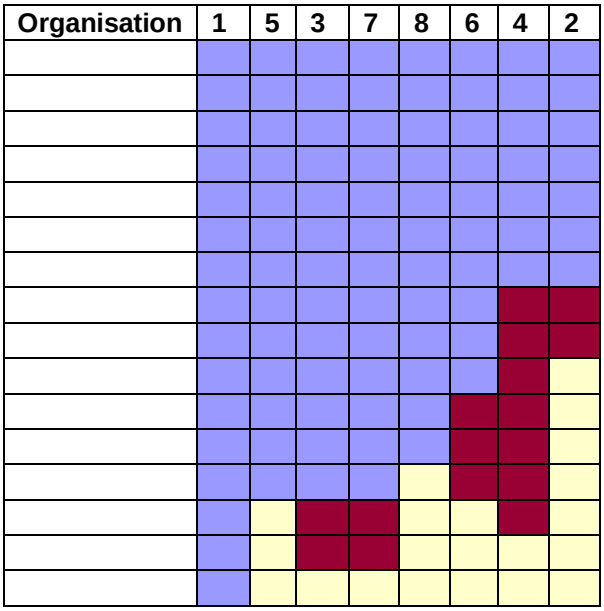


Figure 4.12 Risk exposure for each organisation

This enables the ranking of the participating organisations in relation to the treatment of risks, with organisation one having the most consistent responses and organisations four and two having the most diverse. In fact, responses from organisation one might seem almost *too* consistent in this respect. This raises the question of whether there was an element of wishing to appear well managed in organisation one. It is worth reiterating, however, that participants had to justify their responses by describing and evaluating the techniques that they used. Thus while no observation or 'proof' of practices was sought, there is some justification for assuming a degree of reliability in the answers.

Organisation two described risks as 'usually not worth controlling' more often than any other organisation and is thus ranked at the right-hand side of the scale used in Figure 4.12. However one may argue that organisations four and six in fact have weaker risk management portfolios, with the following rationale. Organisation two perceived seven risks as not worth controlling. If one accepts that these risks really are not worth controlling for this organisation (based on the stance that all participants have valid perspectives), then organisation two has techniques to deal with all but two of the risks *they consider important*. (These answers are examined from other perspectives in Phase II, reported later in this chapter.) In contrast, organisation four accepts that for seven of the risks they consider worth controlling they do not often use a technique to control them, placing them in perhaps a more vulnerable position in terms of risk exposure.

Regardless of where organisation four is ranked, these results do show that there is an awareness of the need for improvement in their management of risks. Conversely organisations one, five and eight do not see a great need to make many changes. When the participant from organisation one was prompted whether there were other risks that should be identified as important, they pointed out that one can take a positive view of risk since some risks can actually become opportunities. It is possible that by embracing risks, organisation one has evolved a more comprehensive risk management structure than other organisations studied. This suggests that perceptions of risk may play an important role in themselves in these organisations.

4.3.4 Summary of results regarding risk importance

Broadly speaking the risks that were investigated were considered important – that is, worth controlling – by the service managers interviewed. Participants may have agreed that some other risks were important had they been suggested to them. However, apart from customer relationship issues, the only additional risks that were identified by more than one participant were consistency of project manager style and the risk of key personnel leaving. Some risks were important in certain situations but not always. Examples included 'gold plating' and the risk of key personnel leaving. Both 'continuous requirement changes' and 'customer relationship issues' could be considered as the key risks for the eight participating organisations, given the unanimous agreement on their importance

Sometimes risks were described as 'usually not worth controlling' by organisations when in fact what was really occurring was a form of risk avoidance. This suggests that these smaller organisations conducted risk management but they may not have described it as such. Examples included 'sub-contracting' and 'lack of senior management commitment to the project'. The reasons some risks were not described in risk management terms could be among the following:

(a) Business versus project risk; there is an intersecting grey area between what is a business risk and what is a project risk. For example, several organisations avoided sub-contracting to avoid the associated risks. This was a business decision that would only be re-considered for an exceptional project.

(b) A risk is always avoided; therefore it is dismissed as a risk. For example, one niche application provider employed many staff knowledgeable in the market and thus did not have a problem with 'misunderstanding the requirements'.

(c) An effective technique is embedded into the organisation so well that a risk is always avoided. A common example of this was that senior management were *always* involved in projects of any significance – thus, risks associated with 'lack of senior management commitment to the project' simply did not occur.

To a certain degree the informality of these smaller organisations meant that at times they were managing risk unconsciously. In other instances, some risks were addressed well but were still treated with a high level of awareness and an understanding of the need to monitor and control them. The risks associated with 'continuous requirement changes' and 'customer relationship issues' were good examples of this.

This research did not set out to determine why techniques may not be institutionalised in these organisations. The reasons why a technique was often not used were discussed during the course of the interviews, and the reasons given varied. One common theme that emerged was that in some cases different people may use different processes rather than there being an established organisation-wide process. It is thought that this issue is related to the flexibility inherent in small organisations (Benamati & Lederer, 2001; Lee & Xia, 2005; Luna-Reyes et al., 2005; Overby, 2001) that gives them a competitive advantage. This research suggests that a balance is required between flexibility and addressing key risks in smaller software organisations. It should also be noted that this flexibility is a great asset when contemplating organisational change. This was illustrated by several examples during this research project where process quality improvements were either planned, being implemented or had been recently implemented. These organisational changes were not studied since that is another topic in itself. However several participants gave the impression that process improvements were simply (but somewhat paradoxically) 'business as usual'. This supports the contention in the literature that change is intrinsic to software development projects and, by extension, the organisations that undertake them (Andrew, 2003; Barry et al., 2002; Boehm, 2002; Dhillon & Hackney, 2000; Doherty & Doig, 2003; Lee & Xia, 2005; Luna-Reyes et al., 2005; Nakamura & Matsuda, 2003; Ovaska et al., 2005; Zafiropoulos et al., 2005). Based on discussions in these interviews, it may be that these smaller teams more rapidly adopt changes including more formal processes where such changes are perceived to be required to address specific problems or risks.

A collaborative element in these suppliers' dealings with their customers became apparent when discussing the importance of certain risks. For example, one participant identified that the (lack of) knowledge and skills in their customers was a significant risk to project success even though these knowledge and skills were the customers' responsibility. This suggests an overlap in responsibility and ownership of project success. Several service managers explained that although schedules may not be able to be re-negotiated, budgets might be able to be modified. This suggests that the terms of a project may be re-negotiated to ensure a successful outcome for both supplier and customer organisations. These collaborative elements may help explain why risks associated with customer relationship issues were considered so important.

In fact the participants rated 'customer relationship issues' as one of the two most important risks. Furthermore, in discussion it became clear that, in the opinion of these service managers, it was so important that it could supersede all other risks. Yet this risk had not been identified in the review of prior project management literature. It may be that the dominance of larger organisation studies in that prior literature meant that the issue did not emerge. In larger organisations, it is possible that such issues might be considered well outside the scope of project management. Another possibility is that this is simply a flaw in the research or the way the research is presented. In any case it became very clear that to these practitioners, a discussion about project risk would be deficient if it did not consider customer relationship issues. Such a view is also supported when one considers that a new software system is bound to create a certain degree of business process change. The business process literature certainly highlights the importance of customer relationship issues. It is therefore curious and troubling that this is not highlighted in the literature concerning software project risk.

4.4 Techniques and their effectiveness

The previous section shows that for most organisations and most risks the majority view was that these risks were worth controlling and in many cases a technique was used. The next task is to determine the number and nature of the techniques employed. Although the number of techniques used to address a risk should not be taken as a direct indication of the importance of that risk, it does suggest the depth of an organisation's risk management portfolio.

4.4.1 The number of techniques used

Figure 4.13 shows the ranked list of risks (from Figure 4.11) overlaid with the number of techniques used to address each risk. Note that as the participant from organisation two was interviewed early in the sequence they were not queried directly on the number of techniques used to address 'customer relationship issues' during Phase I (as the issue had not emerged as a common concern at that stage).

Key:	
Worth controlling and a technique is used [with number of techniques shown]	2
Worth controlling but technique often not used	
Usually not worth controlling	

Organisation	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Continuous requirement changes	1	2	1	3	1	1	1	1
Customer relationship issues	1	?	2	1	1	2	1	1
Unclear or misunderstood scope/objectives	1	1	2		3	2	2	1
Introduction of new technology	1	1	1	1	2	1		1
Unrealistic schedules and budgets	1		1	1	3	1	2	1
Failure to gain user involvement	1		1	1	1	2	1	1
Resource usage and performance	1		3	1	2		1	1
Failure to manage end user expectations	1	1			1	1	1	3
Misunderstanding the requirements	1		1		3	1	1	1
Staging problems	1	2	2		1		2	1
Inadequate knowledge/skills	1				2	1	2	2
Lack of effective project management methodology	1	2	1	1			1	
Gold plating	1		1		1			1
Lack of senior management commitment	1		2				2	
Developing the wrong software functions	1				2		1	
Sub-contracting	1		1			2		

Figure 4.13 Number of techniques used to address each risk

It can be seen in Figure 4.13 that organisation one listed precisely one technique for each risk addressed. Of the eight organisations interviewed, organisation five was the most likely to use multiple techniques to address any given risk. If one assumes that a single technique is less likely to address every aspect of a particular risk than several techniques then these results suggest that organisation five may have more comprehensive coverage of these risks. However, the number of techniques used does not in itself allow these conclusions to be substantiated. One must also consider the effectiveness of each technique before drawing such conclusions.

4.4.2 Effectiveness of techniques used by each organisation

Figure 4.14 shows the perceived effectiveness of the techniques used, presented by risk and organisation. In this figure each technique used is represented by a colour block. Thus if three techniques are used (as per Figure 4.13) the figure shows three coloured blocks stacked on top of each other. Each block is colour coded according to how effective that technique was deemed to be by the participant.

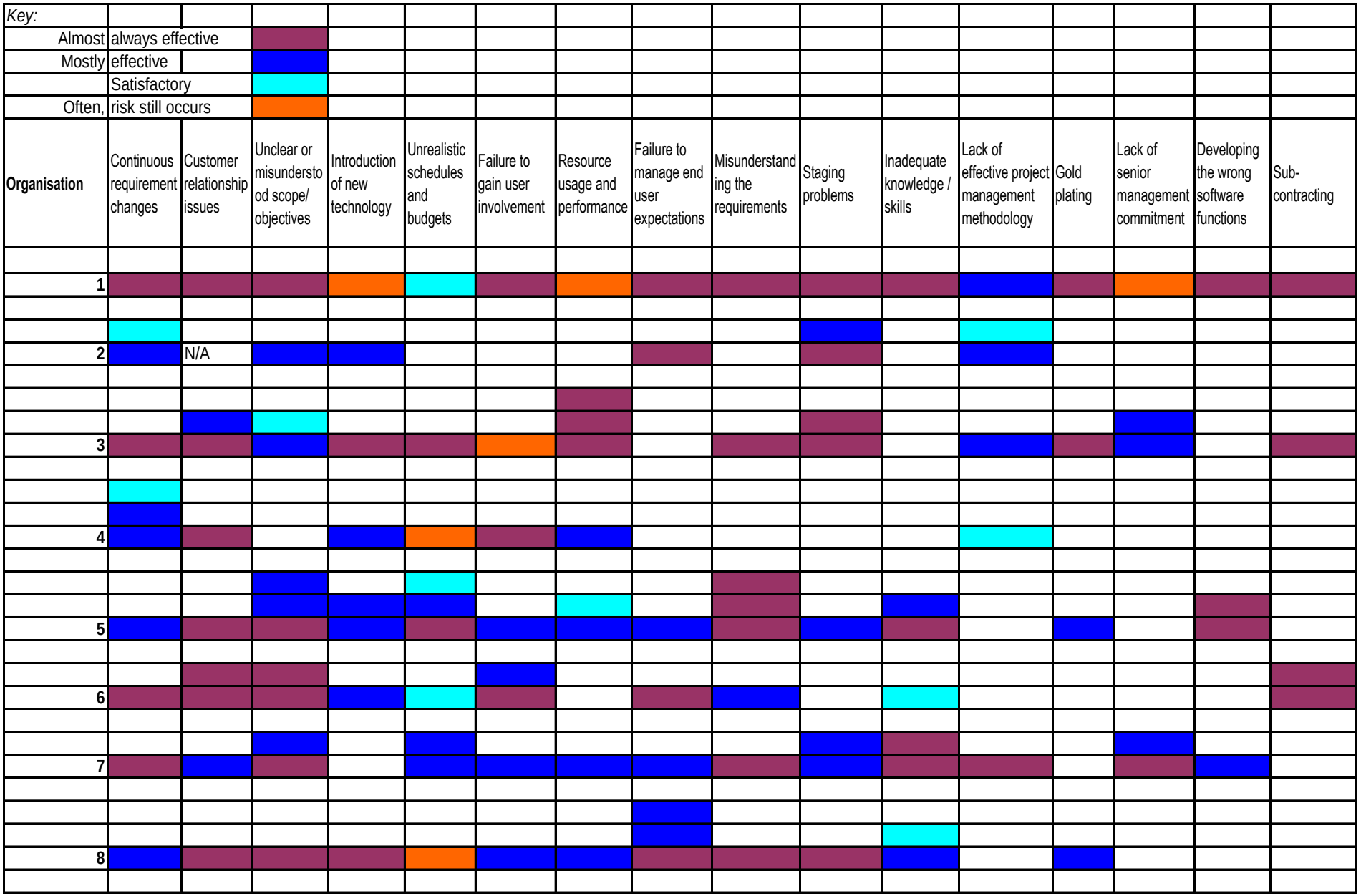


Figure 4.14 Effectiveness of techniques used by risk by organisation

Considering organisation one, the service manager believed that most of the (single) techniques used were almost always effective. Of the four techniques that did not reach this high level of effectiveness, three could be considered ineffective since often the risk still occurred. This organisation described just one technique to address each risk. Hence in the three cases where the technique was ineffective the organisation was left exposed to these risks, risks that were considered important all the same. Every other organisation had more than one technique for at least one important risk. This result suggests there is value in having multiple techniques to address risks.

As already mentioned organisation two was not explicitly queried about how effectively they addressed customer relationship issues (although they did have some techniques in this area, as identified in Phase II). Organisation two addressed six of the other fifteen risks discussed. They did also identify the time taken to obtain a requirement as an important risk but there did not appear to be a consistently used technique to address that risk. They considered seven of the risks not worth controlling. They discussed nine techniques, most of which they acknowledged had room for improvement. Organisation two estimated that 30-50% of their projects were new to their organisation, included new technology, and were new to the project team members. Yet the service manager in this organisation reported that the risk of 'inadequate knowledge/skills' was not considered worth controlling. Given the high degree of novelty of the projects this organisation undertakes, it seems logical that they have a requirement to update their knowledge and skills on an on-going basis. For the service manager to describe 'inadequate knowledge/skills' as a risk not worth controlling suggests either a lack of understanding of risk management or a level of denial about the risks they face. This organisation participated in Phase II of the study where other perspectives and the customer relationship issues were studied in more detail. Based on the Phase I data, however, it could be suggested that organisation two's risk management practices are not entirely efficacious.

Organisation three has an apparently solid risk management portfolio, the only notable exception being in the end user involvement area. The risk 'failure to manage end user expectations' was considered not worth controlling – during the interview, however, this participant did hint that they may not be identifying the risks in this area adequately. They also ranked their single technique to address the risks associated with 'failure to gain user involvement' as 'often, risk still occurs'. These results suggest that

organisation three could benefit from a greater level of communication and involvement from end users. They otherwise perceive themselves to be effective in dealing with the project risks they face.

Organisation four reported that many of their projects had a high degree of novelty. They also admitted that seven of the sixteen risks studied were worth controlling but no technique was used to control them. Several of the techniques they did use were considered to be less than ideally effective. They only considered two of their techniques to be 'almost always effective'. This reinforces the suggestion made previously, that of the organisations studied this organisation probably has the most room to develop their risk management strategies.

Organisation five described their projects as becoming more novel over time. However thus far only some projects had new technology, new functionality, and were new to the development team. Organisation five considered thirteen out of the sixteen risks as being worth controlling and had at least one technique to address each of these. In many cases several techniques were described. Figure 4.14 (and Figure 4.15) show that organisation five was able to describe the largest number of risk management techniques overall. In addition, the techniques used by organisation five were considered to be almost always or mostly effective in most cases. Only two techniques were described as being only satisfactory and in both cases the risk was also controlled by a more effective technique. The empirical data suggest that organisation five might be the most effective at controlling risk although they did not appear to be as exposed to as much novelty as other organisations.

Organisation six acknowledged that three risks were worth controlling but no technique was used. Where a technique was used, in most cases it was almost always effective. However, not as many additional techniques were used as in other organisations. Organisation seven utilised the third-highest number of techniques and considered all of their techniques to be either almost always effective or mostly effective.

Organisation eight was also generally satisfied with the effectiveness of the techniques they employed. Their most difficult challenge seemed to be with unrealistic budgets in certain countries to which they exported. There was a feeling that this risk was a difficult one to manage effectively due to the international organisational structure of

many of their clients. In many cases the budget was being set at a world wide headquarters that was not aware of the local requirements where each project was planned. Some of these requirements were mandated by local laws and some were local cultural requirements which meant they could not be re-negotiated. These issues varied widely from country to country and thus it was difficult to devise generic but still effective contingency plans.

This last example helps to illustrate that smaller software organisations may well have complex risk management issues to deal with. This highlights flaws in the supposition that the complexity of risk management in software organisations is solely or largely related to the size of the project and/or the team.

The following brief discussion puts aside the specific risks and considers the number and effectiveness of techniques used by each organisation. Figure 4.15 highlights that organisations two and four appear to have a relatively weak portfolio of risk management techniques in terms of possible coverage. They may be more exposed to project risk than the other six organisations considered here. Organisations one and three both utilised a large number of techniques that they felt were almost always effective. That said, it should be noted that during the interviews participants generally reported that a technique was effective *when it was use*d. Many participants reported that the techniques described were not always used. In this respect, organisation one, which employs a single technique to control each risk, might be exposing themselves to more risk than is indicated from the data above.

Some organisations are so comfortable with how the organisation as a whole is managing their projects that they rank one or more cited risks as not worth controlling. This is different to perceiving a risk and having a technique that is almost always effective in controlling that risk. In the first instance the risk is not perceived as explicitly requiring effort or additional effort to address. In simple terms it is not considered a risk for their particular circumstances. In contrast, using a technique that is almost always effective requires effort and diligence to adhere to a process. This may reflect that smaller organisations put their focus into balancing effective practice with the effort required. If there is no suggestion that a process needs to change, perhaps the practitioners dismiss the risk as being irrelevant to their concerns.

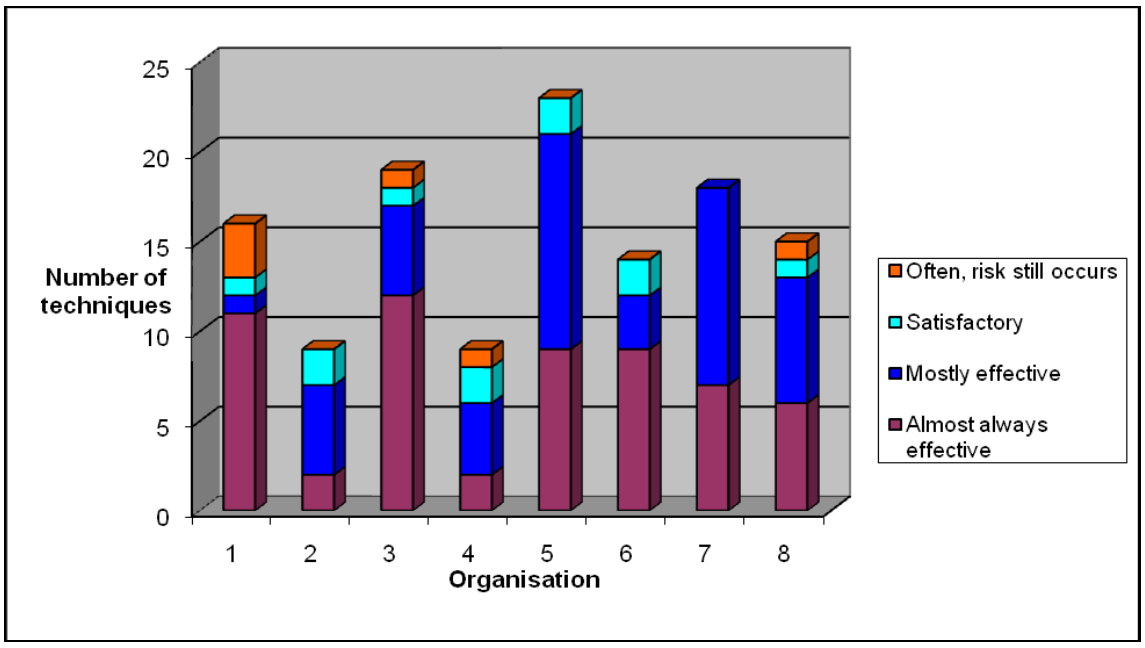


Figure 4.15 Technique effectiveness by organisation

4.4.3 Effectiveness of techniques by risk

This section reports in detail the analysis of the service managers' responses regarding the perceived effectiveness of each technique in dealing with risks. The risks are discussed in the same order as the previous discussion on risk importance.

4.4.3.1 Developing the wrong software functions

The graph depicted in Figure 4.16 shows the number of techniques used to address this risk and their perceived effectiveness across the eight organisations. As discussed previously, only half of the eight organisations considered this risk worth controlling and one of those did not have a technique to control it. Thus data for only three organisations appear in the graph below. This graph shows that organisation one has a single technique that is almost always effective. Organisation seven's single technique is mostly effective. Organisation five utilises two techniques, both of which are almost always effective. This risk is not well catered for but it is also arguably considered the least important risk.

The participants where then asked to explain how they determined the effectiveness of each technique used. For this risk of 'developing the wrong software functions' Table 4.2 sets out these measures.

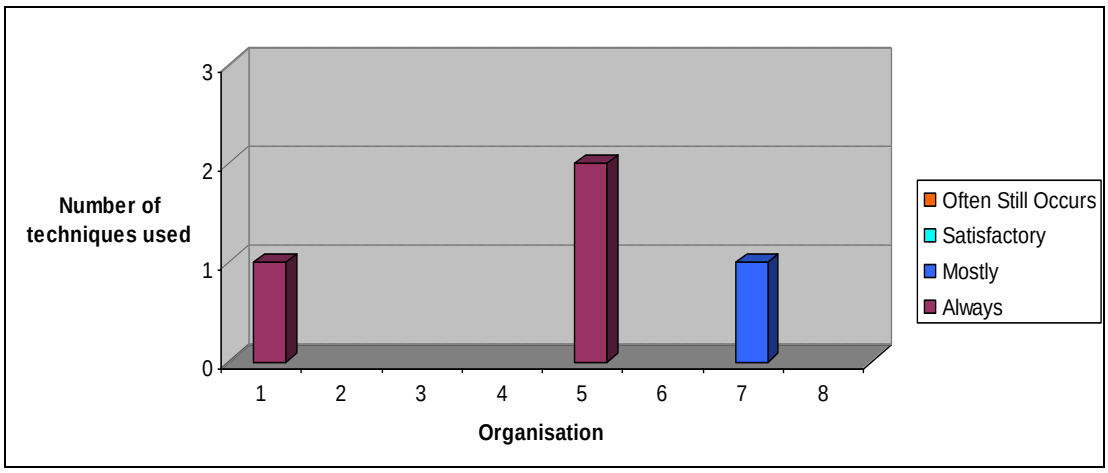


Figure 4.16 Incidence and effectiveness of techniques used to address the risk 'developing the wrong software functions'

Technique	Effectiveness	Determined to be effective by
Progress meetings: constant contact with customer.	Always	Profit
Published road map to get feedback from resellers.	Always	Forces developers to focus on scheduled software functions.
Checking development plan against issues logged.	Always	Find groups of issues and addresses them so know we are dealing with the most common issues.
Process specification – functional and technical and project plan.	Mostly	Sometimes still occurs.

Table 4.2 Techniques, effectiveness and measures used to address the risk 'developing the wrong software functions'

The techniques used and the means of determining effectiveness seem generally reasonable, apart from the first answer listed. Organisation one held progress meetings and maintained constant contact with their customer during the project. The participant viewed this as almost always effective. However when asked to explain how it was determined that this was so effective the participant claimed that the effectiveness was indicated by the project profit. There are many factors that influence profit – hence this is not considered to be an entirely sound measure of effectiveness for a specific risk management technique. It may be true that this technique is almost always effective; however this study cannot substantiate that claim when the effectiveness is determined by a generic outcome such as profit.

4.4.3.2 Sub-contracting

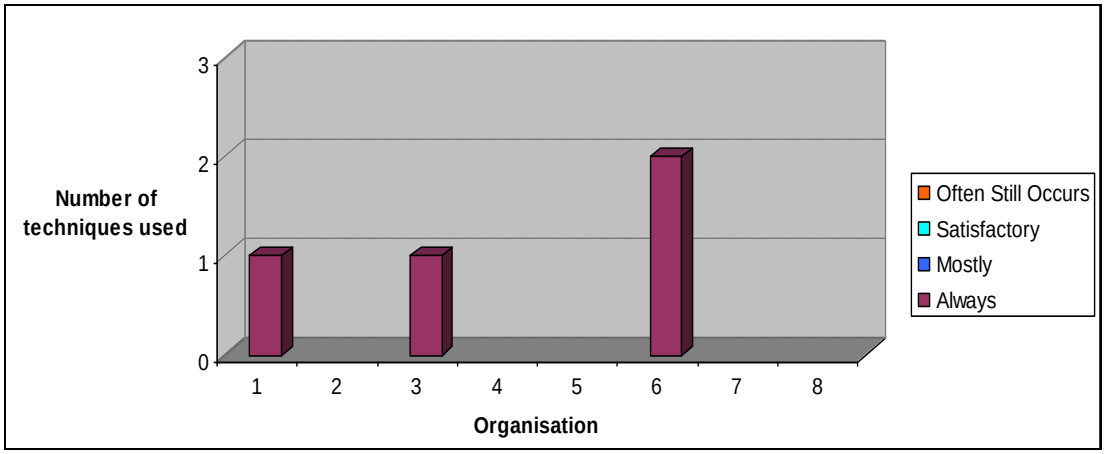


Figure 4.17 Incidence and effectiveness of techniques used to address the risk 'sub-contracting'

As discussed previously, the organisations that described this risk as not worth controlling generally avoided sub-contracting, which in a sense could be described as a risk avoidance technique. In fact organisation three recognised avoiding sub-contractors where possible as a risk management technique. The service manager from that organisation explained that (in his perception) contractors have different motivations from the organisation since they were paid hourly and not for achieving goals. Organisation one addressed this same issue by contracting such workers by task, not by the hour. The three participants that described one or two techniques made it clear during the interviews that they felt they had this risk firmly under control, one way or another. They either avoided sub-contracting or else managed sub-contractors very closely, to the point that one participant stated they simply did not have issues related to this risk. They felt this risk was important, but they also believed they managed it very effectively. This is reflected in the data presented in Table 4.3.

Technique	Effectiveness	Determined to be effective by
Contract by task. Not a significant risk.	Always	Unknown and unconcerned.
Do not subcontract if possible because contractors have different motivations [aid hourly not goals].	Always	Do not have issues to deal with.
Micro management	Always	Time and Costs vs estimates
Fixed price	Always	Time and Costs vs estimates

Table 4.3 Techniques, effectiveness and measures used to address the risk 'sub-contracting'

4.4.3.3 Lack of senior management commitment

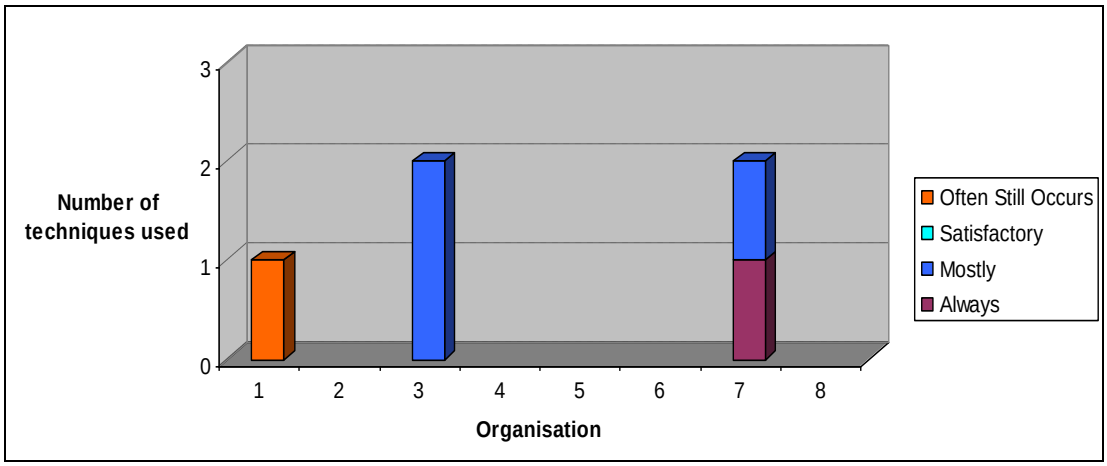


Figure 4.18 Incidence and effectiveness of techniques used to address the risk 'lack of senior management commitment to the project'

Generally the risk of 'lack of senior management commitment to the project' could be described as not relevant to these smaller organisations since their senior management made it a policy to be involved in any significant project. Organisation three reported that in the two projects where their senior management had not been involved the projects failed. As a result of those lessons, senior management had been explicitly assigned to every project ever since. This again reflects the context of these smaller organisations, where the success or failure of a project is directly linked to the success and profitability of the organisation as a whole. Several of the service managers explained that even worse than monetary loss of a failed project was damage to the customer-supplier relationship and damage to the supplier's good name in the market place. This damage to their reputation was felt more keenly and 'hurt' for much longer than the monetary loss of the project. Put simply, these organisations felt that senior management commitment to projects was too important to overlook.

Technique	Effectiveness	Determined to be effective by
Customer must assign senior people to the job.	Often risk still occurs	Often still encounter this risk because of limited control over what
Overseer of project manager work on relationship with client at highest level.	Mostly	Because when it was not done was when 2 projects "failed"
Senior management is able to contribute to the project by identifying real business drivers in goals and objectives session.	Mostly	Did a port project review a few times and identified this issue.
Lead qualification: Projects above a certain dollar value must have project director sign off and below a certain $ value must have project manager sign off.	Always	Supplier internal Policy: all projects have senior level involvement.
Identify key stake holders and maintain communication with them.	Mostly	Some communication with customer organisation is not able to be controlled.

Table 4.4 Techniques, effectiveness and measures used to address the risk 'lack of senior management commitment to the project'

What these organisations found more challenging was the risk of a lack of senior management commitment – and involvement – on behalf of the customer. The suppliers have limited control over whether senior managers in the customer organisation maintain their involvement in the project. Some of the suppliers studied tried to impress on the customer the importance of having a senior manager involved in the project. More than one supplier suggested that if the customer's senior management failed to maintain their involvement then it was a non-verbalised signal that there were customer relationship issues that needed to be addressed. (This led in part to the risks associated with customer relationships being studied in more detail in Phase II.)

4.4.3.4 Lack of effective project management methodology

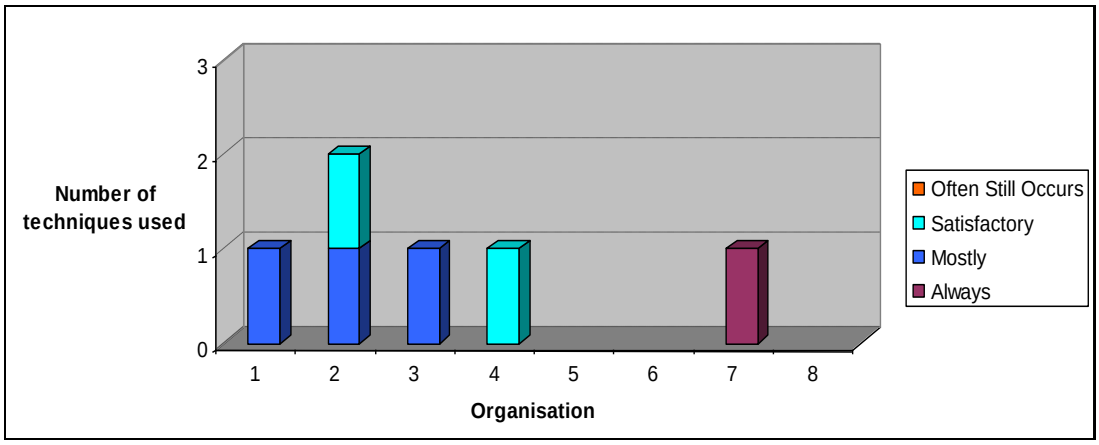


Figure 4.19 Incidence and effectiveness of techniques used to address the risk 'lack of effective project management methodology'

Industry standard methodologies are generally not used in these organisations and even when they are used they are problematic and not entirely effective. These smaller organisations tended to have developed their own methodologies from their own experience in what was an ongoing state of development. Figure 4.19 shows that the effectiveness of techniques employed to deal with the risk of a 'lack of effective project management methodology' was mixed. Several participants explained that they did not have a dedicated project manager role and one of their primary concerns was ensuring that team members adhered to a single methodology. In addition, there was a keen sense of the need to be adaptable. As one participant put it "flexibility is key". Only one organisation had adopted a formal methodology (Prince 2) recognised by the project management industry. This organisation considered the methodology as satisfactory in effectiveness. They cited the labour intensity of this approach as being an inhibiting factor, providing anecdotal evidence that such formally recognised methodologies are not well suited to the flexibility inherent in these smaller organisations.

Technique	Effectiveness	Determined to be effective by
Don't use critical path but do assign tasks and monitor progress. Take contingency action if required. Flexibility is key.	Mostly	Results are stable code, few support calls and generally within budget.
Training in project management.	Satisfactory	Expect to improve formality/granulation and concrete/clearer identification of progress therefore better prediction of completion date.
Roles introduced into team to assist quality and infrastructure of process and maintains focus. * Note: would like to have dedicated PM role but 1. hard to justify in size of org and 2. small team – flexible & choose their own work styles.	Mostly	More code reuse/robust code assets, more extensibility/ more rapid turn around. More uniform coding standards. Store code – auditable/reliability. Testing – uniform quality and standards. Less implementation problems Accountability and focus = reliability and predictability.
Risk is lack of adherence to methodology. Technique is use methodology.	Mostly	No reports available – issues list Client reports not knowing progress and budget blow out. Occasionally personality conflicts undermine success of project.
Prince methodology adopted. However Individuals apply methods inconsistently. Elements are documented but entire process is not documented. Solution – implementing service delivery system.	Satisfactory	Labour intensive. Data on project e.g. $, resourcing was hard to obtain – in many places.
Always use project methodology	Always	Do not have projects that have not been managed according to methodology.

Table 4.5 Techniques, effectiveness and measures used to address the risk 'lack of effective project management methodology'

4.4.3.5 Gold plating

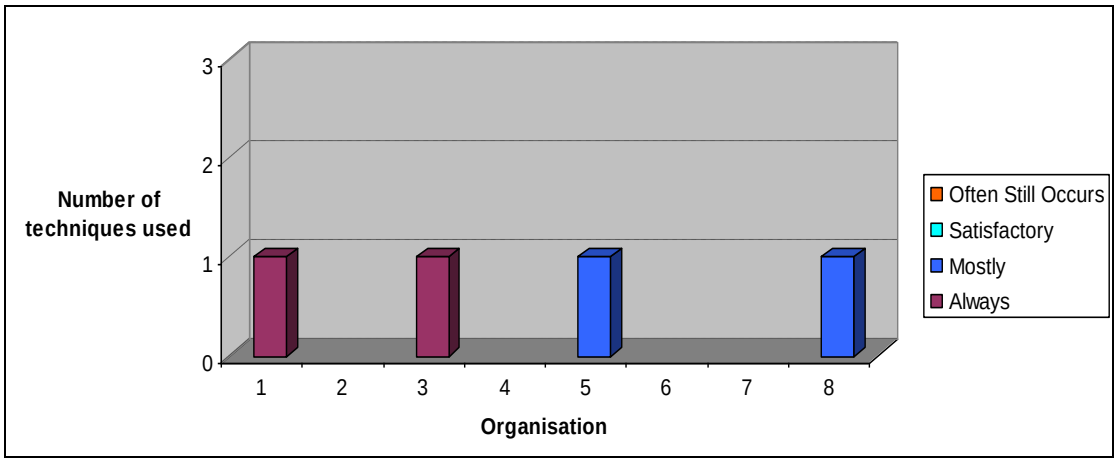


Figure 4.20 Incidence and effectiveness of techniques used to address the risk 'gold plating'

The participants who treated 'gold plating' as a risk believed that they controlled it fairly well. There was general agreement that this risk was one associated with less experienced developers and that with guidance from senior staff this risk diminished over time as the experience of the junior developers increased. Table 4.6 lists the various techniques used to address this risk, revealing a general theme of monitoring the developers' output. However there did not seem to be a consensus on how to determine if the techniques used to control this risk were effective.

Technique	Effectiveness	Determined to be effective by
Monitoring developers approach. Setting expectations of goal orientated approach. Readability/reliability/Maintainability. Usability Test as it is being developed.	Always	Useable software. Small work/big gains [more sales]
Identify gold plating and if it has additional value – turn risk into opportunity. Reporting systems – budget. Project charter – continuous improvement for future phases.	Always	Don't get unplanned budget blow outs.
Risk is at design stage. Peer review on design specs.	Mostly	Some project have required management intervention.
Tight tracking of time and output vs. specs. (Agile method pick this up quickly).	Mostly	Product review by product managers. Productivity tracking outcomes in ½ days that are testable – so becomes obvious. Overtime this becomes less of an issue.

Table 4.6 Techniques, effectiveness and measures used to address the risk 'gold plating'

4.4.3.6 Misunderstanding the requirements

The risk of 'misunderstanding the requirements' was perceived to be effectively controlled across the organisations studied, as depicted in Figure 4.21. The criteria used to determine this effectiveness (shown in Table 4.7) were generally either customer feedback or formal sign off, or both. These are quality criteria because they relate directly to the risk being controlled.

Technique	Effectiveness	Determined to be effective by
Agile development: Scope / frequent versions / feedback / testing	Always	Software is successful. End users satisfied. Formal feedback. Growing user base. Requests for new features.
Business requirement review documentation and sign off	Always	Integral to success. Project sign off.
1. Functional Spec and tech spec & customer "show and tell" during development.	Always	Customer feedback. Little changes required after initial delivery.
2. Scope and functional document	Always	Customer feedback. Little changes required after initial delivery.
3. Simple spec – e.g. screen shot + notes	Always	Few re-opened helpdesk calls.
Business or functional spec which incl. workshops with project team to ensure clarification.	Mostly	Unexpected work – is it chargeable or not.
Documenting requirements and documenting solutions plus discussing proposed solution and requiring sign off.	Always	Because either get an amendment or sign off before proceeding.
Requirements management and detailed workshops. Scope document includes very specific objectives	Always	Development of s/w correlates to test scenarios.

Table 4.7 Techniques, effectiveness and measures used to address the risk 'misunderstanding the requirements'

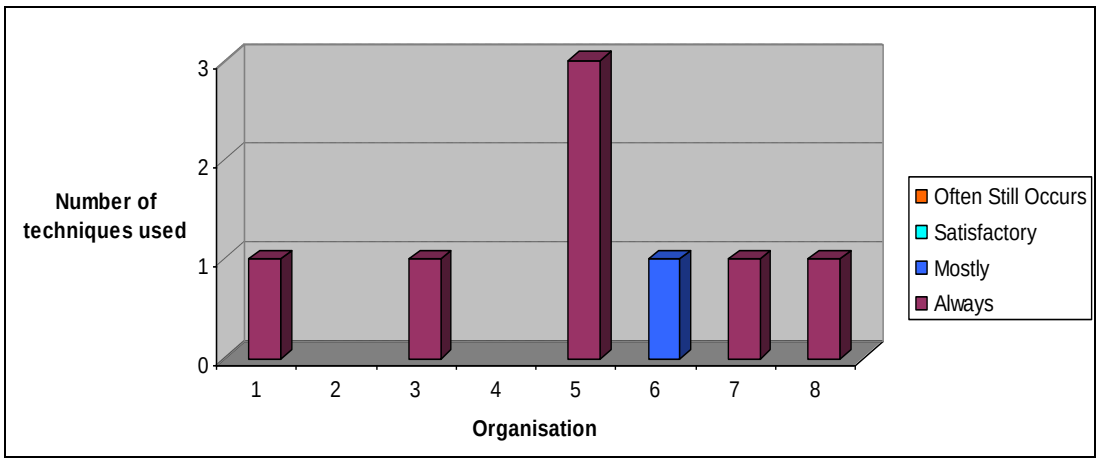


Figure 4.21 Incidence and effectiveness of techniques used to address the risk 'misunderstanding the requirements'

4.4.3.7 Failure to gain user involvement

The risks associated with 'failure to gain user involvement' were recognised and generally perceived to be effectively controlled (Figure 4.22), typically through customer feedback (Table 4.8). One common theme in the techniques used was to identify one or more champions or key stakeholders within the customer organisation and to keep these key personnel involved in the project.

Technique	Effectiveness	Determined to be effective by
Meetings and on-going communication with customer. Agile programming works best but can be a disaster. Regular as well as ad hoc meetings required.	Always	Using s/w at the end of the project.
Locate a champion and opinion leaders and include them into the project team.	Often risk still occurs	Feedback – bad reports in project reviews.
Early customer involvement and keep customer involved throughout project. Regular meetings at multiple levels – incl. selling level, technical level, end user level.	Always	Unsolicited feedback. Feedback at end of projects. Ongoing relationship
Only worth it for larger projects. User involvement in definition and as development proceeds.	Mostly	Deliverable generally meeting requirements. Feedback at Beta stage.
User acceptance testing	Always	How UAT is going to plan. Deviation from specs. Slide of specs and time.
Training (Highlights issues with user involvement)	Mostly	Sometimes training does not always occur.
Identify key stakeholders and keep them informed.	Mostly	Sometimes communication through hierarchy of customer doesn't happen and is outside our control.
Ground work / Homework to identify and get access to the users	Mostly	System goes in and is signed off but their can be resistance to acceptance if not done well.

Table 4.8 Techniques, effectiveness and measures used to address the risk 'failure to gain user involvement'

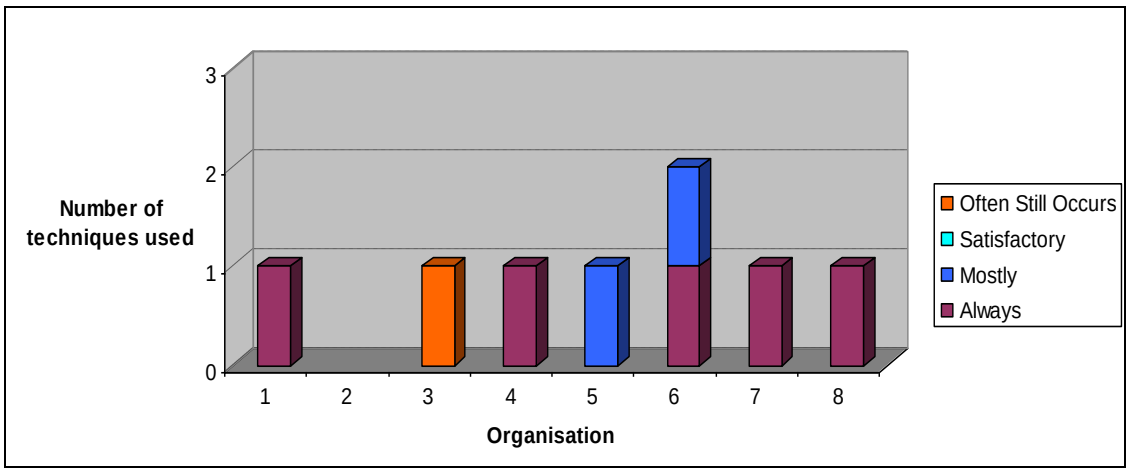


Figure 4.22 Incidence and effectiveness of techniques used to address the risk 'failure to gain user involvement'

4.4.3.8 Staging problems

This risk was added to the original list based on the writer's own experience, and the perceptions of the participants concurred with that experience. For the most part each organisation used one or two techniques to address this risk, as shown in Figure 4.23. The use of separate development and testing (and in particular user acceptance testing (UAT)) environments seemed to be a key factor in controlling this risk. User acceptance testing is also a useful way to determine the effectiveness of other techniques, such as version control.

Technique	Effectiveness	Determined to be effective by
Avoid some environments. In-house test environment, clean code and simple s/w. Usually get around such problems. Develop s/w so point of failure only affects feature not whole program. Stick to standards.	Always	Customers generally accept reduced functionality because of their setup.
Use of process development manager.	Mostly	Can rapidly build new release CDs with confidence that they will operate correctly.
Active and rigorous version control and build processes.	Always	Minimum downtime in changing release environments.
User acceptance testing. Check in / check out version control.	Always	UAT – identified critical problems before go live.
Separate dev/test/user acceptance environments	Always	Rare s/w to have problems in customer's production environment.
A Beta program	Mostly	Some resellers do not advise customer it is Beta software.
Have dev/test – UAT environments	Mostly	Often customer environment unknowns "discovered".
Provide a lot of documentation on staging and migration into UAT and into Live	Mostly	Don't know everything about the environment.
Staging process prior to UAT	Always	Quality of pilot

Table 4.9 Techniques, effectiveness and measures used to address the risk 'staging problems'

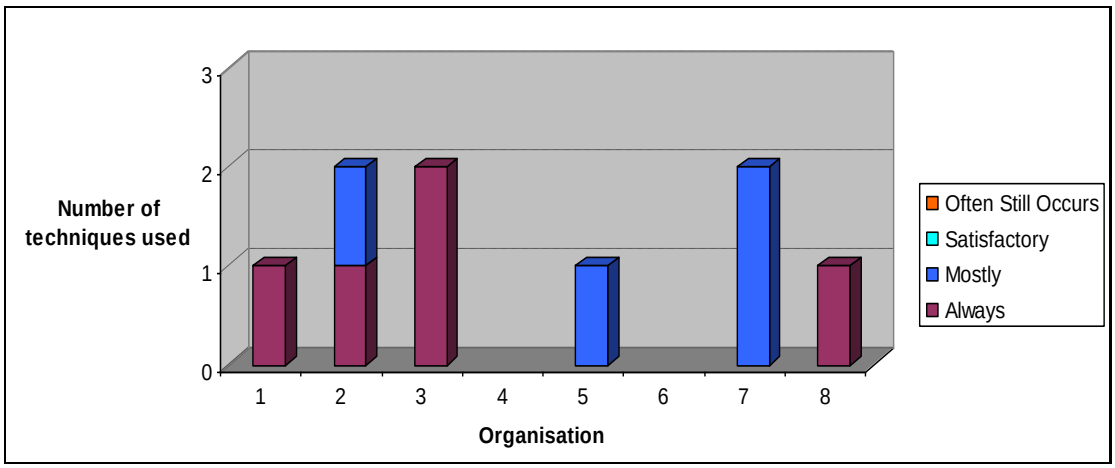


Figure 4.23 Incidence and effectiveness of techniques used to address the risk 'staging problems'

4.4.3.9 Inadequate knowledge/skills

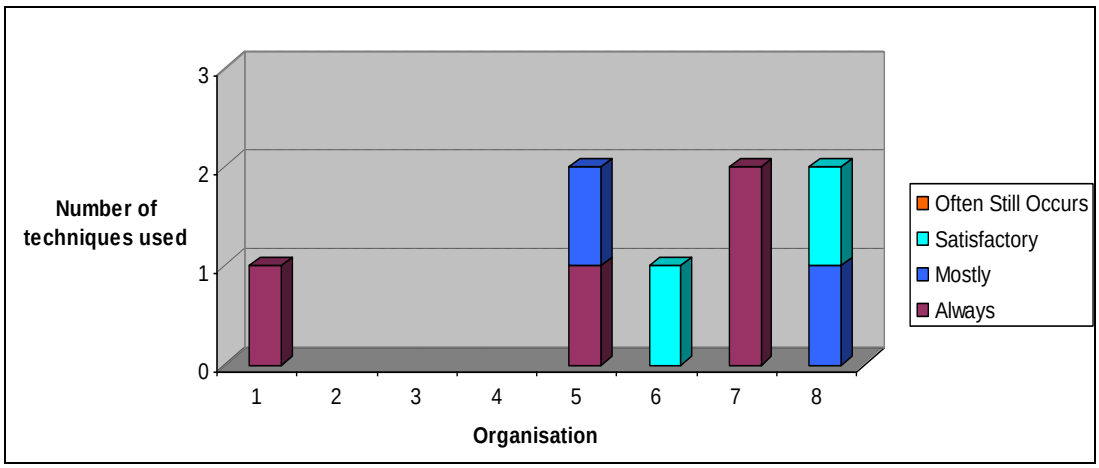


Figure 4.24 Incidence and effectiveness of techniques used to address the risk 'inadequate knowledge/skills'

While the risk of 'inadequate knowledge/skills' received a reasonable level of attention from the eight organisations (Figure 4.24), the techniques used to address this risk within the supplier organisations showed considerable variation (Table 4.10).

Three of the techniques used were targeted at dealing with a lack of knowledge and/or skills *in the customer organisation*. Yet the responsibility for training users was owned by the customer organisation. This appeared to be an important concern for several of the organisations studied. The suppliers deemed themselves unsuitable to train end users due to their limited knowledge of the customer organisation's business and the desire for the customer organisation to take ownership of the software, but at the same time the suppliers were not entirely confident in the outcome of the customer's training process.

Table 4.10 further shows that there was no obvious consensus on the criteria to use to determine the effectiveness of techniques used to address the 'inadequate knowledge/skills' risk. In addition, some of the criteria, such as "don't get into contractual dispute", are rather coarse and not necessarily linked to the specific risk being considered. On the other hand some suppliers clearly went to great lengths to address this risk and were happy with the outcomes.

Technique	Effectiveness	Determined to be effective by
Externally - Advise customer that result may be variable and customer shares the risk.	Always	Don't get into contractual dispute over software.
Peer review of changes to framework or database structures.	Mostly	Sometimes mistakes made due to lack of knowledge
Resellers doing customisation send a developer working in vendor organisation for 1 to 2 months = certified developers.	Always	Always effective when changing core product. When they change licensed code this is not known unless it goes badly wrong.
Externally – help prepare methods to training users.	Satisfactory	Is customer's responsibility therefore can only advise – limited control of outcome.
Lead qualification process investigates skills/knowledge match to project.	Always	Skills shortages are identified. High probability of success of delivery of proposal that are won.
Project delivery: mentor junior people into personal development required.	Always	Developer identified need and successful project delivery in a managed way.
Internal - pair junior developers up	Mostly	Quality of code
External – up-skill subtly	Satisfactory	Acceptance of solution.

Table 4.10 Techniques, effectiveness and measures used to address the risk 'inadequate knowledge/skills'

4.4.3.10 Resource usage and performance

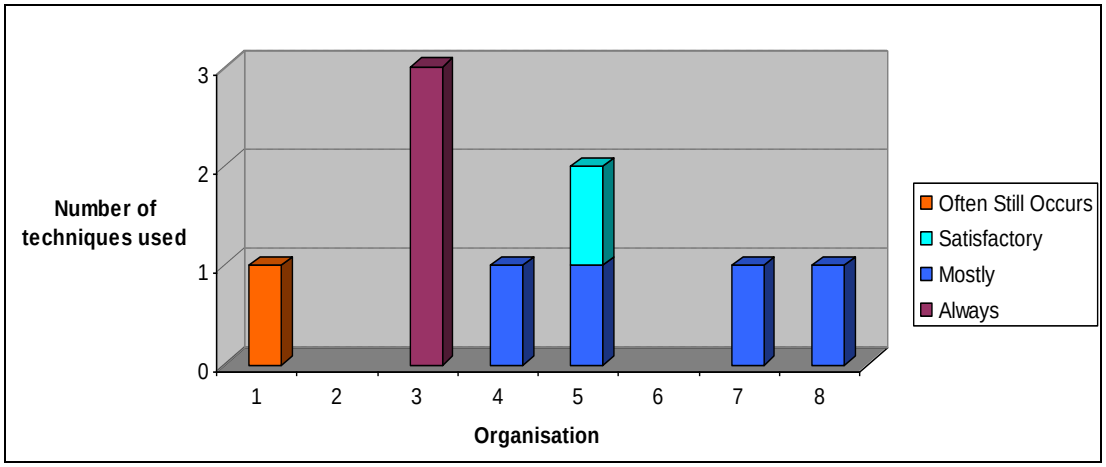


Figure 4.25 Incidence and effectiveness of techniques used to address the risk 'resource usage and performance'

The results for the treatment of 'resource usage and performance' risks illustrate that smaller organisations can have markedly different practices (Figure 4.25). Organisation three reported the use of three very specific techniques (Table 4.11) all of which were thought to be 'almost always' effective in controlling this risk, whereas organisation one reported one rather vague and ineffective technique to address this risk.

Technique	Effectiveness	Determined to be effective by
Plan ahead	Often, risk still occurs.	Very rarely able to predict time frames for acceptance. Can't really eliminate this risk. No certainty with go ahead.
Resource planning incl. 3 mtgs per week.	Always	Capacity ratios reviewed
Performance reviews as needed	Always	Not many instances of people doing the wrong time or poor performance.
May have to pull people off projects due to stress	Always	Don't know. [never been sued & had no burn outs].
Monday workload mtgs	Mostly	Projects largely on time and budget. Issue lacks visibility is time consuming to address and information difficult to obtain.
Load balancing of projects	Mostly	Slippage is not too bad – 60% on schedule.
Analysis of throughput of individuals	Satisfactory	Difficult to interpret results because work is varied.
Formal resource planning process every 2 weeks, 10 weeks in advance	Mostly	Can see where there are resource "crunches" and reallocate resources. However can not foresee all future events because technique is predictive.
Project server and time sheets, short cycle, agile methods and intensive testing	Mostly	Utilisation and progress versus estimates.

Table 4.11 Techniques, effectiveness and measures used to address the risk 'resource usage and performance'

4.4.3.11 Failure to manage end user expectations

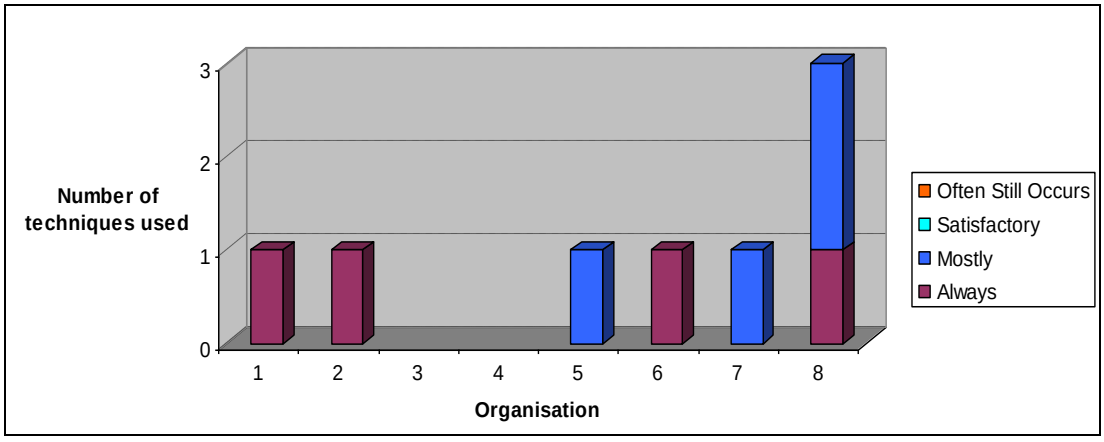


Figure 4.26 Incidence and effectiveness of techniques used to address the risk 'failure to manage end user expectations'

In general, the techniques employed to deal with the risk of 'failure to manage end user expectations' (Figure 4.26 and Table 4.12) all rely on some form of user involvement and/or interaction during software development. During the interviews the participants often reported that a technique was effective so long as it was used, reiterating that there may be an issue in smaller organisations where their own proven practices are not followed, with subsequently risky outcomes for projects. To illustrate, as one organisation had end users all over the world far from the development team they created a series of prototypes for the users to peruse. The service manager considered this technique to be 'almost always' effective. He determined this because occasionally the technique was not employed, which resulted in software being delivered that did not meet expectations or required extensive rework done at the supplier's expense.

Technique	Effectiveness	Determined to be effective by
Agile development	Always	User feedback
Prototyping	Always	Often technique not used! Too frequently delivering s/w that doesn't meet expectations or too much extra work spent meeting expectations.
Large and Medium projects have a "show and tell" plus a beta program	Mostly	Dealer feedback.
Functional and business specifications incl. mtgs to reinforce	Always	Rework
Involve end user stakeholders in specification team incl. mock up screens.	Mostly	Application flow not as user prefers. Can not always get end user involvement in specification team.
Requirements documentation	Mostly	Can be problems with translating requirements.
Account (Relationship) management	Mostly	Can not always establish the right relationship
Constant communication (technical)	Always	Acceptance

Table 4.12 Techniques, effectiveness and measures used to address the risk 'failure to manage end user expectations'

4.4.3.12 Introduction of new technology

In general the participants perceived themselves to be effective at addressing the risk of 'introduction of new technology'. However for most participants this effectiveness was tempered with a belief of being imperfect (as depicted in Figure 4.27). Only two organisations described a technique that they considered 'almost always' effective.

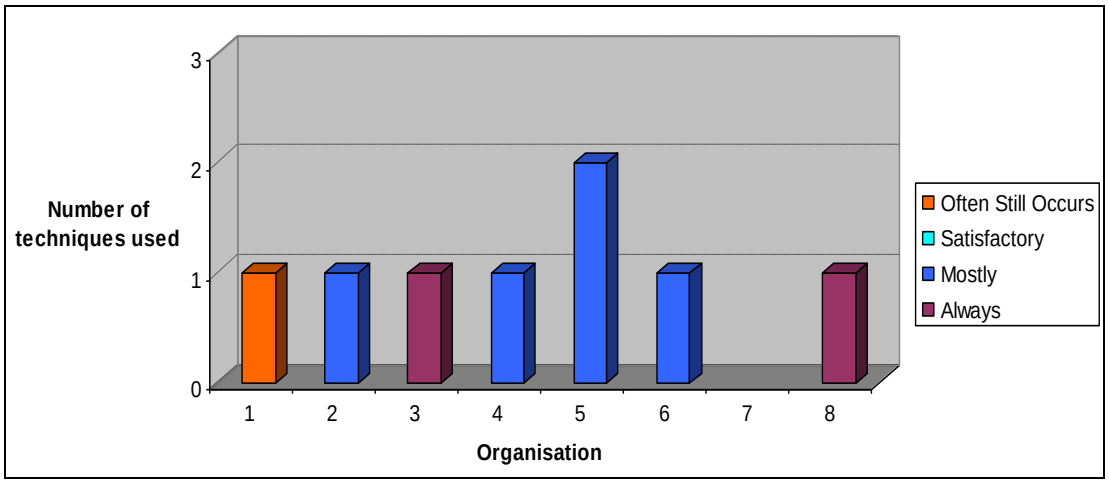


Figure 4.27 Incidence and effectiveness of techniques used to address the risk 'introduction of new technology'

The techniques described to control this risk (shown in Table 4.13) can generally be categorised as either training, assessment or testing. Only organisation five utilised two techniques, falling into the categories of assessment and training. No organisation reported using all three categories of techniques. In addition, most participants felt there was room for improvement in controlling this risk. The lack of any organisation to have all three categories of controls may indicate a gap in coverage for this risk.

For this risk the measures used to determine if the techniques used were effective were generally of high quality, with a common thread of organisations being able to link the handling of this risk directly to project success, as reflected in Table 4.13. The writer's submission is that these are good means of determining effectiveness precisely because of the direct link back to the specific risk being addressed. For example, the effectiveness of a training technique was determined by the ability to address problems at the helpdesk level of support. Since those problems are carefully recorded and categorized by the helpdesk, detailed and reliable reports could be used to measure the effectiveness of the training with considerable detail, accuracy and validity.

Discussion of this risk during the interviews illustrated that these organisations were prepared to use a risk management technique that they considered efficacious when they were aware that it was not optimal. Where the techniques were described as 'mostly' effective, there were various feedback methods employed depending on the specific detailed risk. These various methods often showed that the technique was efficacious. For example, one assessment technique was described as mostly effective since their deployments were successful but the supplier was not always sure that they had delivered the optimum solution. Anecdotally, the constraint that led to deliberately using an efficacious technique rather than a more effective technique was a function of resources and time. Hence while the participants might acknowledge there was room for improvement in controlling this risk, they had made a conscious decision not to do so at that time.

Technique	Effectiveness	Determined to be effective by
Prepare test scripts to emulate functionality without full coding.	Often risk still occurs	[no answer]
Training and new technology are made available in a timely fashion.	Mostly	S/w continues to operate in changing environments. Customers replacing competitors but few replacing our s/w.
IT review incl. in business requirements	Always	Haven't had an 'intercompatibility' issue that didn't know about before hand.
Technical architect trained in how to apply new technology and liaises with vendor to assess new technology.	Mostly	Relies on quality of relationship with overseas vendors. Successful implementations and good references for the vendor. Used as intended.
Training as required.	Mostly	Helpdesk feedback – not able to deal with issues at helpdesk.
Allocate time for research	Mostly	Deployments successful but not always sure have optimum solution.
Assessment process	Mostly	Time and cost vs. estimate.
Extensive testing and certification	Always	Zero failures.

Table 4.13 Techniques, effectiveness and measures used to address the risk 'introduction of new technology'

4.4.3.13 Unrealistic schedules and budgets

There seems to be potential for improvements in how this risk is controlled. The risks associated with 'unrealistic schedules and budgets' were considered to be among the most important, yet there were very mixed perceptions about the effectiveness of the techniques used to control this risk, as Figure 4.28 illustrates. (All the participants in Phase I thought this risk was worth controlling but organisation two often did not use a technique to control it.)

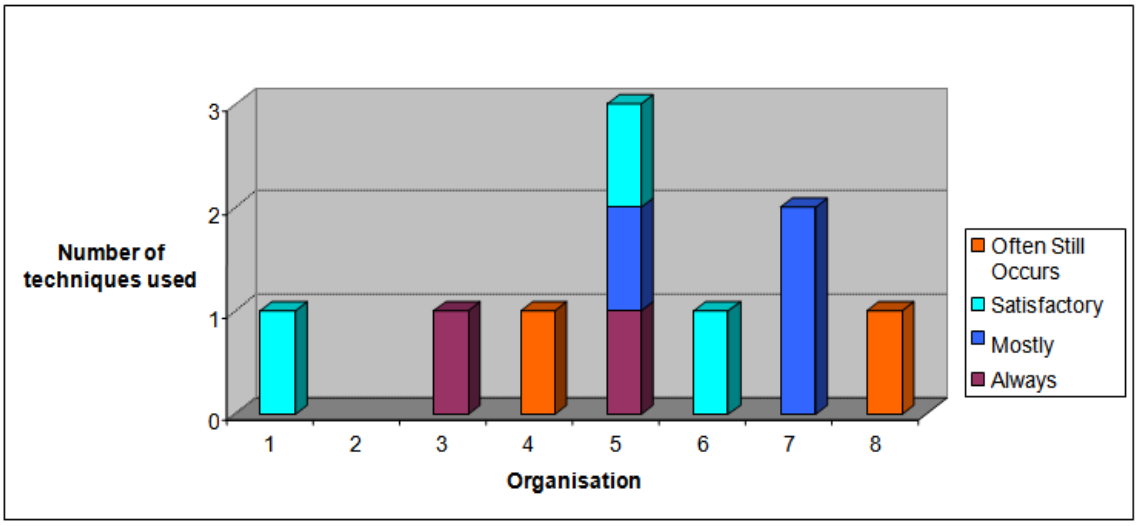


Figure 4.28 Incidence and effectiveness of techniques used to address the risk 'unrealistic schedules and budgets'

In terms of efficacy it seems that most techniques and most organisations studied manage to control this risk, given that most perceived themselves to have one or more techniques that were at least satisfactory. However since this is an important risk it can also be argued that 'satisfactory' in this context suggests room for improvement. Just half of the ten techniques used were rated as 'mostly' or 'always' effective (as conveyed in Table 4.14). In addition, three out of the eight organisations used no technique, or used a technique to little effect (as often the risk still occurred). Since this is seen to be an important risk by the organisations studied it would be an interesting topic of future research to see how important this risk is considered and how effectively it is controlled by a wider cross-section of the industry.

Several organisations stressed that in regard to this risk there could be some flexibility with the budget, but that an unrealistic schedule was a far more significant problem. However this was not a universal context. Some organisations – notably the ERP vendors in the sample – reported that the budget could not be altered but if the software was not completely ready then the schedule may have to be delayed.

Technique	Effectiveness	Determined to be effective by
Build in contingency into quote	Satisfactory	**So** difficult! Problem with being too precise / too detailed.
Regular project reporting. – metrics of progress on weekly basis. Honesty / realism in predicting effort required	Always	Do not get high level dissatisfaction with delivery on time. But to work requires culture of being realistic. Estimate of effort and estimate of charge may be different from each other. Also useful in managing people therefore peoples' behaviours are focused on risk and thus no surprises. Library not used but would like to.
Manual timesheets and analysis of requirements, leave, other commitments at Monday meeting to set schedule for the week.	Often risk still occurs	Relies on people remembering all other commitments. Often miss deadlines Often overload specific people.
Individual workload is balanced & reviewed (based on effort guess).	Satisfactory	Project slips are tracked.
Team project reviews	Mostly	Anecdotal evidence – people who were stuck waiting for resource are resolved.
Large projects – regular project meetings	Always	Ability to keep customers informed of slippage plus is effective in identifying places were extra resources are required.
Detailed project plan against spec. * Note deadlines are critical.	Satisfactory	(Become unrealistic) Deviation from plan – particularly by milestones.
Detailed project plan incl. mitigation of cost and time & manage to plan.	Mostly	Because events occur that can not be foreseen.
High levels of communication	Mostly	Because customers get "pissed- off" sometimes – reluctant to accept changes to schedule and budgets.
Extended time/scope reduction. Renegotiation cost recovery.	Often risk still occurs	50/50 renegotiation not successful.

Table 4.14 Techniques, effectiveness and measures used to address the risk 'unrealistic schedules and budgets'

This is another example where the use of more than one technique to address a risk could have advantages. Organisations one and six may be vulnerable to finding themselves with an unrealistic schedule or budget, since they have only one technique which they rate as no better than satisfactory. Organisation five was able to describe three techniques (Figure 4.28). Although only one of these techniques was considered almost always effective, the data suggests that organisation five is less exposed to this risk overall. Admittedly the graph is likely to be a simplification of the organisational practices, since each risk may have several facets. Hence the number of techniques being used may or may not be an indication of how well a risk is controlled. What the data for organisation five does suggest though, is that where one aspect of this risk may have a technique that is of limited effectiveness, other aspects of this risk may have techniques that are highly effective. This may be a useful starting point for organisations looking to improve their practices. Organisations finding themselves with only one technique of limited effectiveness may be wise to consider keeping this technique but supplementing it with additional techniques that address different aspects of a risk, thus limiting their overall exposure to that risk.

A careful analysis of the techniques presented in the Table 4.14 indicates a theme of the 'devil being in the detail' when dealing with this risk. The participants often reported that there were feasibility problems with managing this risk in too much detail. Yet without that level of detail, the likelihood of this risk arising and affecting the project increased. In other words, the organisations had to search for a balance between effort and risk – a balance that was at times difficult to achieve.

4.4.3.14 Unclear or misunderstood scope/objectives

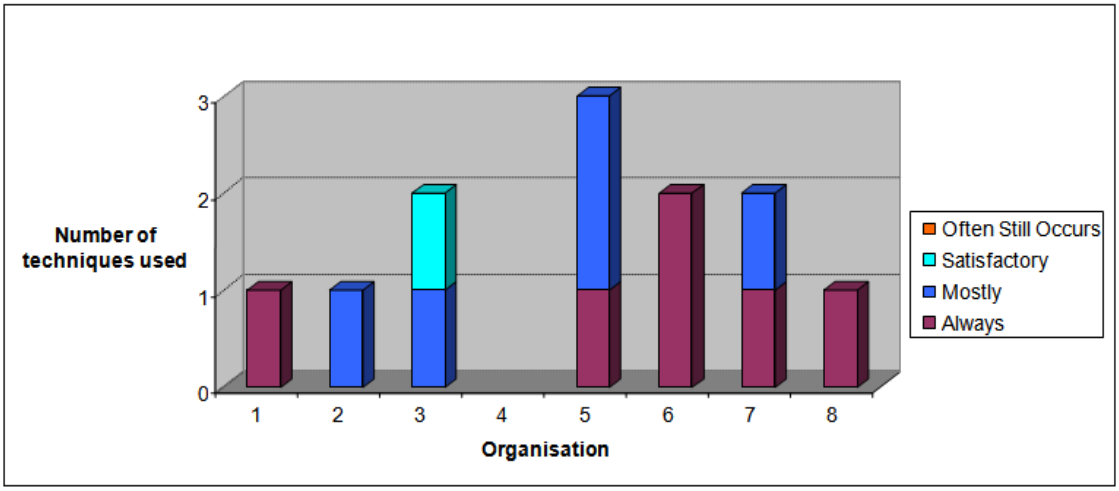


Figure 4.29 Incidence and effectiveness of techniques used to address the risk 'unclear or misunderstood scope/objectives'

In general the interviewees reported greater breadth and quality of techniques used to address this risk than for similarly important risks. 'Unclear or misunderstood scope/objectives', 'unrealistic schedules and budgets' and 'introduction of new technology' were ranked as similar in importance by the basic measures used. A comparison of Figure 4.29 with the corresponding graphs for the other two similarly rated risks highlights that this risk was far more likely to have more than one technique used to control it, in spite of the fact that the techniques used were also generally considered to be more effective.

Put simply this risk was considered important and was also well controlled. Organisation four was the exception – although that organisation's participant considered the risk of 'unclear or misunderstood scope/objectives' to be important they reported that they did not have a technique to control it. (This perception was examined further during Phase II of the study.)

The management of this risk seemed to reflect good practice as commonly described in the standard project management literature, in so far as the objectives were clearly defined and then monitored. The techniques described (as conveyed in Table 4.15) were generally a combination of (a) some kind of definition document and (b) some mechanism such as a meeting to raise awareness or keep track of any deviations from the specified and agreed scope/objectives. It could be that this risk more neatly fits into a standard approach to project risk management and thus a standard approach works very effectively when addressing it.

There also appeared to be a tendency to use different techniques depending on the scale of the project, with detailed study and definition techniques being the norm for larger projects and a much simpler definition being used for smaller projects. This seems to again indicate a balance between effort and risk, based on some indication of project size. It suggests that for what might be termed 'micro-projects' size may be related to risk. However further discussion during the interviews revealed that these 'micro-projects' were *considerably* less complex and thus a simpler definition of the scope was appropriate. For example, one technique involved placing specific enhancement requests through a helpdesk process. Each enhancement request was small in size but more significantly they were also only a minor variation from the main product, and thus of low complexity. The supplier would try to steer the customer away from enhancements that varied in a fundamental way from the scope of the core product. In other words, an informal and undocumented form of risk avoidance would occur to avoid complex projects being treated as small projects.

Anecdotally, this again suggests that the flexibility of the organisations studied may play an important part in dealing effectively with exceptional circumstances. If an exceptional risk is identified, the smaller organisations studied may more readily 'bend the rules' and step outside their standard practices to address the exceptional circumstance. The data collected does not necessarily show that these smaller organisations identified exceptional risks more quickly than large organisations, only that they have the ability and willingness to readily adjust their practices once such a risk has been identified.

Technique	Effectiveness	Determined to be effective by
Meeting to confirm scope at intervals	Always	Based on experience on alternative to detailed scope docs.
Clear statement of user requirement esp. user interface	Mostly	Not evaluated by qualitative measures. Amount of user interface rework. Amount of functional extn. Required after delivery. Timeliness of delivery and customer satisfaction.
Large project – scope study incl. interviews/methodology of client. Inform client of risks and sign off. 10-20% of value. If customer can't work this way, we walk away.	Mostly	Project sign off. A few still fail – may not have stuck to methodology.
Small project – work statement.	Satisfactory	Project sign off.
Questionnaire to determine scope – functional spec. – scope doc.	Mostly	Customer feedback during Beta testing. 80% usually do as too difficult to communicate and define requirement.
Helpdesk documents enhancement request.	Always	Customer and reseller feedback because requested by specific customer(s).
Medium projects are scoped and then have a peer review incl. tech reviews.	Mostly	Don't know – guess.
Project Charter (how to approach, roles etc.)	Always	Tracking against project plan. Feedback and senior level problems with project sponsor.
Project scope	Always	Tracking against project plan. Feedback and senior level problems with project sponsor.
Scope incl. project plan and sign off.	Mostly	Because sometimes don't charge some requests outside scope are performed due to strategic reasons.
Changes through change mgmt process	Always	Most projects stick to scope.
Requirements management and detailed workshops. Scope document includes very specific objectives	Always	Development of s/w correlates to test scenarios.

Table 4.15 Techniques, effectiveness and measures used to address the risk 'unclear or misunderstood scope/objectives'

4.4.3.15 Continuous requirement changes

As noted previously, every organisation used at least one technique to address the risk of continuous requirement changes, reflecting its relative importance. Figure 4.30 indicates that each of the eleven techniques employed was considered to have some degree of effectiveness.

The techniques that were perceived to be 'almost always' effective (as shown in Table 4.16) revolved around progress meetings with the customer and the use of a formal change process. A formal change process was also considered to be 'mostly' effective by three further organisations. Issue tracking and release management were also considered as 'mostly' effective techniques. One organisation considered making changes to the specifications to only be a 'satisfactory' technique.

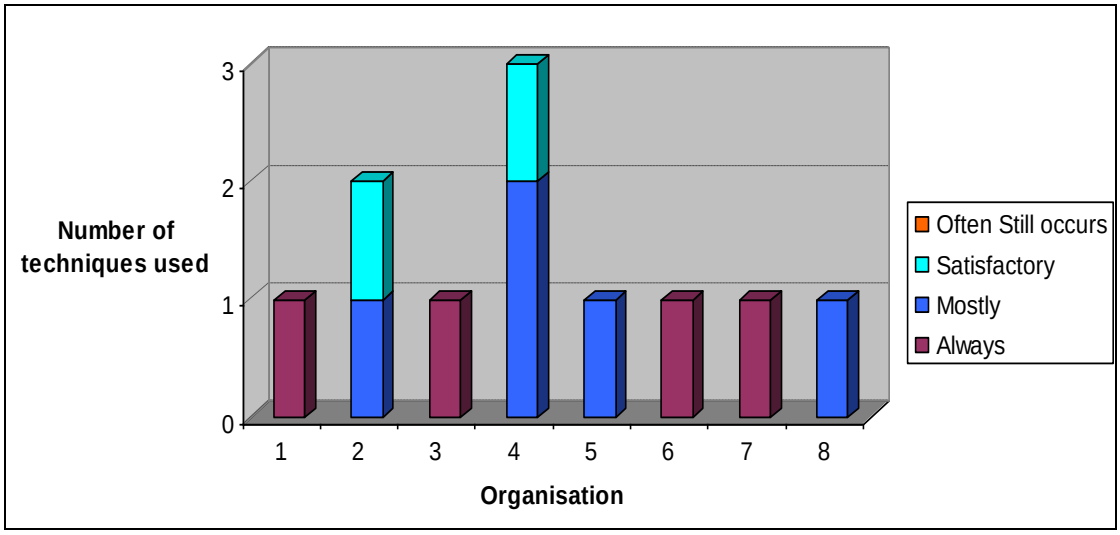


Figure 4.30 Incidence and effectiveness of techniques used to address the risk 'continuous requirement changes'

Technique	Effectiveness	Determined to be effective by
Progress mtg. keep customer on track.	Always	Make a profit
Formal variation request procedure.	Always	High collection of invoices
Change control register	Always	Deviation from modified project plan is evaluated and managed.
Change process	Always	?
Requirements change process	Always	Don't allow continuous changes
Release management	Mostly	Less hot fixes, less production versions to support.
Issue tracking	Mostly	Customer acceptance of consequences of requirement changes.
Changes to scope	Mostly	Customer acceptance
Stick to signed off spec OR agreed scope change	Mostly	Not always effective because sometimes requirement changes are negotiated.
Use prototypes to align customer expectations with a deliverable within available time frame.	Satisfactory	Customer satisfaction and less deployment problems, specifically; less customer time spent to confirm requirements, fewer reiterations of releases, less last minute changes for final deployment.
Changes to specifications	Satisfactory	Replies on quality of specification. Able to negotiate customer acceptance that this is a project change.

Table 4.16 Techniques, effectiveness and measures used to address the risk 'continuous requirement changes'

One organisation considered the use of prototypes and meetings with the customer to be only 'satisfactory'. This is, broadly speaking, the same technique that organisation one found to be 'almost always' effective. This is an example where the context within which each organisation operates can lead to significant differences in what techniques are found to be effective.

In summary, the general consensus was that using a formal change control process which involved the customer was an effective technique to control this risk. It was not considered to be a panacea to resolving this issue, but no other technique was considered as effective.

4.4.3.16 Customer relationship issues

The service manager participants reported that this risk superseded all other risks. They explained that if a problem that could be described as a customer relationship issue was not dealt with effectively then it could undermine the whole project.

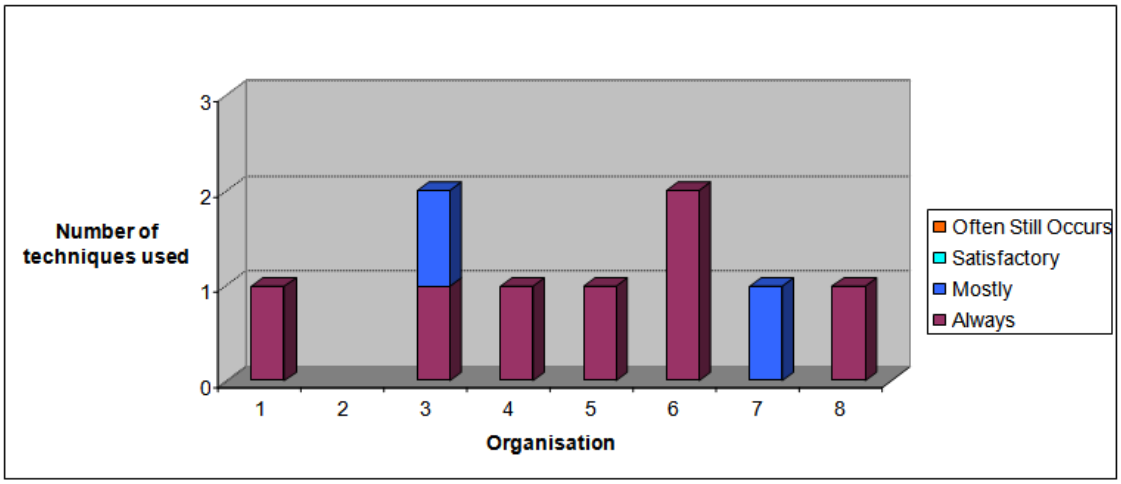


Figure 4.31 Incidence and effectiveness of techniques used to address the risk 'customer relationship issues'

Technique	Effectiveness	Determined to be effective by
If customer will not participate in agile process then walk away from business	Always	Risk no longer exists
Multilevel communication	Always	The more trusting and closer the relationship the more successful the project in terms of having a happy client. Willingness and speed to reference + more easily forgiven if other project mistakes made.
Extra effort beyond what was contracted in order to improve strategic customer relationship.	Mostly	Value of customer over the long term. Conversely, 1 example of terminated a piece of business which caused a lot of marketing damage.
Multiple levels of contact between company and client	Always	Longevity of customer – supplier relationships which have surpassed individuals' tenure within the organisations.
Sometimes send someone on site to maintain a good relationship	Always	Immediate lift in positive attitude in customer. Also when someone not send, occasionally had customer relationship issues.
Strong account management	Always	Calls M.D. does NOT get.
Consulting techniques	Always [100%]	Results in identification and turn around of situations where; customers do not fully engage in discussions, maintaining their distance and not being forthcoming.
Multilevel communication to a high degree	Mostly	Not always effective because sometimes miscommunication occurs or perception of importance of some issues can be difficult between customer and supplier.
Awareness in all project participants of the importance of this aspect. Use the project to cement customer relationships.	Always	Reference sites.

Table 4.17 Techniques, effectiveness and measures used to address the risk 'customer relationship issues'

When considering the risk of customer relationship issues, the old adage of necessity being the mother of invention comes to mind. This risk was felt to be so important that the organisations found it imperative to employ at least one technique that was highly effective in order to control it (see Figure 4.31 and Table 4.17). For example, organisation one was confident that the use of an agile approach with many re-iterations involving the customer would address this risk. The participant was so confident in this technique that if the customer would not accept this approach that supplier would decline to provide services to that customer. As a result this participant reported that the risks associated with customer relationship issues no longer existed. (Organisation two did have a technique to address this risk however it was not assessed for effectiveness and thus it has been omitted from the graph in Figure 4.31.)

4.4.4 Summary of how each risk was addressed

Developing the wrong software functions: This risk was not well catered for but it is also arguably the least important of the risks considered here.

Sub-contracting: The organisations studied felt this risk was important, but they also believed they managed it very effectively. Those that described this risk as not worth controlling generally avoided sub-contracting, which could be described as a (suitable) risk avoidance technique. One service manager explicitly recognised that this was a risk avoidance technique and explained that the risks stemmed from contractors having different motivations from the organisation.

Lack of senior management involvement: Generally the risk of 'lack of senior management involvement' did not exist in these smaller organisations since their senior management made it a policy to be involved in any significant project, thus acknowledging and avoiding this risk. This and other similar results highlight that what is a risk for one (class of) organisation may not be a risk for another, hence the inappropriateness of entirely generic risk check-lists.

What these organisations found more challenging was the risk of lack of senior management involvement on behalf of the customer. More than one supplier suggested that if the customer's senior management failed to maintain their involvement then it

was a non-verbalised signal that there were customer relationship issues that needed to be addressed.

Gold plating: There was general agreement that this risk was one associated with new and less experienced developers. With guidance and monitoring from senior developers this risk diminished over time as the experience of the junior developers increased. However there did not seem to be a consensus on how to determine if the techniques used to control this risk were effective.

Misunderstood requirements: The criteria used to measure this risk were generally either customer feedback or formal sign off or both. These are quality criteria because they relate directly to the risk being controlled.

Failure to gain user involvement: The risks associated with 'failure to gain user involvement' were recognised and generally perceived to be effectively controlled, typically through customer feedback. One common theme in the techniques used was to identify one or more champions or key stakeholders within the customer organisation and to keep these key personnel involved in the project.

Staging problems : For the most part each organisation had one or two techniques to address this risk. Separate development, testing and in particular User Acceptance Testing (UAT) environments is a key factor in controlling this risk. UAT is also a useful way to measure the effectiveness of other techniques such as version control.

Inadequate knowledge/skills: The techniques used to control this risk within the supplier organisations showed considerable variation. This may reflect that the knowledge and/or skills required are very specific to the projects being undertaken. Interestingly some techniques used were targeted at dealing with a lack of knowledge and/or skills in the customer organisation, yet the responsibility for training users was owned by the customer organisation. This appeared to be an important concern for several of the organisations studied.

Resource usage and performance: There were markedly different practices for the treatment of the risk of 'resource usage and performance'. This risk may be a good

example where different techniques are required for different organisations and contexts.

Failure to manage end user expectations: In general the techniques used to deal with this risk all rely on some form of user involvement and/or interaction during the software development stage.

Introduction of new technology: The techniques used to control 'introduction of new technology' can be summed up as being able to be categorised as either training, assessment or testing. No organisation reported using all three types of techniques which suggests that they may be able to learn from each other as to how to deal with this risk more comprehensively.

Unrealistic schedules and budgets: There seems to be potential for improvements in how the risk of 'unrealistic schedules and budgets' is controlled. In terms of efficacy it seems that most techniques and most organisations studied managed to control this risk. Yet, fewer than half the techniques used were rated as 'mostly' or 'always' effective. Since this is an important risk, these results indicate room for improvement.

Unclear scope/objectives: In general there was reported more breadth and quality of techniques to address the risk of 'unclear scope/objectives' than similarly important risks. This risk was far more likely to have more than one technique to control it, even though the techniques used were also generally considered more effective. Put simply this risk was considered important and was also well controlled.

Continuous requirement changes: Every organisation had at least one technique to address the risk of continuous requirement changes, reflecting its relative importance. The techniques that were said to be almost always effective were progress meetings with the customer and the use of a formal change process. Issue tracking and release management were also considered mostly effective. There was variation but general consensus was that using a formal change control process which involved the customer was an effective technique to control this risk. Unfortunately it was not considered to be a panacea to resolving this issue yet no other technique used was considered to be as effective.

Customer relationship issues: The participants reported that this risk superseded all other risks. They explained that if these issues were not dealt with effectively then it could undermine the whole project. This risk was so important that it seems the organisations found it imperative to have a technique that was highly effective to control it.

4.5 Phase II results and analysis

4.5.1 Different perspectives regarding importance

The second phase of interviews had two separate objectives, the first being to obtain different organisational perspectives on the data collected in the first phase of interviews. Four of the eight organisations that took part in Phase I also participated in Phase II. In each of these four organisations someone in a project manager role and someone in a senior developer role were interviewed (except in one case, where no developer was available – hence eleven responses in total are considered in this phase). (In some of the tables and graphs in this section these roles may be abbreviated to PM and DEV respectively. The results obtained from the person in the service manager role from Phase I may likewise be abbreviated to SM.)

4.5.2 Trends: agreement on importance of these risks

The data collected in this phase reinforce the conclusion that the risks under consideration in this research are, for the most part, thought to be important in the four organisations that took part in both phases of the study. In fact in Phase II this sense of their importance was even more apparent. This is illustrated in Figure 4.32. This graph ranks the risks studied by those worth controlling versus those deemed not worth controlling. Each block represents a response, from one of the roles of a service manager, project manager or developer in the four organisations that took part in both phases of interviews. By this measure it can be seen that that there is unanimous agreement about the importance of five risks: unclear objectives, continuous requirement changes, resource usage and performance, lack of effective project management methodology, and failure to manage user expectations.

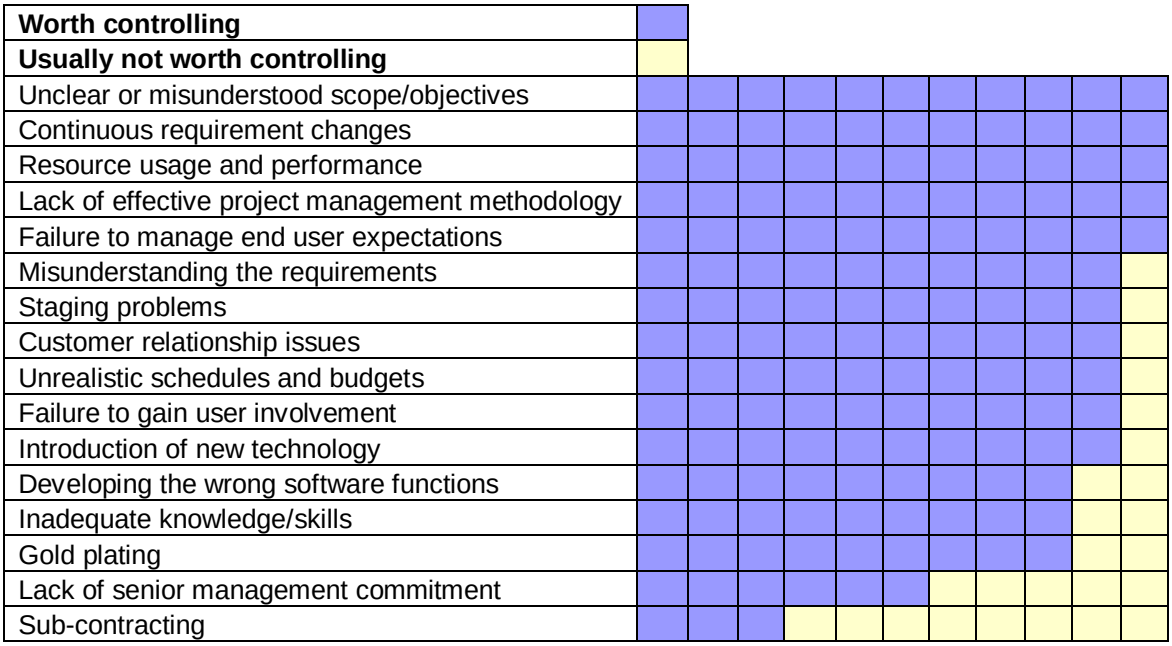


Figure 4.32 Agreement on importance of risks

According to this basic measure of importance there appear to be two notable exceptions to the trend of considering these risks as important. As was observed in Phase I, 'lack of senior management commitment' and 'sub-contracting' rank lowly according to this scale. However the reasons for this were the same as noted in Phase I. That is, senior management on the supplier side were always involved in significant projects, whereas senior involvement from the customer side was more of an issue. In other words the involvement of senior management on the supplier side was ingrained into most organisations studied, to the point were it was perceived as 'usually not worth controlling'. Sub-contracting was generally avoided and was thus mostly perceived as 'usually not worth controlling'. However one of the primary reasons sub-contracting was avoided was precisely because it was too risky. Therefore the risks associated with sub-contracting could arguably be considered very important.

One notable difference between the results of Phase I and Phase II was that in Phase II one respondent (a developer) considered that customer relationship issues were not worth controlling. That respondent was new to the role so it is possible that this was a factor in influencing their answer. However in that organisation most projects were conducted with limited direct contact between the supplier and the customer – this may also have been a factor in this response. Conversely this response may signal a shift in the perception of the importance of this risk by developers when compared with service managers.

4.5.3 Trends: risks not necessarily controlled

Even though the risks studied were for the most part considered important enough to be worth controlling, that did not mean that they were in fact controlled. If priority is given to those risks where a technique is used to control them a different ranking is obtained, as shown in the graph in Figure 4.33.

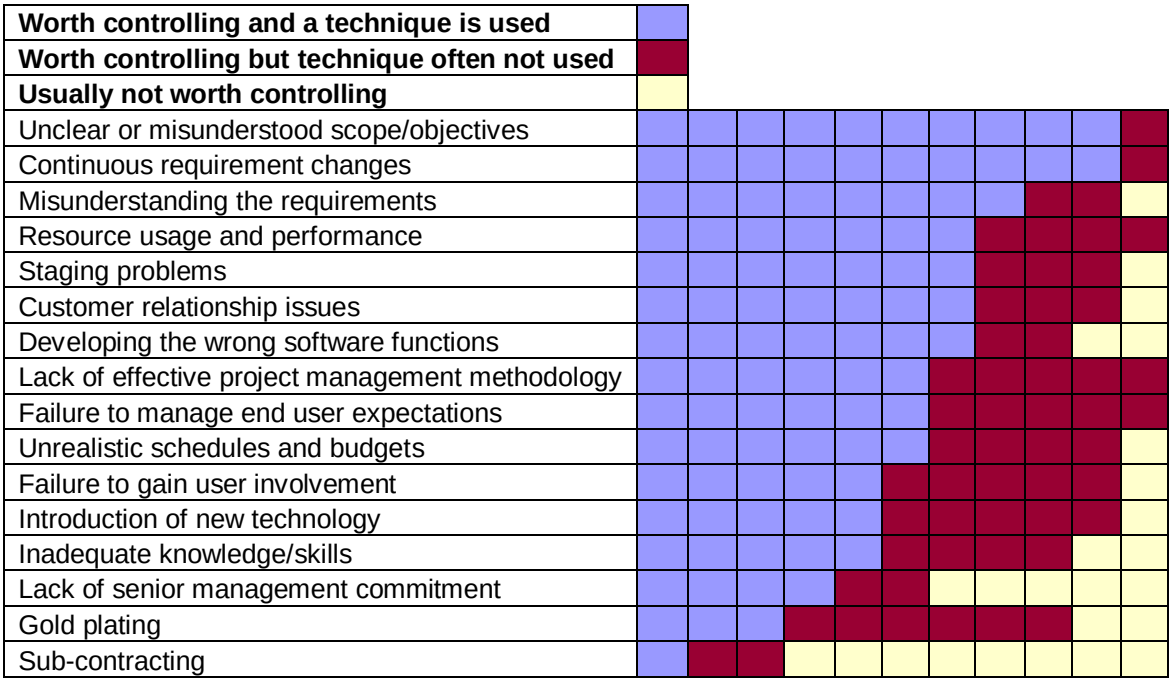


Figure 4.33 Risks not necessarily controlled

'Unclear or misunderstood scope/objectives' and 'continuous requirement changes' stand out as being acknowledged by all participants as risks that were considered to be worth controlling and were being addressed in some way. It was apparent during the interviews that all but one of the respondents were confident that these risks were both identified and addressed. The increasingly large burgundy blocks towards the bottom of the graph highlight that there is perceived to be a significant gap between the importance of these risks and the use of risk management techniques to control them.

When using this ranking 'lack of effective project management methodology' and 'failure to gain user involvement' drop down the graph. However in broad terms there are no dramatic changes to the ranking of the risks. Given its importance, of potential concern is that 'customer relationship issues' are considered by three respondents as having no technique to addresses them. Several risks are seen here as important but techniques are not used to control them. For example 'gold plating' stands out in this respect, with six respondents taking such an approach to this risk.

4.5.4 Trends: no technique used

As one compares the responses between service managers, project managers and developers a trend emerges. The project managers tend to more often report that no technique is used than service managers. The developers' perception continues this trend as they tend to report no technique being used more often than project managers.

The graphs on the following page in Figure 4.34 show all the results of Phase II on risk importance. The top row of graphs shows the results for each organisation. The second row of graphs groups together the service managers', project managers' and developers' responses. This illustrates the general trend of the results moving from 'worth controlling and a technique is used', to 'worth controlling but often a technique is not used' as the role moves through management positions to project manager then developer positions.

4.5.5 Trends: risk is usually not worth controlling

Also of note is the implication that service managers consider more risks as usually not worth controlling than either project managers or developers. For example 'developing the wrong software functions' is not considered worth controlling by half the service managers, but no project manager or developer reported this view.

With the exceptions of 'sub-contracting' and 'lack of senior management commitment', no risk was perceived as 'usually not worth controlling' by all three roles. This is another indicator that the risks studied were perceived as important.

The project managers and developers were less likely to perceive a risk as not worth controlling than the service managers. However the project managers and developers were far more likely than the service managers to claim that a technique was often not used to control the risks studied. The graphs in Figure 4.35 compare the responses of the service managers presented in the graph on the left, with the responses from the project managers and the developers (who have been grouped together) in the graph on the right. There are few blocks indicating 'worth controlling but technique often not used' by the service managers in the graph on the left whereas there are many such blocks in the right-hand graph.

Worth controlling and a technique is used														
Worth controlling but technique often not used														
Usually not worth controlling														
Organisation / Role	**1/SM**	**1/PM**	**1/Dev**	**2/SM**	**2/PM**	**2/DEV**		**3/SM**	**3/PM**	**3/DEV**		**4/SM**	**4/PM**	**4/DEV**
unclear objectives									!!!!!					
misunderstood requirements														
unrealistic schedules														
Failure to gain user involvement														
Inadequate knowledge/skills														
Lack of effective PM methodology														
Lack of senior mgmt commitment to project														
gold plating														
continuous requirement changes														
developing the wrong s/w function														
sub-contracting		N/A												
resource usage and performance														
introduction of new technology														
failure to manage user expectations														
staging problems														
customer relationship issues														
Organisation / Role	**1/SM**	**2/SM**	**3/SM**	**4/SM**		**1/PM**	**2/PM**	**3/PM**	**4/PM**		**2/DEV**	**3/DEV**	**4/DEV**	
unclear objectives								!!!!!						
misunderstood requirements														
unrealistic schedules														
Failure to gain user involvement														
Inadequate knowledge/skills														
Lack of effective PM methodology														
Lack of senior mgmt commitment to project														
gold plating														
continuous requirement changes														
developing the wrong s/w function														
sub-contracting						N/A								
resource usage and performance														
introduction of new technology														
failure to manage user expectations														
staging problems														
customer relationship issues														

Figure 4.34 Importance of risks grouped organisation and by roles

Phase I – service manager perspective

Phase II – project manager and developer perspectives

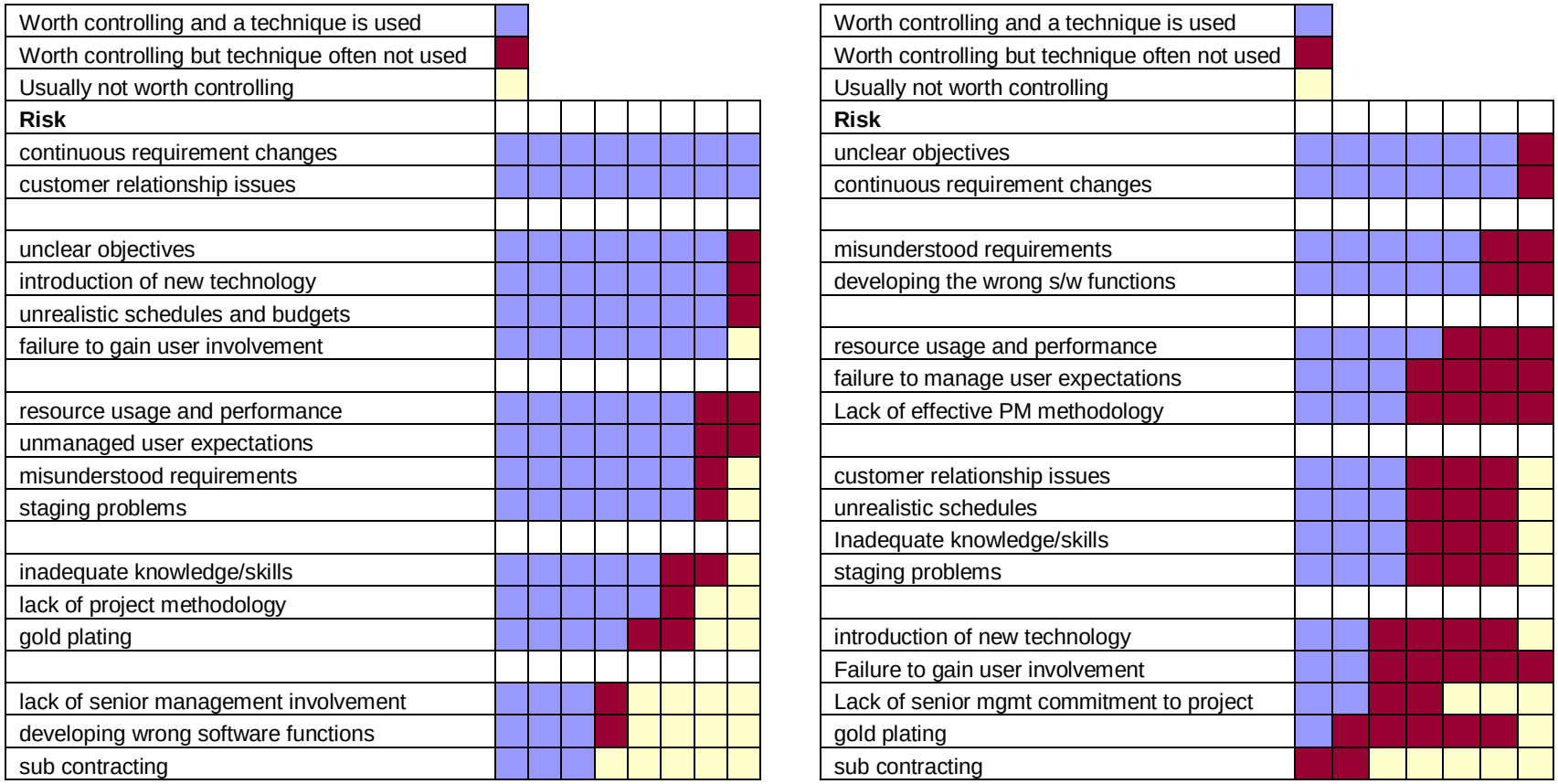


Figure 4.35 Comparison of risks by degree of consensus

The reasons for this discrepancy were not explored with the participants in detail, for two reasons. One, such issues were outside the specific goals of this research. Two, there was a conscious effort to avoid giving the project managers the perception that their answers should be in alignment with their service managers' answers. If the participants had been asked to explain the discrepancies there was a risk that they may have felt inclined to align their responses with the service managers' responses.

Phase I – service managers perspective	Phase II – project managers and developers perspective
continuous requirement changes	unclear objectives
customer relationship issues	continuous requirement changes
unclear objectives	misunderstanding the requirements
introduction of new technology	developing the wrong software functions
unrealistic schedules and budgets	
failure to gain user involvement	resource usage and performance
	unmanaged user expectations
resource usage and performance	lack of effective PM methodology
unmanaged user expectations	
misunderstanding the requirements	customer relationship issues
staging problems	unrealistic schedules and budgets
	inadequate knowledge/skills
inadequate knowledge/skills	staging problems
lack of effective PM methodology	
gold plating	introduction of new technology
	failure to gain user involvement
lack of senior mgmt commitment	lack of senior mgmt commitment
developing wrong software functions	gold plating
sub-contracting	sub-contracting

Table 4.18 Ordered groupings of risk importance by roles

To aid the analysis of the perceived importance of the risks studied they were organised into 5 groups. Those groupings are repeated for clarity in Table 4.18. The most important group [worth controlling and most likely to be controlled] is at the top of this table and the least important risks are grouped at the bottom of this table. Some insights can be gained by comparing responses by peer group roles across a mix of organisational contexts. It should be noted that the ranking by service managers on the left column of this table includes all eight organisations whereas the ranking of project managers' and developers' responses in the right column is from four of those organisations. The purpose of this particular analysis is not to make direct comparisons between these two groups but rather to consider the relative ranking of importance between peer groups. (A direct comparison between the different roles within the four organisations that were part of Phase II is provided later in this chapter.)

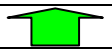
Risk	Phase I group	Phase II group	Change
continuous requirement changes	1	1	
customer relationship issues	1	4	
unclear objectives	2	1	
introduction of new technology	2	5	
unrealistic schedules and budgets	2	4	
failure to gain user involvement	2	5	
resource usage and performance	3	3	
unmanaged user expectations	3	3	
misunderstanding the requirements	3	2	
staging problems	3	4	
sub-contracting	5	5	
inadequate knowledge/skills	4	4	
lack of effective PM methodology	4	3	
gold plating	4	5	
lack of senior management commitment	5	5	
developing wrong software functions	5	2	

Table 4.19 Differences regarding perceptions of risk importance across roles

Although Table 4.19 highlights differences in importance it is also interesting to note where there is agreement about the relative importance of risks across the two groupings of participant roles. 'Resource usage and performance' along with 'unmanaged user expectations' remain in the middle group. All the roles consider these risks of middle importance relative to others. Similarly there is agreement that 'inadequate knowledge/skills' ranks in the fourth most important group. There is consensus that 'sub-contracting' and 'lack of senior management commitment' are the least important risks. There was a general consensus across all roles that sub-contracting is avoided and senior management are usually committed to projects.

The risks associated with 'misunderstanding the requirements', 'lack of effective project management methodology' and 'gold plating' move up higher in the risk groups for the PM/DEV group. This may indicate that these risks are more visible to project managers and developers than to senior management.

A selection of the other risks – those for which the perceptions are strongly in agreement or where differences in relative ranking are especially pronounced – are discussed in more detail individually on the following pages.

4.5.6 Importance of specific risks

The results for the risks reported in this section are worth closer examination.

4.5.6.1 Continuous requirement changes

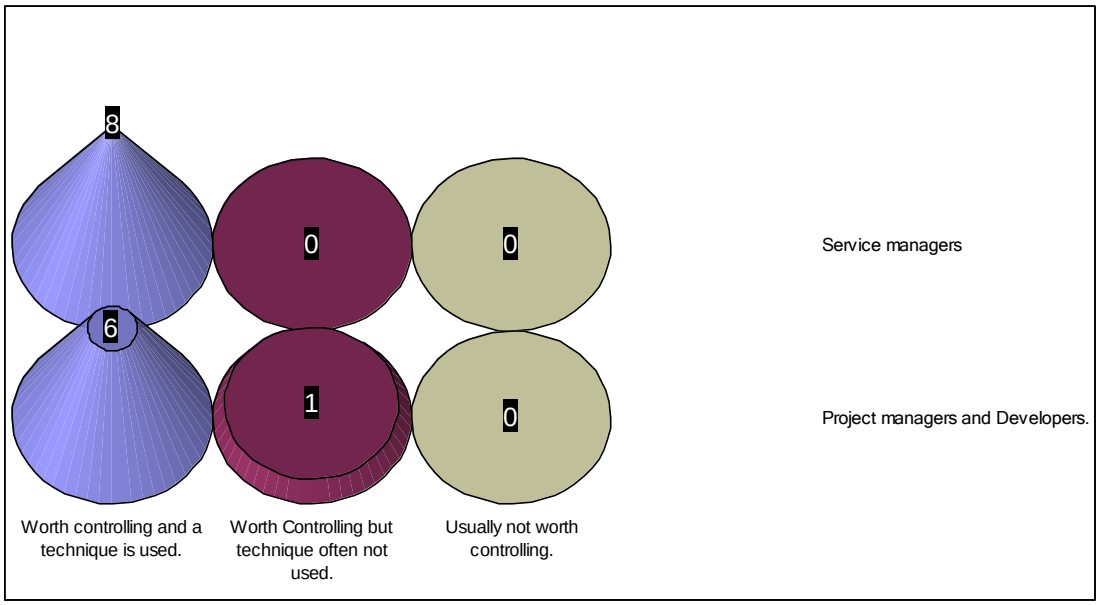


Figure 4.36 Continuous requirement changes

The risk ‘continuous requirement changes’ sits in the most important group of risks in both phases. This indicates that this risk is recognised as important to manage among all roles considered here. Put simply, there appears to be a high degree of awareness in these supplier organisations that continuous requirement changes can derail their projects and thus need to be controlled.

4.5.6.2 Customer relationship issues

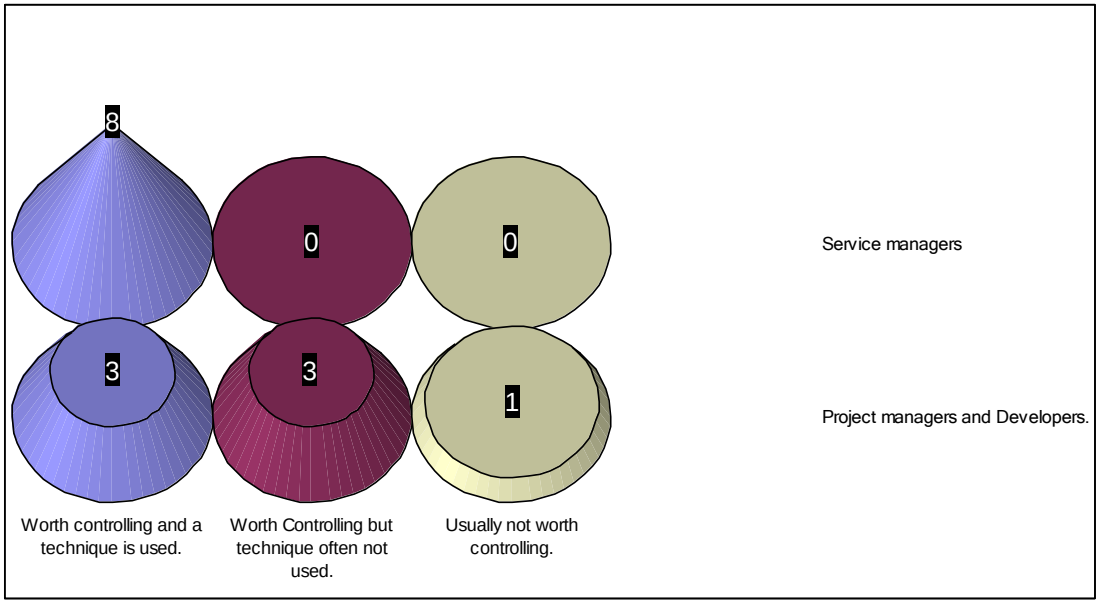


Figure 4.37 Customer relationship issues

Given that there was consensus among the service managers that 'customer relationship' risks could supersede all other risks, the service managers may be concerned that their view is not generally shared by the project managers and developers interviewed. The service managers frequently described techniques for managing this risk that involved multilevel contact between their organisation and the customer organisation. This multi-level contact included the project manager and developer roles. Yet when there is a comparison between the service managers' perceptions and those of the other roles' perception of 'customer relationship issues' importance there is a large drop from the most important group down to the fourth out of five groups. Two possible suggestions can be proffered for this discrepancy:

(a) The problems associated with failing to manage 'customer relationship' risks fall to the service manager or senior management roles and thus are not perceived to be so important to the other roles studied.

(b) The project managers and the developers may need some direction by their management to view the customer relationship related risks with more importance.

The reasons for this discrepancy would make an interesting topic of future research in their own right. It would also be interesting to explore whether this discrepancy in perceptions points towards an area where the actual level of project performance could be improved. An example research question could be: if project managers and developers treated customer relationship issues with more importance would there be an increase in successful projects in these organisations?

4.5.6.3 Unclear objectives

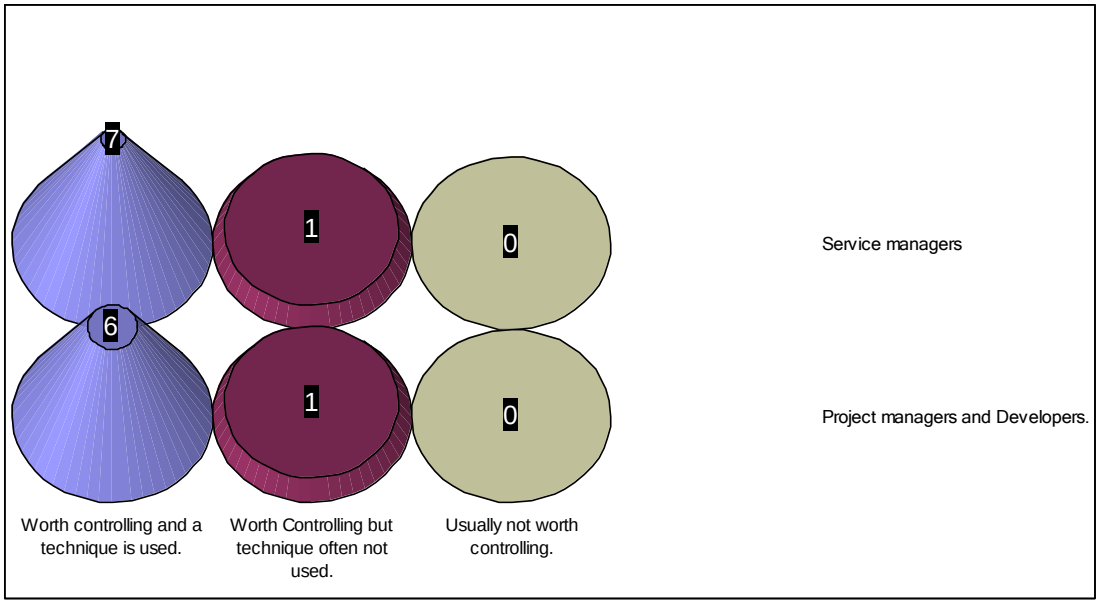


Figure 4.38 Unclear objectives

It is concerning to find that a technique was not always employed to manage the risk of 'unclear objectives' since one might consider this a well known and fundamental risk to software projects. Table 4.19 shows that 'unclear objectives' moves up slightly in relative importance for the PM/DEV group, which potentially reflects the importance of this risk to those delivering the project. Risks associated with 'unclear objectives' were considered to have a technique to control them with one exception in each group of roles. One of the service managers (who did not participate in Phase II) acknowledged that a technique was often not used to control this risk. In Phase II all four service managers described a technique to control this risk. One project manager reported that this risk was worth controlling but a technique to control it was often not used. This was not what was reported by others in that organisation. It seems surprising that, of the roles considered, a project manager would report this perception since a project manager has responsibility to meet the objectives of a project. When this person was prompted with the techniques described by the service manager they were able to describe and evaluate those techniques. It is possible that this project manager may have recently had a negative experience in that particular area and was expressing some frustration at that point in time, whereas when asked to reflect on the techniques used was able to provide a more balanced view.

Those potential explanations aside, this specific risk may be a useful area for future research. It is also possible that both exceptions to the majority view simply reflect a less than ideal reality. Possibly these perceptions simply reflect that there are a certain

percentage of projects in these smaller teams where there is not a technique to ensure the project objectives are clear. Perhaps the lack of formality in these smaller teams works against their best interests when concerning this risk. It may be that this is an area where, in spite of the maturing practice of software development, rather fundamental risk management techniques are not always used as standard. If that is so, one could expect project failures or project difficulties to be more common than they need to be.

4.5.6.4 Introduction of new technology

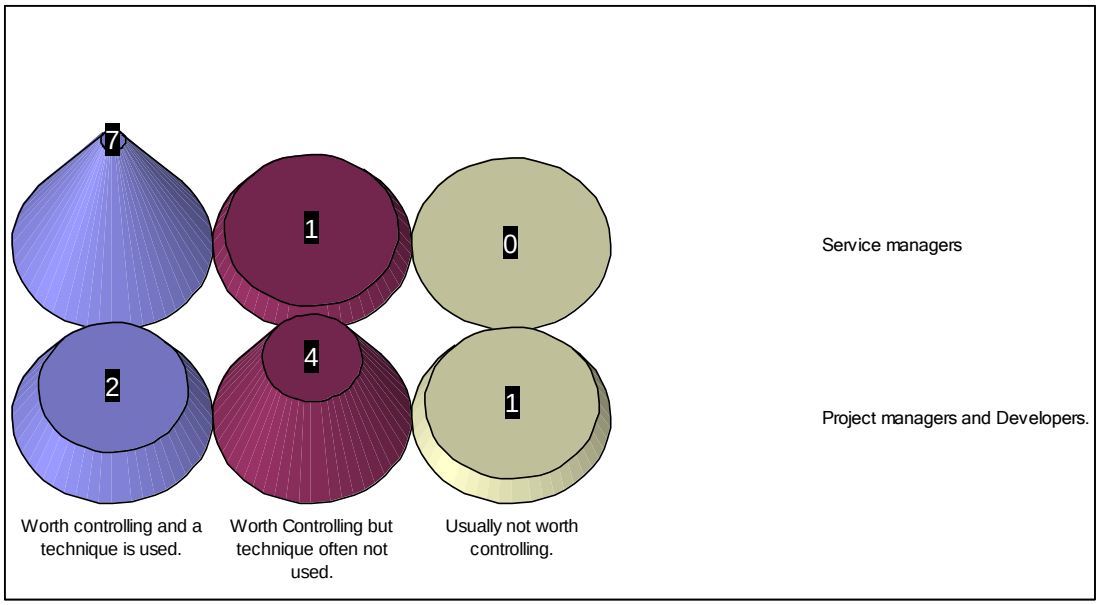


Figure 4.39 Introduction of new technology

The risks associated with 'introduction of new technology' saw a large drop in importance from group two (for SMs) to group five (for PMs/DEVs). This may be an indicator that developers and project managers are more receptive to new technology in general. It may also indicate that the service managers are more focused on business objectives and view new technology more of a risk whereas developers may tend to view new technology as an opportunity.

4.5.6.5 Unrealistic schedules and budgets

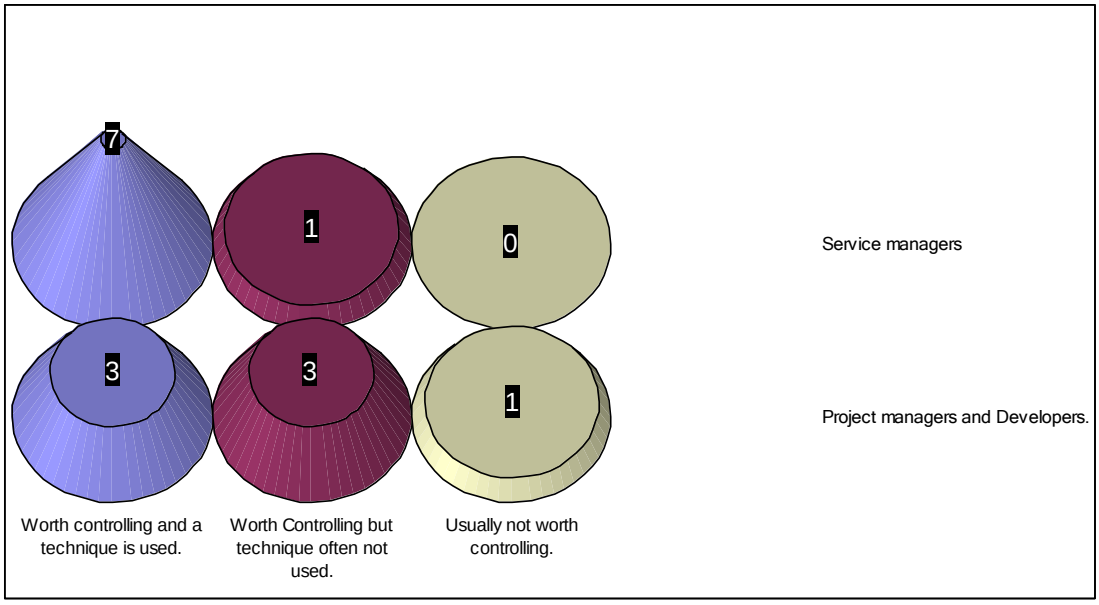


Figure 4.40 Unrealistic schedules and budgets

The risks associated with 'unrealistic schedules and budgets' drops from group two to group four in the relative comparison. This reflects that developers consider this risk not well managed. That may be because developers have little influence over such circumstances yet bear the brunt of dealing with the problems that arise as a result.

4.5.6.6 Failure to gain user involvement

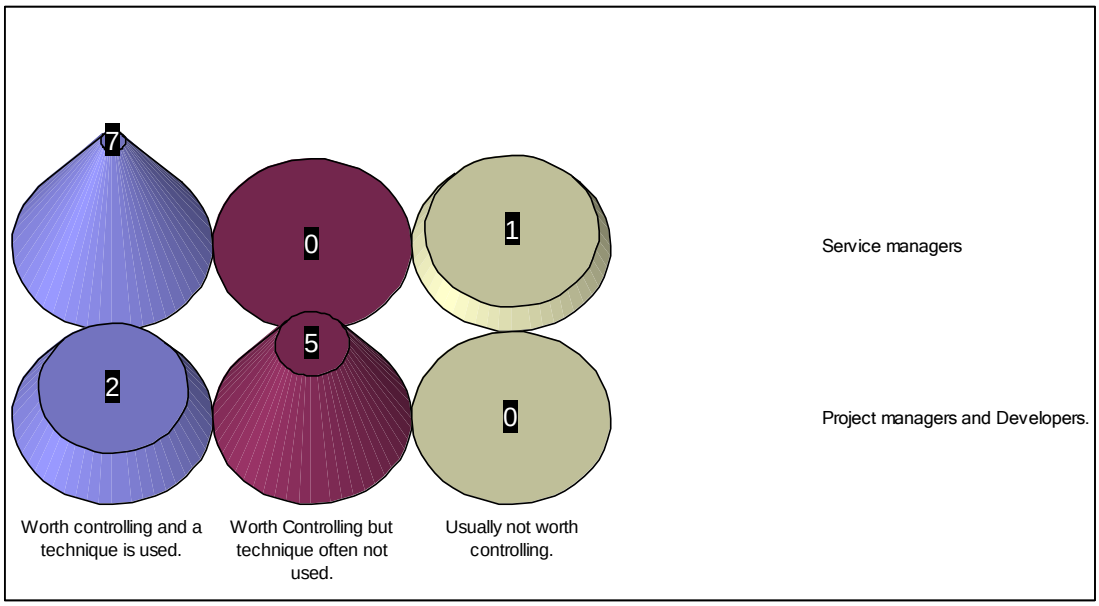


Figure 4.41 Failure to gain user involvement

Both project managers and developers appear to consider that 'failure to gain user involvement' is often not well managed. This is indicated by a large drop in importance from group two to group five for this risk. This raises a potential future research

question as to whether these roles do more over time to gain user involvement or whether service managers and/or customer organisations create structures that hinder this involvement. One organisation reported that they worked in a way where there is little direct communication between developers and users. The communication was channelled through one source. This may improve the efficiency of code production and enable the communication to be managed, but it would seem to also increase the risks associated with 'failure to gain user involvement'. This example of work practices may be a situation where a technique to address one risk has the unintended consequence of increasing exposure to another.

4.5.6.7 Developing the wrong software functions

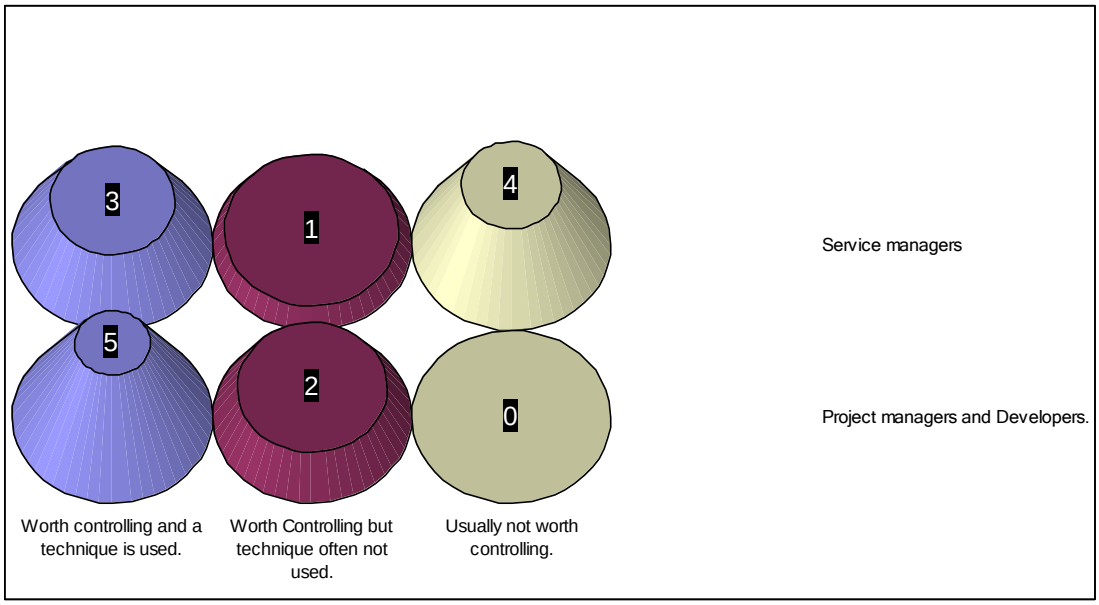


Figure 4.42 Developing the wrong software functions

The risk of 'developing the wrong software functions' makes a large climb from group five (SMs) to group two (PMs/DEVs). This indicates that this risk is not considered particularly significant to the service management role yet is perceived to be very important to those delivering the software functions for reasons which are perhaps obvious.

4.5.7 Summary of risk importance in Phase II

In the second phase of this research the views of project managers and developers were collected and compared against their respective service managers' views. Earlier in this chapter it was reported that the risks under consideration in this research are, for the most part, thought to be important and that their importance became more apparent when the views of the project managers and developers were considered. The two

notable exceptions, ‘lack of senior management commitment’ and ‘sub-contracting’, continued to rank lowly according to the scale adopted. The reasons for this were the same as noted in Phase I. That is, there was an ingrained practice of always having senior management involved in significant projects on the supplier side, whereas senior involvement from the customer side was more of an issue. Sub-contracting was generally avoided and was thus mostly perceived as ‘not worth controlling’.

One notable difference between the results of Phase I and Phase II was that in Phase II one respondent (a developer) considered that customer relationship issues were not worth controlling, a reflection that the developers in that organisation had very limited direct contact with the customer.

Even though the risks studied were for the most part considered important enough to be worth controlling, that did not mean that they were in fact controlled. There was perceived to be a significant gap between the importance of these risks and the use of risk management techniques to control them. Given its importance, of particular concern is that ‘customer relationship issues’ were considered by three respondents as having no technique to addresses them.

The project managers and developers were less likely to perceive a risk as not worth controlling than the service managers. However the project managers and developers were far more likely than the service managers to claim that a technique was often not used to control the risks studied.

All three roles were in broad agreement about the relative importance of the risks associated with; ‘resource usage and performance’, ‘unmanaged user expectations’ and ‘inadequate knowledge/skills’. The risks associated with ‘misunderstanding the requirements’, ‘lack of effective project management methodology’, ‘unclear objectives’, ‘developing the wrong software functions’ and ‘gold plating’ moved up higher in the risk groups. This may indicate that these risks are more visible to project managers and developers than to senior management. In contrast, the risks associated with ‘introduction of new technology’, ‘failure to gain user involvement’ and ‘unrealistic schedules and budgets’ dropped in relative importance since they tended to be considered by project managers and developers to be not well catered for.

The risk ‘continuous requirement changes’ remained in the most important group of risks. This indicates that this risk is recognised as important to manage among all roles in the process. Put simply, there appears to be a high degree of awareness in these supplier organisations that continuous requirement changes can derail their projects and thus need to be controlled. Conversely, given that there was consensus among the service managers that ‘customer relationship’ risks could supersede all other risks, the service managers may be concerned that their view is not generally shared by the project managers and developers interviewed. The reasons for this discrepancy would make an interesting topic of future research.

The next section considers the responses from project managers and developers when prompted to consider if they agreed with their respective service managers on what techniques were used.

4.5.8 Variation in techniques used

The next stage in Phase II of the research was to show the project managers and subsequently the developers what techniques had been described by their respective service managers. At this point the project managers and the developers were asked to offer their opinion on any variation in what techniques were used. A detailed list of these variations is included in Appendix D. These variations are collated in this section.

4.5.8.1 General observations

For thirteen of the sixteen risks the project managers and developers either considered a risk worth controlling and described a technique used or else added further techniques to those already described by the service manager. In general, project managers and developers added to the repertoire of techniques rather than deleted them from the service manager-provided list. However in one case a project manager disagreed that a particular document addressed the specific risk being discussed.

These outcomes may be due in part to the research process used, since the project managers and developers were provided with the list of techniques described by their service manager (whereas the service managers had been given a ‘clean sheet’ to describe the risk management techniques used). This effectively placed the project managers and developers in the position of being able to critique and elaborate on the original list of techniques provided by the service manager. In addition, there is the aspect that the project managers and developers perform tasks to control these risks on a

day to day basis and thus they are more likely to provide a comprehensive list when queried. There may also arise some situations where certain processes are working so well that they address a specific risk to the point where the service manager is not conscious of the specific technique[s] being used by their project managers and developers.

In some cases, notably 'unrealistic schedules and budgets' and 'lack of effective project management methodology' the project manager clearly disagreed with the service manager. The project manager was able to clearly describe certain techniques that addressed these areas. This discrepancy is perhaps because these areas are arguably more central to the project manager's day to day activities than those of the service manager. The reader should keep in mind that the term 'service manager' used in this research is a catch-all phrase to best describe the senior managers interviewed. The official title of these individuals varied from managing director to development manager. In other words they often had other functions including service management. Hence they may not always be focused on the practices that were researched.

Developers sometimes pointed out areas or situations not addressed by a technique. This may indicate they are more aware of the exceptions that are not well covered by a standard technique. Developers pointed out several times that certain techniques were effective *when they were followed* but even so the technique in question was not used as often as indicated by the service manager. Sometimes they also pointed out problems with implementing techniques, such as a lack of time, the introduction of new people, and problems identifying key stakeholders.

4.5.8.2 Specific variations of techniques used

Some variations seemed to be a matter of definition or perspective. For example, when considering 'unclear or misunderstood objectives' one project manager agreed in general with the documentation described by the service manager but opined that the technique did not include the project plan. The service manager's perspective appeared to be that part of the project plan involved making sure the objectives were, and continued to be, clearly understood. The project manager's perspective appeared to be that the project plan was to deliver the objectives which should be clearly understood first and always. Both perspectives could be considered as 'correct'. It is likely that there is a degree of semantic triviality about where the task of remaining clear about the objectives overlaps with the task of project planning.

These semantic differences are one reason why interviews were used for this research. Interviews allowed the researcher to clarify terminology of the questions asked and the answers given as well as to establish some common terminology among peers. Many project management terms need contextual definition to be understood in a precise way. Although this is a recognised issue for project management in general it is not addressed well for the complex and abstract nature of software projects. This may be another factor in why general project management standards are not often adopted by smaller software project teams.

In one organisation a developer explained that in some cases a third party does the requirements documentation which may not be peer reviewed and may be poorly done. This easily led to misunderstanding the requirements yet it was a difficult risk to control. In another organisation, the service manager did not think 'misunderstanding the requirements' was worth controlling. However the project manager from that organisation explained that a communication plan was draw up to address this risk and was also useful as a historical resource.

There were some significant variations between the roles when reporting on 'unrealistic schedules and budgets', particularly between the service managers and the project managers. There did seem to be a general trend in this area where the technique described to control this risk was often not actually implemented in practice. The overall impression given was that at times this was a difficult risk to control.

When considering 'failure to gain user involvement' in one organisation, the service manager described the risk as not wroth controlling but the project manager clearly described a two-step technique to control this risk. In another organisation the service manager described a technique but the project manager pointed out this was not always done in practice. This pattern of varied responses occurred for several of the risks described. These different responses seem to indicate a lack of awareness of what is actually put into practice by the service managers in terms of certain risks. The sample of organisations is not large enough to draw any generalised conclusions from these mixed responses based on the roles studied. However it may simply be an indication that what is actually implemented in practice is partly "fluid" and partly up to the project manager and thus is not always visible to the service manager. Another

explanation could be that the service managers and the organisations as a whole, do not consciously construct their project management practices in a methodical, risk focused way. It may be more common in these organisations to continuously modify their practices as the impact of new risks and issues is felt. This would be a subject worthy of future research. Such research may provide valuable insights into the issues surrounding process improvement and implementation.

When interviewing the project manager and developer roles about the risk of there being a 'lack of effective project management methodology' some trends seemed to emerge. It was commonly reported that there was not a consistent methodology implemented on all projects by all project managers and teams. In two of the four organisations studied steps had recently been taken to introduce a standard methodology but this process was in its beginning stages. It is possible that this is an indication that these smaller software organisations were in the process of maturing their practices to be more predictable. It also suggests these organisations would rank lowly on a formal maturity scale such as CMM.

When describing the control of the risks associated with 'introduction of new technology' the project managers and the developers appeared to be far more aware of what work was done to evaluate and mitigate these risks than the service managers. Since developers and project managers are dealing with the technical issues of projects more than service managers this result may not be surprising. However by failing to be fully aware of how these kinds of risks are identified and addressed, the service managers may be exposing the organisation to more of these kinds of risks than they realise.

When considering staging problems from a risk perspective some project managers and developers pointed out the difficulties in creating a User Assurance Test environment that accurately reflected the production environment. These difficulties often meant that only the main product or major releases were staged in this way and less significant changes were not as carefully managed. This illustrates that in practice the trade off between risk mitigation and effort may be a more difficult problem rather than any lack of knowledge about suitable techniques to use.

When considering the risks associated with 'customer relationship issues', there was a common thread of using multi-level communication between the supplier and the customer organisations. However this practice was not universal. In one organisation the developer and the customer did not usually have direct communication by design. The reason for that arrangement was to prevent miscommunication and to manage user expectations. However the organisation did concede that the arrangement had drawbacks. To a lesser extent this had also been a problem in another organisation. In that case the new appointment of a specialist project manager, who would have far more interaction with the customers than had previously occurred, was partly to correct that very problem.

4.5.9 Comparison of perceptions of technique effectiveness

In this section a detailed comparison of the opinions of the service managers, project managers and developers from the four organisations that participated in Phase II is reported.

4.5.9.1 Comparison of all responses regarding effectiveness

The main trend that emerges when considering the effectiveness of techniques by roles is that project managers were more likely to describe more techniques but they were also more likely to rate each technique as less effective than their counterparts in other roles. It can be seen from the two figures on the following pages (Figures 4.43 and 4.44) that both the developers and project managers were less confident in the effectiveness of the techniques used than the service managers. When comparing the service managers' responses with the project managers' responses the difference becomes quite marked. The project managers seem to consider the techniques used to be less than ideal. The project managers tended to describe more techniques that address risks than the service managers and slightly more than the developers.

An obvious example of both these trends is where the project manager in organisation one described six techniques to control resource usage risks but rated three of these no higher than satisfactory and the other three as mostly effective. This compares with the service manager from the same organisation, who described only three techniques for the same risk and rated them all as almost always effective.

Since it is the project managers' job to operationally manage these risks, it could be expected that the project managers would be more critical of the processes used. It also may be that the project managers have a more accurate appraisal of the true effectiveness of the techniques since these are the issues that they deal with on a day to day basis. It is submitted that the fact that the project managers were able to describe more techniques to address each risk suggests that people in this role are more aware of the benefits of certain procedures than those holding other roles.

In the organisations that took part in Phase II, it was rare for any role to rank a technique as so ineffective that a risk often still occurred. That could be an indicator that the organisations that participated in Phase II were those that were confident of the effectiveness of their risk management techniques.

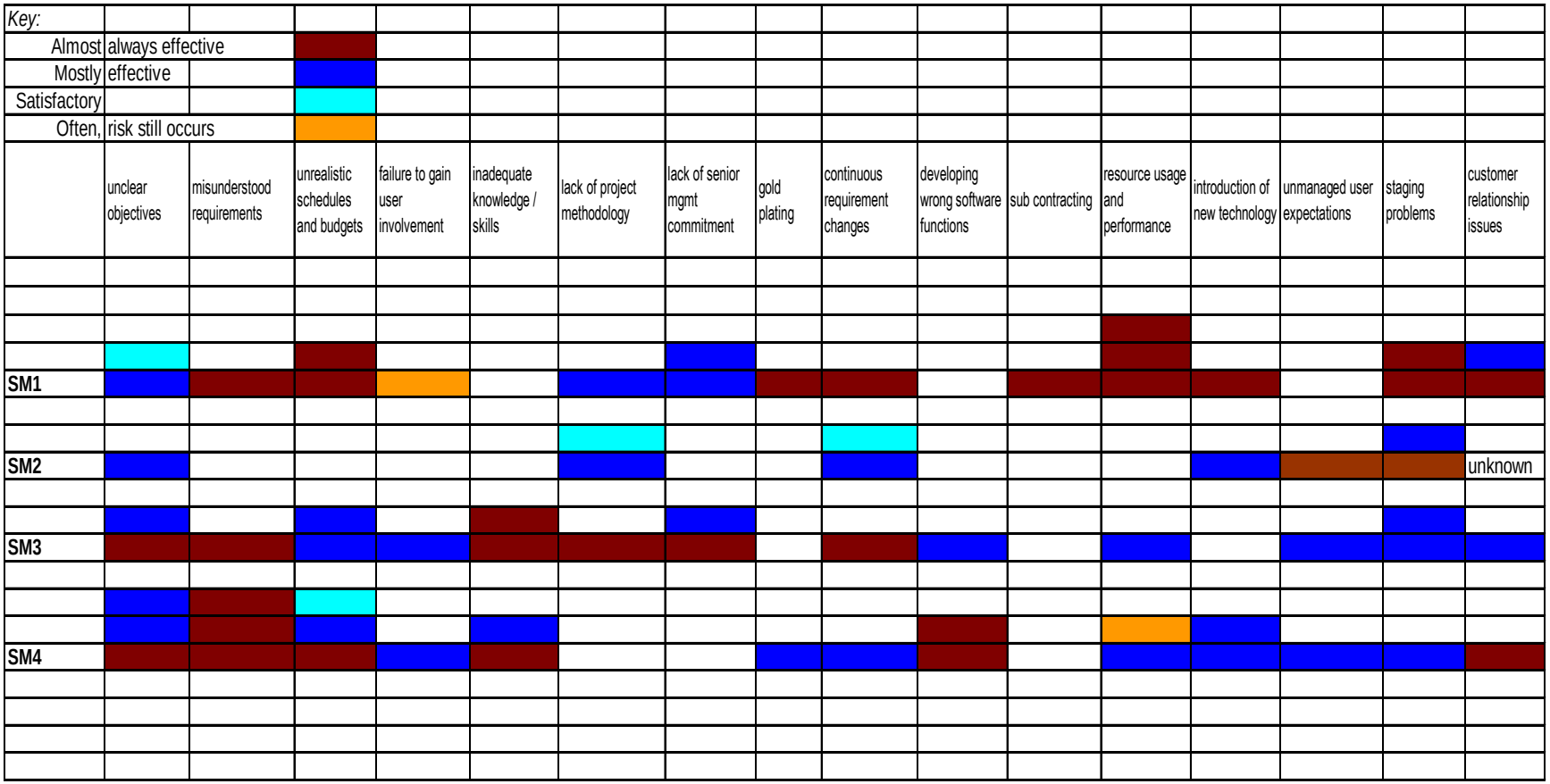


Figure 4.43 Service managers' perceptions of technique effectiveness

Key:																
Almost	always effective															
Mostly	effective															
Satisfactory																
Often,	risk still occurs															
	unclear objectives	misunderstood requirements	unrealistic schedules and budgets	failure to gain user involvement	inadequate knowledge / skills	lack of project methodology	lack of senior mgmt commitment	gold plating	continuous requirement changes	developing wrong software functions	sub contracting	resource usage and performance	introduction of new technology	unmanaged user expectations	staging problems	customer relationship issues
PM1											N/A					
PM2																unknown
PM3																
PM4								unknown								
DEV2																unknown
DEV3																
DEV4																

Figure 4.44 Project managers' and Developers' perceptions of technique effectiveness

4.5.9.2 Comparison of responses by organisation

The following graphs of report the perceptions of technique effectiveness for each organisation that took part in the second phase of the research. That is, the data is presented for each organisation in turn. The results themselves are now discussed

Organisation 1

In this organisation it is apparent that the project manager has less confidence than the service manager that the techniques used are always effective. For example, the project manager points out and rates a technique for each of 'developing the wrong software functions' and 'failure to manage end user expectations' but the service manager considers these risk as not worth controlling.

Organisation 2

In this organisation several risks did not have a technique to control them. The project manager and the developer both described and rated techniques to manage some risks that the service manager did not describe. When the responses of this organisation are compared with those of the other three organisations there are obviously fewer techniques in use in this organisation. In addition, the service manager in organisation two described most risks as not worth controlling which was in stark contrast to other organisations studied. In the other three organisations there were only one or two risks where the service manager described a risk as not worth controlling but the project manager thought the risk was worth controlling. In contrast, in organisation two there are five risks that the service manager describes as not worth controlling but the project manager considered were worth controlling. This divergence suggests that either:

(a) the service manager has analysed or considered those risks and is unconcerned about them or

(b) the service manager has not really analysed those risks and was not able to readily associate processes conducted in terms of those risks.

Given the subjective and perspective-based nature of this work, it is beyond the boundaries of this study to determine whether the service manager or the project manager is 'correct'. What is clear is that this organisation as a whole has a considerably lighter risk management portfolio than the other organisations. Furthermore it would seem that the service manager and the project manager disagree

about the importance of a significant number of risk areas. This is a level of disagreement that is not evident in the other organisations studied.

Organisation 3

In this organisation the developer indicated more confidence in the effectiveness of the techniques used than was indicated in other organisations. In this organisation the service manager rated seven techniques as 'always effective' and the developer rated eight techniques as 'always effective'. In that respect this organisation was exceptional since the trend was for developers to rate techniques as less effective than their service managers. The project manager described and rated two techniques for managing the 'introduction of new technology'.

A careful examination of Figure 4.47 reveals that organisation three as a whole is more satisfied with the effectiveness of the techniques that they employ than the other organisations in Phase II of this research. The participants from all three roles in this organisation usually considered the techniques they use to be 'almost always' or 'mostly' effective. In the other organisations it was more common for the techniques to be rated as less effective. In addition, the only risks that organisation three did not consider were worth controlling were those that they avoided altogether. These were 'sub-contracting' – which they avoided, and 'gold plating' – which was a reflection of the fact that they had experienced programmers who knew to avoid that practice.

Organisation 4

In organisation four there was a high degree of agreement on the techniques used to manage each risk. In this organisation the developer rated slightly more techniques as almost always effective than the service manager. The data for this organisation helps to illustrate the general trend with all four organisations that the project managers were more sceptical about the effectiveness of the techniques used than either the service managers or the developers.

Key:																
Almost	always	effective														
Mostly	effective															
Satisfactory																
Often,	risk still	occurs														
	unclear objectives	mis-understood requirements	unrealistic schedules and budgets	failure to gain user involve-ment	inadequate knowledge / skills	lack of project methodology	lack of senior mgmt commit ment	gold plating	continuous require-ment changes	developing wrong software functions	sub contracting	resource usage and perfor-mance	introduction of new technology	Failure to manage user expectations	staging problems	customer relationship issues
SM1																
PM1											N/A					

Figure 4.45 Perceptions of technique effectiveness – organisation one

Key:																
Almost	always	effective														
Mostly	effective															
Satisfactory																
Often,	risk still	occurs														
	unclear objectives	misunderstood requirements	unrealistic schedules and budgets	failure to gain user involvement	inadequate knowledge / skills	lack of project methodology	lack of senior mgmt commitment	gold plating	continuous requirement changes	developing wrong software functions	sub contracting	resource usage and performance	introduction of new technology	unmanaged user expectations	staging problems	customer relationship issues
SM2																unknown
PM2																unknown
DEV2																unknown

Figure 4.46 Perceptions of technique effectiveness – organisation two

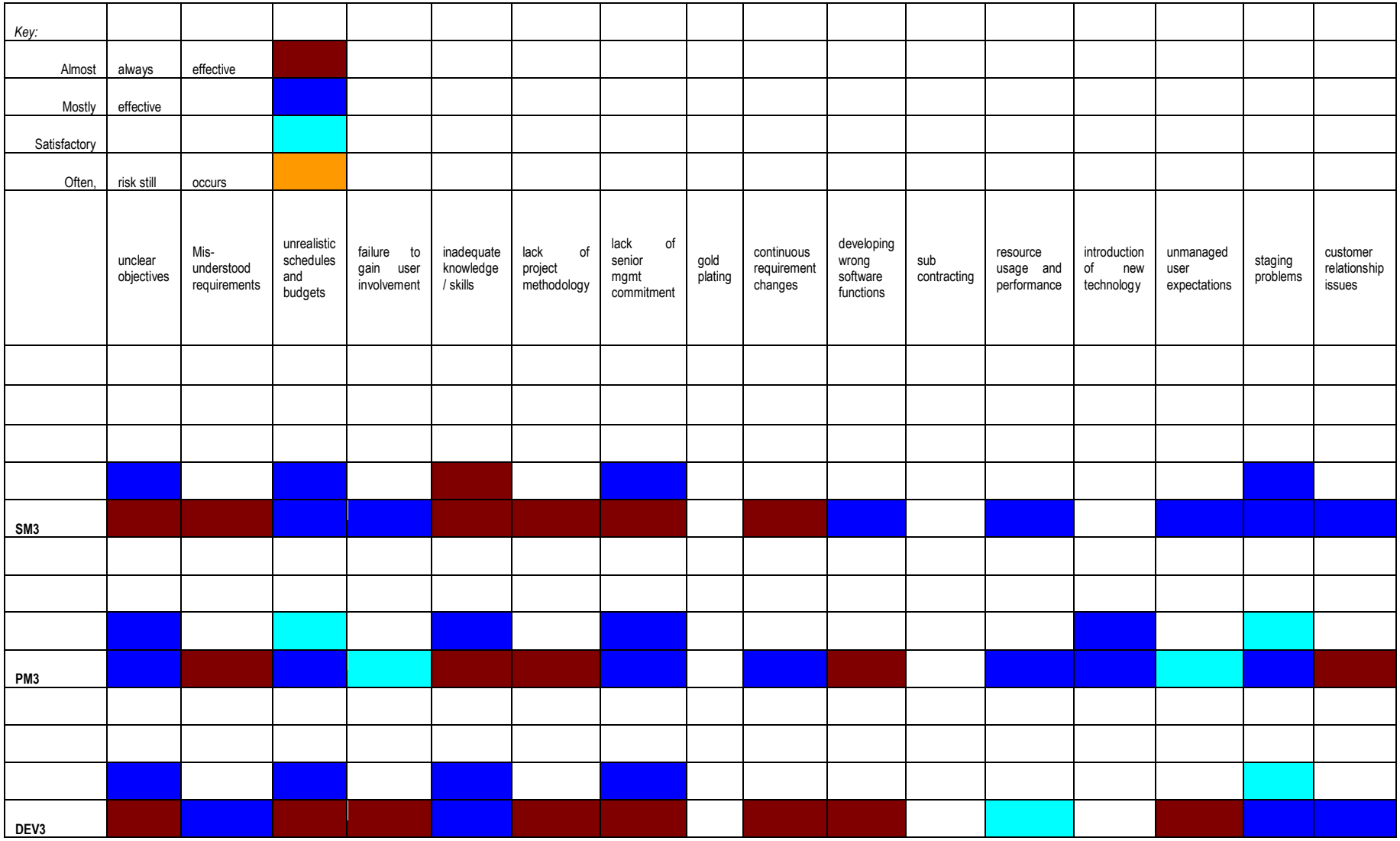


Figure 4.47 Perceptions of technique effectiveness – organisation three

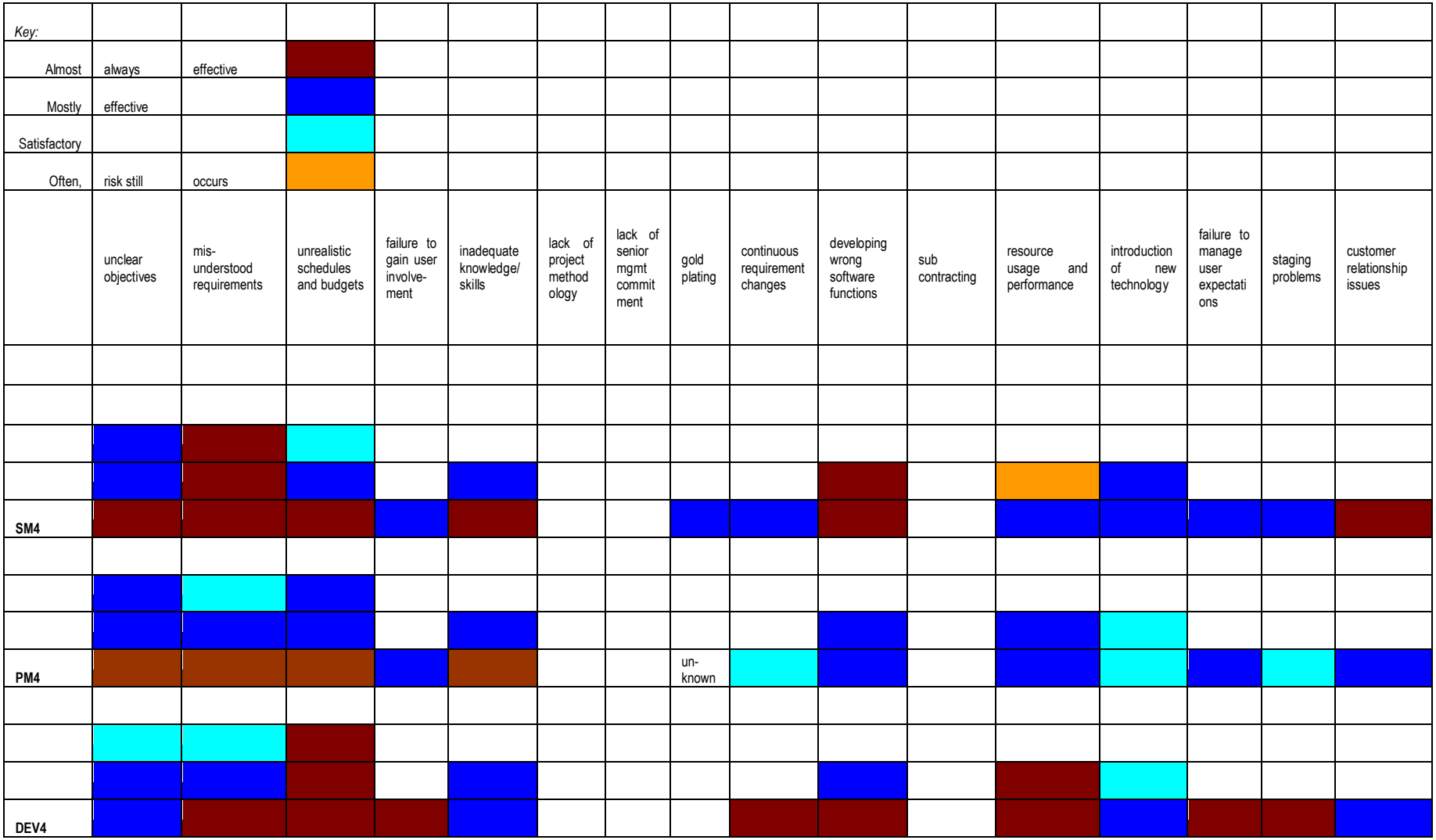


Figure 4.48 Perceptions of technique effectiveness – organisation four

4.5.9.3 Summary of Phase II responses on effectiveness

The main trend identified when considering the effectiveness in techniques by roles was that project managers were more likely to describe more techniques but they were also more likely to rate each technique as less effective than their counterparts in other roles.

Notable variations between the organisations were as follows. Organisation two used fewer techniques than the other organisations studied. In organisation three the developer indicated more confidence in the effectiveness of the techniques used than in other organisations. In organisation four the developer rated slightly more techniques as almost always effective than the service manager.

The results suggest that the project managers were not coy in criticising the risk management techniques they used. This willingness to describe their techniques in less flattering terms suggests that they were not concerned with appearing to have more effective techniques than they believed they used. It also suggests that:

a) the consequences of instances where risk management techniques are less effective fall primarily to the project managers,

and/or

b) the project managers worry more about the consequences of risks to projects than the service managers and the developers.

4.6 Customer-supplier relationship issues

This section reports selected observations from the Phase II interviews with service managers on risks related to customer relationship issues. The objective of this part of the research was to explore customer relationship risk management issues in more detail. Four of the service managers that took part in Phase I of this study were interviewed for this purpose. The data from those interviews is synthesized and presented in this section, with examples of the raw data shown in Appendix E. There were four research questions asked in this part of the work and these four research questions are presented here in turn.

4.6.1 Research Question 4: Steps taken to identify project risks

The first two questions put to the participants were both designed to draw out how they identify customer-supplier relationship risks. The questions were:

1. A multiple level contact approach is used to manage customer relationship issues which threaten project success. What other things to you do to keep a positive customer relationship and to identify any emerging challenges?
2. When these interactions occur, what do you and your colleagues do/say to draw out/discover issues?

The steps taken by the participants were a combination of regular communication events and informal interactions. Each organisation described multiple types of regular communication events including scheduled meetings, teleconferences and telephone calls. There was a common thread of having meetings that included people from various stakeholder teams within both the supplier and customer organisations. For example, one participant explained that they have fortnightly meetings that included the supplier, the reseller and the customer. It also included the supplier customer services manager, the support team, product experts, quality assurance staff and a business analyst. One participant also commented on the value of ad-hoc *and* formal channels of communication such as via the helpdesk.

The participants explained that informal interactions were just as, if not more important for identifying customer relationship issues. A practice akin to "taking the customer aside for a coffee", as one participant described it, was mentioned repeatedly. This was meant both literally but also as a euphemism to engage a key person in friendly conversation often simply to build rapport. Once the key person felt comfortable conversing with the supplier, as they would with any friendly person, they may volunteer information about important hidden risks. Many of these significant issues only came to light during such informal social encounters. When one participant was asked what they did to identify any emerging customer relationship challenges he answered: "[We] pick up the phone". In other words maintaining this friendly, easy, informal line of communication created a 'safe' channel through which the customer might raise concerns that they felt uncomfortable raising through formal channels. This may happen at any level of the organisation, which was why having multiple levels of communication between both the supplier and customer was so important.

Responses further suggested that the members of the supplier organisations had learnt over time to be sensitive to such information from unlikely sources. For example, joining a conversation around the water cooler, with people not on the project team, could provide hints of problems that had not been expressed formally. One respondent described an interesting situation where a third party became aware of a future event which might have a major impact on the supplier's project. This event was creating uncertainty in the mind of the customer but the customer had not felt confident enough to share this with the supplier. Once the supplier discovered this information from the third party they were able to arrange an informal situation with the customer where they could gently draw the concerns out of the customer. This resulted in contingency plans being drawn up for the mutual benefit of both parties and a healthier working relationship was established.

The issue of building up a sense of mutual trust was repeatedly mentioned. There was a common theme when discussing the identification of customer relationship issues of the key role that account or channel managers played within the supplier organisations. These account managers "maintain[s] an interest throughout the project" as one participant described it. Their primary responsibility is to maintain a good relationship with the customer. Hence risks and their identification were fundamental to their role. As one participant explained it, the account managers' role was to "become a trusted advisor" to the customer. It would be useful to include the perceptions of account managers in some further research.

The service managers explained that there was a paradox between the use of informal and formal communication techniques to identify customer service issues that posed a risk to the project. Identifying such risks early was viewed by all participants as key to being able to effectively address them. The paradox was that formal approaches tended to identify such risks earlier than informal approaches. However many key risks in this area could only be discovered through informal approaches.

4.6.2 Research Question 5: Customer relationship project risk response

The study sought to explore how the organisations responded to the risks identified, by asking the following question:

3. How do you/your company respond?

The participants found this a difficult question to answer without considering specific examples. A standard response was generally not appropriate. The response and how the issue was handled appeared to necessitate a tailored solution to each situation. However some synthesis of the approaches taken, as opposed to a specific answer, is evident in the responses.

The initial step tended to entail an internal discussion within the supplier organisation, usually involving senior management. Anecdotally it seemed rare for such issues to be addressed without senior management at least being informed of them. This was viewed as crucial by the service managers. However that did not necessarily mean that the issue was discussed at a formal meeting or even documented. This was freely acknowledged by at least one participant. In another case, the researcher was present when a project manager returned from a meeting with a customer. After confirming that the information would be treated with the highest confidentiality, an important customer relationship issue was discussed informally in the hallway between the project manager, the service manager and the leading developer.

All four participants in this phase of the research explained that some issues were addressed through formal project management processes. For example, an issue may be tabled and discussed at the next regular project meeting. One participant explained that this was usually only suitable for minor issues. In some cases the issue would be addressed informally with the customer. However one participant explained that they had written a formal letter to the customer about such an issue.

One participant explained that they usually devised two or three optional ways to resolve the issue and would then present these to the customer. They also considered which option would be in the customer's best interest and recommend that option, even if it was not to the supplier's short term advantage. By doing this, they are able to bring

projects back on track and at the same time gain the respect, confidence and trust of the customer. The supplier's motivation is to gain a long term relationship with the customer and thus gain more work in the future even at the expense of profit on the current project.

The participant explained an example of this clearly:

> "I think most customers appreciate your honesty. In saying we can do these things, giving a range of options, we are not always going to recommend the cheapest or [most] expensive. We're going to recommend the one that we think is best for *you* and these are our reasons. We actually did that [for] a customer. [The CEO] wanted what he was thinking of as a quick win. By spending another 23 K [$23,000] on something he could get an interim step along the road. The redevelopment itself was a 200K [$200,000] job.
>
> We looked at it and agreed to do the 23 and the 200K job. We were well up on it [work was in progress on the $20,000 sub-project] when we went back to [the CFO] and the CEO and said: 'Look. We can't in all conscience, recommend that you do that. We think that we should just cut the losses. Don't do that [$23,000 sub-project] at all. Don't give up the main route [even though] we were half way up the wrong way but we can we can redeploy that. It's not going to achieve what you want.' So that was a good step in their interests. [The CFO] really appreciated that and the CEO came round to appreciate it as well."

This question drew out many 'war stories', some of which the supplier had found impossible to resolve and which resulted in failed projects. In one case the service manager described a problem with nepotism, where a key person was incompetent, obstructive and acted inappropriately. That key person could not be avoided due to their relationship with the owner of the customer organisation. In that case the supplier did not address the issue and eventually the project failed.

In most cases a serious issue that had escalated meant that, in the view of the service managers, the supplier had "…bent over backwards to try to accommodate the wishes of the customer", as one put it. One service manager explained that in these situations, although the customer may accept an extension to the delivery time, the pressure to deliver increases substantially with the team working over-time as a result. This also could mean that a "chain of redefinition" could occur. The participant explained that

"Sometimes these things will have a relatively large effect from an architectural perspective".

Some examples of customer relationship issues that were described had arisen out of misunderstanding the requirement due to language and cultural reasons. This misunderstanding had then led to an erosion of trust between supplier and customer which posed a more series threat to the project than the original misunderstanding. An example as expressed in the participant's own words may be helpful to illustrate how easy it can be for such issues to escalate.

> "So. For example: We're doing a relatively large project in Lithuania at the moment. So you can imagine the commonality between Lithuanian & English is not that great. We have dissimilar alphabets for a start."

The participant explained that some additional functionality for some custom hardware called a fiscal printer was not requested. However it was required by law for tax auditing purposes.

> "So all of a sudden the receipts printed from the fiscal printer don't show this loyalty information on there & they come back to us and say: 'Where is it?' We're saying; 'You never asked for that'. And the specifications that we've got actually cover this point quite clearly and say 'This will not be required'.
> Meantime they bought the loyalty [add-on] in good faith, applied it to their system and said 'Oh! We want to see the loyalty points information on this fiscal receipt.'"

The supplier agreed to provide the additional functionality but this meant a delay in delivering the project. That created a public relations problem for the customer since the software project was part of a re-launch that had been advertised to the public. This in turn soured the relationship between the customer and the supplier causing frustration for all parties. That then resulted in the likelihood of additional problems occurring in an already troubled project.

As a result of experiences like this the supplier had employed a dedicated project manager to work with the account managers in maintaining dialogue with the customer for the whole life cycle of future projects.

This helps to illustrate that, at least in these smaller teams, the links between project success and business success are more direct that might be the case in larger organisations. This also means that it can be difficult to make the distinction between what is a project risk and what is a business risk. This suggests that standard project risk management approaches may need to be combined with business risk management approaches to gain a full understanding of the risks faced and addressed by the smaller teams.

In some cases the supplier had eventually "walked away from the business". This phrase meant that the supplier had determined that they would never be able to resolve the issue and retrieve the project thus they had accepted a loss and terminated their relationship with the customer.

4.6.3 Research Question 6: Style of risk management

The research question is:

- In the suppliers' estimation, do customers prefer a formal risk management style or a flexible style?

The question put to the participants was:
What do you think customers prefer and/or think about formal risk management controls versus flexibility? *[Note: this question focuses on the style of the project management methodology that is adopted]*.

The participants provided significantly different responses to this question depending on the market that they serviced. Two of the four participants were ERP software vendors and the other two participants were niche software vendors. The ERP vendors perceived their customers to have a very low level of maturity to risk management. In contrast, the niche software vendors perceived their customers to have a genuine and realistic appreciation and understanding of risk management.

The ERP vendors explained that many of their clients, particularly owner operators, do not want to invest in the formal project management component of the services offered. In addition, the socio-economic level of the market in New Zealand made this component difficult to sell. As one participant put it: "Customers don't 'get' formal risk management". In other words, their customers do not appreciate the importance and value of formal risk management. Their customer organisations were often reselling goods with little added value to the end consumer. This resulted in a climate of diminishing margins where price and short term goals were the dominating factors. The suppliers reported a culture of resistance to services from IT vendors in general. When the suppliers explained that without these services the customers would have to take responsibility for certain project outcomes, the customers accepted these responsibilities. However the customers "don't resource it". Therefore the supplier had to do the risk management for the project and their costs increased. In this market the suppliers believed that *they* may be required to be flexible but *their customers* were unlikely to demonstrate any flexibility.

By contrast the niche software vendors described their customers as preferring a majority of the project being fixed price for a fixed requirement with some contingency for changes in functionality or delivery date. In these markets the customers wanted crucial risks to be managed and allowed some contingency so that there would be flexibility to address unforeseen problems or unidentified requirements. For one supplier, this could also mean providing an iterative prototype environment so that the project could begin before all the requirements had been clarified. In this environment the suppliers and customers tended to take a partnership approach to risk management with some flexibility expected from both organisations to reach a successful project. For example, in one niche environment the most compelling deliverable for the customer was to be on time at a fixed delivery date. Compromises could be made by both the customer and the supplier in order to achieve this primary objective of the project.

4.6.4 Research Question 7: Trends in risk trade-offs.

The research question is:

- What trends do suppliers perceive there are in the compromises customers are willing to make?

The question put to the participants was:
Have attitudes of clients changed over the last 10 years in respect to trade offs between time/requirements/money and how to resolve these issues once the project is underway? *[Note: this question is probably best answered by considering specific situations because it suggests the approach taken when things head off track].*

The difference between the ERP software suppliers and the niche software suppliers was even more marked when answering this question. Generally their perceptions were opposite to each other. Both ERP software suppliers stated that their customers were less willing to make any tradeoffs and the trend was for less risk management not more. The niche software providers on the other hand considered that their customers had become more willing to make trade-offs between time/requirements/cost. In addition both niche suppliers discussed an increased awareness of the need for risk management practices among their customers.

The ERP software suppliers found themselves in a market where margins were constantly shrinking. The driving business goal for their customers was to reduce costs and little value was being added to products and services. They were both confined to the New Zealand market place. The niche software suppliers had positioned themselves in specialised industries that had enjoyed prolonged strong growth with strong and prolonged future growth widely expected to continue. In addition both niche software suppliers exported a significant amount of their outputs. They worked with people internationally.

The relationship between these very different market environments and the consequences for their project risk management was compelling. The customers of the ERP suppliers were described as lacking understanding of risk management and being risk averse. The customers of the niche suppliers were described as having a mature attitude to risk management and as being more willing to accept trade offs in order to reach business objectives.

One participant from an ERP software supplier put it succinctly: “[Customers] have been spending less and expecting more”. Another ERP supplier thought that: “attitudes had hardened a little because [customers] expect more to be built in [to the product] and [they] don’t want customisations. They don’t want to have to maintain customisations

during upgrades." It was considered that their customers needed predictability of future costs. The ERP vendors considered that if their customer was a distributor then they were particularly unlikely to accept any trade offs or customised solutions. If their customers were manufacturers they tended to be more analytical about evaluating the benefits and costs of these kinds of trade offs. The ERP suppliers thought that their customers were less willing to accept risk which meant that they avoided customisations. This meant that they were less likely to have any business advantage over their rivals. This in turn meant that they felt even more pressure to reduce costs and the cycle would continue.

The niche software suppliers thought that their customers were realistic when negotiating over time/requirements and costs. Both of these suppliers considered that the trend was for their customers to be more aware of the importance of risk management and more willing to invest in customisations to gain competitive advantages over their rivals. This meant that these customers tended to accept more risk over time. For both of these suppliers the long term relationship with their customers was of key importance. As their customers were in a growth market, by maintaining a long standing relationship and adding value to their customers' business the suppliers in turn continued to grow even if individual projects were not particularly profitable.

One of these niche suppliers explained that they typically provided customers three options to address their requirements, a cheapest option, a medium-cost option and an expensive option. Most of their customers would select the medium-cost option because it would help them to expand what they could offer the consumer. In other words their customers purchasing decisions were based on business value in a market where the driving force was to grow business value.

Both of the niche software suppliers also made it clear that their customers expected higher quality software than in the past. Once the customer had agreed to a fixed price they had greater expectations that the supplier would deliver what was agreed to and no further trade offs would be expected. They expected software development to be "easier, cheaper and quicker because tools and methods were better and more modern".

These niche suppliers had also undergone internal changes over this time. They believed that they had become more formal and professional. Their customers had become more

mature and had increased understanding of the realities of software development. At the same time their customers expected their suppliers to be more formal and professional but also accommodating to the customers' needs.

Both of the niche supplies discussed these issues in terms of partnering with the customer to achieve a mutually satisfying outcome in their projects. In fact one of the participant organisations had been 'born' out of a joint venture between a customer and supplier. This organisation had made an effort to continue to position itself as a partner. "We have become more flexible and more concerned with successful outcomes than cost/benefit".

4.6.5 Summary of findings on risk management of customer relationship issues

In terms of identifying customer-supplier relationship risks the need to build a sense of mutual trust was repeatedly mentioned. The early detection of such risks was considered of particular importance. It was thought that formal approaches to risk management tended to identify such risks earlier. However many of these risks could only be identified by informal approaches such as chatting to the customer over a coffee.

The response to these risks and how resulting issues were dealt with necessitated a tailored solution to each situation. Some issues were addressed through formal project management processes although many were addressed informally with the customer. It was reported that such issues could easily escalate quickly. In certain instances, the supplier had found it impossible to resolve such an issue, which resulted in failed projects and the loss of the relationship with that customer.

It would be useful to include the perceptions of account managers regarding these issues in further research since their role is key in such relationships. A more holistic approach to risk management in these smaller teams therefore seems warranted.

When reflecting on the style of risk management that they thought customers preferred the participants provided significantly different responses to this question depending on the market that they serviced. The ERP vendors perceived their customers to have a very low level of maturity regarding risk management. The niche software vendors

perceived their customers to have an appreciation and understanding of risk management. The ERP vendors explained that many of their clients, particularly owner operators, did not want to invest in the formal project management component of the services offered and that they were risk averse. By contrast the niche software vendors described their customers as being more flexible. They preferred a majority of the project having a fixed price for a fixed requirement with some contingency for changes in functionality or delivery date. In those niche markets compromises may be made by both the customer and the supplier in order to achieve a successful project outcome.

The perceptions of the ERP software suppliers and the niche software suppliers were strongly contrasting when considering trends in the willingness of customers to make compromises. Both ERP software suppliers stated that their customers were less willing to make any tradeoffs and the trend was for less risk management, not more. The niche software providers, on the other hand, considered that their customers had become more willing to make trade-offs between time/requirements/cost. In addition, the niche suppliers discussed an increased awareness of the need for risk management practices among their customers. The niche providers felt they were in a partnership with their customers to overcome problems and achieve successful project outcomes.

The following section discusses all the findings as a whole and considers themes that have arisen from this work.

4.7 Discussion

This section is a summary of the themes that have emerged from the analysis and a consideration of those themes in relation to the contemporary literature. These themes fall under the following headings:

- Identification of risks
- Size and complexity of projects
- Variability of techniques used
- Novelty
- Complex management issues

- Link between project success and business success
- Techniques work when used
- Measurement of effectiveness
- Standard PM practice
- Use of multiple techniques
- Flexibility
- Efficacy: optimal practice versus effort

4.7.1 Identification of risks

The identification of risks is a cornerstone in risk management theory. Although identification of project risks was not a specific objective of this research, some useful insights in this area were found. In this study, risks identified as important in the literature were compared with risks considered important by these smaller teams. It appears that in general, these smaller teams often identify important risks from their experience of how mismanaged risks escalated in previous projects rather than conducting a formal risk identification exercise.

To compare the risks from the literature to the perceptions of these smaller teams, the participants were asked to consider if the risk was worth the effort of controlling it. Some organisations are so comfortable with how the organisation as a whole is managing their projects that they rank one or more cited risks as not worth controlling. This is different to perceiving a risk and having a technique that is almost always effective in controlling that risk. In the first instance the risk is not perceived as explicitly requiring effort or additional effort to address. In simple terms it is not considered a risk for their particular circumstances, whereas having a technique that is almost always effective requires effort and diligence to adhere to a process. This may reflect that smaller organisations put their focus into balancing improving practice with the effort required. If there is no suggestion that a process needs to change, perhaps the practitioners dismiss the risk as now being irrelevant to their concerns.

One of the consequences of not having a specific risk identification process could be that the practitioners fail to consider some important risks for a given project. For example, in one case the risk ‘failure to manage user expectations’ was considered not worth controlling, yet during the interview the participant did hint that they may not be identifying the risks in this area adequately.

It was beyond the scope of this study to explore what processes these smaller teams used to identify risks but there are indications that identification of risks is important in this context. This would be an interesting area for further research.

4.7.2 Size and complexity of projects

A careful examination of the literature suggests that it is complexity rather than size of projects that directly corresponds to risk quantification. That is, more complex projects are more risky (Boehm, 1991; Butler, 2004; Hall, 1998; Karolak, 1996). Project size appears to be used as a proxy for project complexity. There was some indication of this phenomenon in the organisations studied in this research.

There was a tendency to use different techniques for issues of unclear scope/objectives depending on the scale of the project, with detailed study and definition techniques being the norm for larger projects and a much simpler definition being used for smaller projects. This seems to clearly indicate a balance between effort and risk based on project size. However closer inspection during the interviews revealed that these "micro-projects" were considerably less complex, and thus a simpler definition of the scope was appropriate. If a "micro-project" was found to be significantly complex the supplier made an effort to either have the requirement changed or else treated the project in the same way that they would deal with a larger project. In other words, an informal and undocumented form of risk avoidance would occur to avoid complex projects being treated as small projects.

4.7.3 Variability of techniques used

In spite of the existence of so-called 'standard' approaches to risk management (as promoted in the PMBOK, for instance) there may be significant variation in the practices employed within these smaller organisations. For example, the results for the treatment of the risk of 'resource usage and performance' illustrate that different organisations can have markedly different practices. One generalisation that can be made is that the techniques tended to all rely on some form of user involvement and/or interaction during the development process.

4.7.4 Novelty

The novelty of projects is identified as a significant risk factor in the literature (Addison, 2002; Boehm, 1991; Ewusi-Mensah, 2003; Hall, 1998; Karolak, 1996; Keil et al., 1998; Opperthauser, 1998; Schmidt et al., 2001). Information concerning novelty was collected for each organisation and each participant in the study. However in general, no discernable pattern between the perceived novelty of projects and risk techniques was apparent for the group of organisations studied. Some interesting exceptions to this are worth considering.

Organisation two from the first phase of research estimated that 30-50% of their projects were new to their organisation, included new technology and were new to the project team members. Yet the manager in this organisation reported that the risk of 'Inadequate knowledge/skills' was not considered worth controlling. Given the high degree of novelty of the projects this organisation undertakes, it seems logical that they have a requirement to update their knowledge and skills on an on-going basis. For the service manager to describe 'inadequate knowledge/skills' as a risk not worth controlling suggests either a lack of understanding of risk management or a level of denial about the risks they face.

The empirical data suggests that organisation five from the first phase might be the most effective at controlling risk – that said, they did not appear to be as exposed to as much novelty as other organisations. Perhaps the two are in fact related.

4.7.5 Complex management issues

Some literature claims that large software projects, with their large project teams, have complex management issues to address (Charette, 1996; DeMarco & Miller, 1996). That may be true, but there is also an implication in such claims that smaller teams do not have complex issues to address. This research illustrates that smaller software organisations may well have complex risk management issues to deal with, as illustrated in the following example.

Organisation eight from Phase I was happy with the effectiveness of their techniques in general. Their most difficult problem to address seemed to be with unrealistic budgets in certain countries that they exported to. There was a feeling that this risk was a

difficult one to manage effectively due to the international organisational structure of many of their clients. In many cases the budget for their projects was being set at a worldwide headquarters that were not aware of the local requirements where each project was planned. Some of these requirements were mandated by local laws and some arose due to local cultural requirements which meant they could not be re-negotiated. These issues varied widely from country to country and thus it was difficult to devise effective contingency plans.

4.7.6 Link between project success and business success

This research suggests that there is a more direct link between individual project success and success of the business in smaller organisations than is the case in large organisations. The literature describes the lack of senior management involvement in a project as a major risk (Addison, 2002), whereas in this study of smaller organisations, senior management were always involved in significant projects and hence the risk did not arise.

Organisation three reported that in the two projects where their senior management were not involved, the projects failed. As a result of those lessons, senior management was explicitly assigned to each project ever since. This example illustrates that there is potential for this risk. In all other cases with all the organisations studied senior management ensured they were involved in the projects thus avoiding this risk.

This reflects the context of these smaller organisations where the success or failure of a project is directly linked to the profit and loss of the organisation as a whole. Several of the service managers explained that even worse than monetary loss of a failed project was damage to the customer-supplier relationship and damage to the supplier's good name in the market place. This damage to their reputation was felt more keenly and 'hurt' for much longer than the monetary loss of the project.

4.7.7 Techniques work when used

It should be noted that during the interviews several participants reported that a technique was almost always effective *when it was use*d – but use might be sporadic. In such circumstances, organisations such as organisation one, which has only a single

technique to control each risk, might be exposing themselves to more risk than is indicated from the reported data alone.

It seems that there may be an issue in many smaller organisations where their own proven practices are not always adhered to, with subsequently risky outcomes for the project. This theme arose repeatedly. One good example of this arose when one of the service managers was discussing 'failure to manage user expectations' (as described in the next sub-section). At times the technique would not be employed, as a result the risk would arise and then more work would be required to meet the users' expectations.

4.7.8 Measurement of effectiveness

This research asked the participants in Phase I to explain how they measured the effectiveness of the techniques that they used. The answers varied widely. This seems to reflect that the practitioners usually did not use objective measures. In addition the subjective measures they used had not generally been carefully considered. For example, one response to this question was that the measure of effectiveness of a risk management technique was profit. Although these smaller organisations can draw a more direct link between profit and project risk, there are many factors that influence profit. Hence this is not considered a good measure of effectiveness for a specific risk management technique.

Conversely there were examples of high quality effectiveness measures. The criteria used to measure misunderstood requirements were generally either customer feedback, formal sign off or both. These are quality criteria because they relate directly to the risk being controlled.

As mentioned in the previous subsection, sometimes the effectiveness of a technique becomes obvious if the technique is not employed. One service manager considered a certain technique to control 'failure to manage user expectations' to be 'almost always' effective. He was able to determine this because occasionally this technique was not employed which resulted in software being delivered that did not meet expectations or required too much extra work to be done at the supplier's expense in order to meet expectations.

When considering the risk 'introduction of new technology' the measures used to determine if the techniques used were effective were often of high quality. When the participants were asked how they determined the effectiveness of their techniques there was a common thread of being able to link the handling of this risk directly with project success. The researcher's contention is that these are good examples of determining effectiveness precisely because of the direct link back to the specific risk being addressed. For example, the effectiveness of a training technique was determined by the ability to address problems at the helpdesk level of support. Since those problems are carefully recorded and categorized by the helpdesk, reports could be used to measure the effectiveness of the training with considerable detail, accuracy and validity.

4.7.9 Standard project management practice

Industry standard project management methodologies, being generic collections of practices, are generally not used in these organisations and even when they are used they are problematic and not entirely effective. These smaller organisations tended to have developed their own methodologies from their own experience in what was an ongoing process.

Several participants explained that for various reasons they did not have a dedicated project manager role in their organisation and therefore one of their primary concerns was ensuring that team members adhered to a (single) methodology. Their methodologies tended to be in a state of development. In addition, there was a keen sense of the need to be adaptable. As one participant put it; "flexibility is key". Only one organisation had adopted a formal methodology (Prince 2) recognised by the project management industry. This organisation considered this methodology as only satisfactory in effectiveness. They cited the labour intensity of the approach as being an inhibiting factor. This provides anecdotal evidence that such formally recognised methodologies are not well suited to the flexibility inherent in these smaller organisations, and that tailored sets of specific practices are more likely to be utilised in such organisations.

One exception to this theme was in the management of the risk 'unclear scope/objectives'**.** The techniques described seemed to reflect good practice as commonly described in the standard project management literature, in so far as the

objectives were clearly defined and then monitored. It could be that this risk more neatly fits into a standard approach to project risk management and thus a standard approach works very effectively when addressing this particular risk. For most other risks a more individually refined technique appeared to be more suitable.

4.7.10 Use of multiple techniques

The results suggest there is value in having multiple techniques to address risks. For example, there seems to be potential for improvements in how the risk of 'unrealistic schedules and budgets' is controlled. This risk is an example where the use of more than one technique to address a risk appears to have its advantages. This is an important risk yet many of the techniques used to control it were perceived to be less than optimal.

One highly effective technique may be more than adequate to control a particular risk. Hence the number of techniques being used may or may not be an indication of how well a risk is controlled. However, many risks have different facets and it may be difficult to have a technique that is highly effective as well as comprehensively addressing all aspects of the risk. An analysis of the data for organisation five suggests that where one aspect of a risk may have one technique that is of limited effectiveness, other aspects of this risk may have techniques that are highly effective. This may be a useful starting point for organisations looking to improve their practices. Organisations finding themselves with only one technique of limited effectiveness may be wise to consider keeping this technique but supplementing it with additional techniques that address different aspects of a risk and thus limiting their overall exposure to that risk.

4.7.11 Flexibility

As previously mentioned, sometimes an informal and undocumented form of risk avoidance would occur to avoid complex projects being treated as small projects. Anecdotally, this suggests that the flexibility of the organisations studied may play an important part in dealing effectively with exceptional circumstances. If an exceptional risk is identified, the smaller organisations studied may more readily "bend the rules" and step outside of their standard practices to address the exceptional circumstance. The data collected does not necessarily show that these smaller organisations identified

exceptional risks more quickly than large organisations, only that they have the ability and willingness to readily adjust their practices once such a risk has been identified.

4.7.12 Efficacy: optimal practice vs. effort

The interviews concerning the risk of 'introduction of new technology' illustrate that these organisations may use a risk management technique that they consider efficacious event when they are aware that it may not be optimal. Where techniques were described as 'mostly' effective, there were various feedback methods employed depending on the specific detailed risk. These various methods often showed that the technique was efficacious. For example, one measure was that the software continues to operate in changing environments. There was a recognition that such measures did not mean a technique was always effective. For example, one assessment technique was described as mostly effective since their deployments were successful but the supplier was not always sure that they had delivered the optimum solution. Anecdotally, the constraint that led to deliberately using an efficacious technique rather than a more effective technique was a function of resources and time. Hence while the participants might acknowledge there was room for improvement in controlling this risk, they had made a conscious decision not to do so at that time.

A careful study of the techniques used to control 'unrealistic schedules and budgets' indicates a theme of the "devil being in the detail" when dealing with this risk. The participants often reported that there were feasibility problems with managing this risk in too much detail. Yet without that level of detail the likelihood of this risk arising and affecting the project increased. In other words, the organisations had to search for a balance between effort and risk – a balance that was at times difficult to achieve.

Since these smaller teams have by definition fewer absolute resources, they also by definition cannot take advantages of scale. For example, one percent of the available person-hours spent managing risk in a large team may equate to a full time role as well as a small amount of time from each team member. This amount of time may allow for some fairly elaborate management practices to be adopted. However one percent of the available person-hours in a small team may only allow one person to spend half an hour a day managing risk. In that case there is an obvious constraint on how much effort can be employed in risk management.

Note that in the cases where a technique was used yet the risk often still occurred, no other technique was used by that organisation to mitigate the ineffective technique. For example, organisation three's technique to deal with the risk of failing to gain user involvement was ineffective, yet that organisation only used this single technique to control that risk. It may be that if a technique is ineffective and then an organisation adopts another technique which is at least satisfactory there may be little point in continuing to use the technique which is largely ineffective.

4.8 Conclusion

Chapter 4 has presented the results of this research. It has also presented the analysis of the data and some discussion of the findings. The research conducted was wide in scope but at the same time a great deal of rich data was collected and analysed. Important risks identified in the literature were compared to the perceptions of practitioners in smaller software teams. Their views on the importance of these risks were presented. The techniques that these practitioners used to address important risks were considered and the results synthesised. The perceptions of technique effectiveness were compared between different roles within these smaller teams. The ways in which these techniques were evaluated were also analysed. Risk management issues concerning particular risks described as customer relationship issues were explored in more detail. All of these findings were then reviewed to report on important themes that arose from the work.

The following chapter provides a conclusion for this thesis. It returns to the objectives of this research and reflects on the thesis as a complete work.

Chapter V: Summary and Conclusions

5.1 Summary

This research had a primary aim to investigate some general risk management issues in smaller software project teams. It also had a secondary aim to explore one of those risks more broadly. Specifically, the objectives were to:

1. Determine what project risk management techniques are used in smaller teams and how effective these techniques are.
2. Explore the project risk management issues that relate to relationship issues between customers and suppliers.

For the primary objective, the intention was to investigate what techniques were used and how effective these techniques were in some detail and in a structured way. For the secondary objective, there was an intention to explore these customer relationship issues with a broader scope in the hope that the work would not only provide insights but also suggest areas of particular interest for future research.

For each objective certain issues were selected for study. Each issue was investigated by posing one or two specific research questions. This breakdown of the objectives into issues and then research questions is re-stated as follows.

Research Objective 1

To determine what project risk management techniques are used in smaller teams and how effective these techniques are.

Issue for research	Research question(s)
The risk management practices of smaller teams.	RQ1 What risks are considered important to smaller teams? RQ2 What risk management techniques are used in smaller teams?
The risk management controls these smaller teams use and the extent to which they are perceived as being effective.	RQ3 How effective are these risk management techniques perceived to be?

Research Objective 2

To explore the project risk management issues that relate to relationship issues between customers and suppliers.

Issue for research	Research question(s)
The identification and avoidance of customer - supplier relationship related risks.	RQ4 What is done to identify and avoid risks?
Responses to customer – supplier relationship risks.	RQ5 What risk responses do these practitioners use?
Risk management styles for customer – supplier relationship risks.	RQ6 In the suppliers' estimation, do customers prefer a formal risk management style or a flexible style?
	RQ7 What trends do suppliers perceive there are in the compromises customers are willing to make?

This thesis therefore set out to answer the seven research questions shown on the right of the two lists. Some boundaries were necessarily placed on the scope of the research. Primarily, this research was focused on smaller software teams. For the purposes of this study, software organisations employing more than three but fewer than 30 people were considered to be representative of smaller software teams. In order to avoid certain industries that have inherently high-risk projects this research focused on organisations that developed business or administrative systems only. A wide definition of development was adopted provided that the development included a high degree of novelty. This research focused on the software suppliers (rather than its 'consumers') and within these suppliers it considered the perspectives of people in three different roles – service managers, project managers and developers.

A review of the literature was conducted and reported in Chapter 2. The importance of risk management in software projects was reviewed. The relationship between software project success and the need for both suppliers and customers to have a relationship that involves compromise was explored in the literature. The literature on software project risk management was then considered in terms of whether the size of the project made a difference. The size of the project team was found to be a useful indicator of the size of the project since it provided an approximate measure of the effort required. The dynamic nature of these smaller teams in their socio-technical context was considered. A review of what the literature has to say concerning various stakeholders' perspectives was summarised.

Gaps in the literature were identified. In particular the lack of literature focusing on what risk management practices are actually implemented by practitioners was emphasised. It was pointed out that the academic risk management literature focuses on large projects based on certain assumptions. These assumptions were challenged and the dearth of literature focused on smaller software projects was highlighted. The third significant gap in the literature discussed concerned the importance of the customer-supplier relationship in software project risk management.

A multi-paradigmatic approach to this research on IT practices was considered to be most suitable, as discussed in Chapter 3. Interviews were selected as the appropriate research method given that the objectives were to investigate practices and how effective these practices were perceived to be. A two-phase interview approach was adopted to obtain perspectives from different roles within the organisation as well as to drill down on the specific questions concerning customer relationship related risks.

A list of important risks to be studied was prepared, based on prior literature that had investigated the risk management concerns of project managers experienced in dealing with large projects. One risk was added to this list based on the researcher's extensive experience in the industry. After the research had begun a review of progress was made at an early stage and a further, key risk was added to this list. Thus a list of sixteen risks previously found to be important was compiled.

The study was split into two phases. In the first phase service managers of small software organisations were asked for their perceptions on important risks, the techniques used to address these risks, how effective those techniques were and how they measured effectiveness. Eight organisations were selected to participate in this study for the first phase. To aid the structuring of the interviews a worksheet was developed to lead the participants though some detailed questions on what techniques they used to address each risk and how effective they found those techniques to be.

Four of those eight organisations also participated in the second phase of the study. In the second phase, project managers and developers were asked for their views on important risks, the techniques used to address those risks and how effective they considered those techniques to be. Also in the second phase of the study, four of the

service managers were re-interviewed, this time on their perceptions of customer relationship risk management issues as defined by objective two of this research.

The results of these interviews were reported in Chapter 4. The results were analysed and the findings also discussed. Broadly speaking, the risks that were investigated were considered important. These risks were able to be ranked into groups of relative importance. An analysis of the techniques used to address each risk and the effectiveness of those techniques was presented. A synthesis of the data collected from the interviews concerning customer relationship project risks was presented. Salient points were raised to provide insights and suggest areas of future research. A discussion of all the results was provided which focused on themes that could be drawn out from the research findings.

5.2 Limitations

This research focused on the suppliers' perceptions of their own practices. It did not set out to observe those practices or to establish scientific truths of what those practices were and objectively measure how effective they were. The perceptions of certain roles within the supplier organisations were canvassed. However it did not consider the perceptions of all stakeholders in a software project. In particular the perceptions of customers were not sought. It may be reasonable to expect customers to have different views on these subjects.

The collection of data on the same subject from different roles within the organisation is not the same as triangulation of the results. Triangulation of research data involves using different methods to verify the validity of the data collected. It helps to overcome problems with bias and validity common to using a single method, particularly interviews. Triangulation has become common practice in social research (Blaikie, 1991). The collection of different perspectives on the same subject, as undertaken in this thesis, provides a richer pool of data than if only one perspective had been collected. However consensus of opinion does not constitute validity of data. It only demonstrates a majority viewpoint. For the purposes of this research, perspectives were considered more important than establishing 'truth'. However, future research may wish to compare perspectives with observational data regarding what is done in practice.

When interviewing the service managers on the risks associated with customer relationship issues, it quickly became apparent that the role of the account manager has an important impact in this area. Future research into this specific risk may find it useful to consider the perspectives of account managers.

This research considered the practices and perceptions of personnel in several organisations. This is broader than a case study of only one organisation. By including several organisations that serviced different markets, the findings are not constrained to only the context of one organisation. On the other hand, the number of organisations included in this study is not sufficient to be able to claim generalisable conclusions, and it is likely that the depth of coverage, and the opportunity for triangulation, would be improved if a case study approach had been adopted.

A specific trial run of the interview questions was not conducted as such. Instead, service managers of two organisations were interviewed and then the results reviewed before continuing. This led to the realisation that an additional risk, 'customer relationship issues', needed to be added to the list of important risks. It had been determined at the beginning of the research that a subject in the general domain of the implications for risk management arising from the relationship between suppliers and customers would be explored. However it had not been anticipated that this issue would be identified so clearly and early in the research process as an important risk.

It could be argued that this was fortuitous and a specific pilot of the research questions would have been wise. There is merit in this argument since the second organisation to be interviewed was not specifically asked about the risks related to customer relationship questions during Phase I of the process. Similarly, an additional risk suggested by a project managers was the 'time spent obtaining user requirements'. It could be that other interviewees would concur with this risk had they been prompted. On the other hand, a specific pilot as opposed to the early review would have produced with the same result.

In addition, it should be noted that it was always the intention of this study to explore this area of supplier customer relationships in a way that was guided by the participants. The researcher was aware that this general domain was important. However the specific

viewpoint on it needed to be driven by the participants, not the researcher. For example, the researcher may have expressed it in more narrow terms than simply the risk of 'customer relationship issues'. If that had occurred then useful insights may have been lost. By being sensitive to the general domain, but not expressing the risk in the researcher's terms, it meant that the researcher could pick up and add this as a risk after the early review stage. That way the researcher had justification for defining 'customer relationship issues' as an important risk and also the participants were able to relate to this terminology since it arose from their peers in similar organisations.

This research considered the perspectives of three different roles in these smaller organisations. They were the service managers, the project managers and the senior developers. There is literature available on what risks experienced project managers in larger teams consider to be important. However there is a gap in the literature on what project managers and senior developers in larger teams consider to be important risks. This meant that a direct comparison of the data from this thesis with the literature on large software teams was not possible. This is not so much a limitation of this work perhaps as a shortcoming of the literature. It does however mean that one should be conscious of this discrepancy if trying to make direct comparisons between large and smaller software teams.

Finally, a few of the questions put to the participants were interpreted differently by respondents. On the one hand this led to differing responses, but on the other it meant that a wider range of issues emerged and could be controlled by the researcher. This demonstrates an advantage of the interview method.

5.3 Conclusions

This section revisits the research objectives and considers the results of each research question in turn.

This thesis had two objectives:

1. To investigate what project risk management techniques are used in smaller teams and how effective these techniques are.

2. To explore the project risk management issues that relate to relationships between suppliers and customers.

Within these objectives particular issues were selected for study and these issues were addressed by posing seven research questions.

5.3.1 What risks are considered important to smaller teams?

Fourteen risks were considered important by the smaller software teams studied. The literature suggests fourteen risks that are important to larger software teams. However they are not the same fourteen risks.

The risks considered to be important by the smaller teams studied here were:

- Customer relationship issues
- Continuous requirement changes
- Unclear objectives
- Misunderstood requirements
- Resource usage and performance
- Unrealistic schedules and budgets
- Failure to manage user expectations
- Introduction of new technology
- Failure to gain user involvement
- Staging problems
- Inadequate knowledge/skills
- Lack of effective project methodology
- Gold plating
- Developing wrong software functions

The research reported here began with the fourteen risks that the literature suggested were important to project managers experienced in dealing with large projects. One risk was added to that list from the researcher's industry experience. One more risk was added to that list based on the initial interviews. Thus a total of sixteen potentially important risks were studied in detail.

This research then went on to investigate three different perspectives on importance of these sixteen risks, that is, the perspectives of service managers, project managers and senior developers. The project managers and developers ranked these risks in a slightly different order than the service managers. The risks and their relative importance are shown in the table in Table 5.1 which lists the most important risks grouped at the top and the least important risks grouped at the bottom.

Phase I – service managers perspective	Phase II – project managers and developers perspective
continuous requirement changes	unclear objectives
customer relationship issues	continuous requirement changes
unclear objectives	misunderstood requirements
introduction of new technology	developing the wrong s/w functions
unrealistic schedules and budgets	
failure to gain user involvement	resource usage and performance
	unmanaged user expectations
resource usage and performance	lack of effective PM methodology
unmanaged user expectations	
misunderstood requirements	customer relationship issues
staging problems	unrealistic schedules and budgets
	inadequate knowledge/skills
inadequate knowledge/skills	staging problems
lack of project methodology	
gold plating	introduction of new technology
	failure to gain user involvement
lack of senior mgmt commitment	lack of senior mgmt commitment
developing wrong software functions	gold plating
sub-contracting	sub-contracting

Table 5.1 Importance of risks by roles

The smaller teams that participated in this research for the most part considered that the risks of 'lack of senior management commitment' and 'sub-contracting' were not particularly important. That was because senior management were always involved in significant projects in these organisations, and sub-contracting was generally avoided. These two risks were identified as important to large software teams in the literature, at least from the project managers' perspective. Thus twelve of the risks identified in that literature were also considered to be important in smaller teams.

Risks related to 'staging problems' and 'customer relationship issues' were considered to be important from all three perspectives in the smaller teams studied. These two risks are not identified in the software project management literature as being perceived to be important in large software projects. The service managers in this research considered

the risks related to ‘customer relationship issues’ to be of pre-eminent importance. They explained that ‘customer relationship issues’ had the potential to supersede all other risks and possibly cause a project to be considered a failure regardless of other risks. (This finding on ‘customer relationship issues’ drove the final design of later research questions into that specific risk.)

5.3.2 What risk management techniques are used in smaller teams?

The risk management techniques used by the organisations studied were collected and are listed in this thesis. It is difficult, and in fact inappropriate, to seek consensus on the techniques used for each risk. This is because there may be significant and justifiable variation in the practices employed within these smaller organisations. For example, the results for the treatment of the risk of ‘resource usage and performance’ illustrated that different organisations can have markedly different practices.

One reason that the techniques used vary from organisation to organisation is because they may be tailored to the specific context and the specific nature of the risks encountered. Hence for any given risk, a technique used in one organisation may not be appropriate for another organisation. Industry standard project management methodologies are generally not used in these organisations. Even when they are used, they are problematic and not entirely effective. These smaller organisations tended to have developed their own methodologies from their own experience, an ongoing process believed to be appropriate and effective by these organisations.

The most notable exception to this general principle was with the handling of ‘unclear objectives’. In that case, standard industry practices were the norm. There was also a significant degree of commonality in the way that risks associated with ‘continuous requirement changes’ were dealt with. One generalisation that can be drawn in regard to this risk is that the techniques tended to all rely on some form of user involvement and/or interaction during the development process.

The participants explained that a strategic advantage that these smaller teams have is their ability to be flexible. Thus the techniques adopted needed to have low compliance requirements and applied selectively. The results also suggest there is value in having multiple techniques to address risks. For example, there seems to be potential for

improvements in how the risk of 'unrealistic schedules and budgets' is controlled. The use of more than one technique to address such a risk may have advantages.

5.3.3 How effective are these risk management techniques perceived to be?

The main trend identified when considering the effectiveness of techniques by roles was that project managers were more likely to describe more techniques per risk but they were also more likely to rate techniques as being less effective than their counterparts.

The results suggest that the project managers were not coy in criticising the risk management techniques they used. This willingness to describe their techniques in less flattering terms suggests that they were not concerned with appearing to have more effective techniques than they believed they used. It also suggests that:

a) the consequences of instances where risk management techniques are less effective fall primarily to the project managers,

and/or

b) the project managers worry more about the consequences of risks to projects than the service managers and the developers.

Developing the wrong software functions: The service managers considered that there were few effective techniques to address this risk. They also considered this to be one of the least important risks. The project managers and senior developers listed several highly effective techniques to address this risk.

Sub-contracting: The organisations studied felt this risk was important, but they also believed they managed it very effectively. Those that described this risk as not worth controlling generally avoided sub-contracting, which could be described as a risk avoidance technique.

Lack of senior management commitment: Generally the risk of 'lack of senior management commitment' did not exist in these smaller organisations since their senior management made it a policy to be involved in any significant project, thus acknowledging and avoiding this risk. What these organisations found more challenging was the risk of lack of senior management involvement on behalf of the customer.

Gold plating: There was general agreement that this risk was one associated with new and less experienced developers. With guidance and monitoring from senior developers this risk diminished over time as the experience of the junior developers increased. However there did not seem to be a consensus on how to determine if the techniques used to control this risk were effective.

Misunderstood requirements: The criteria used to measure this risk was generally either customer feedback, formal sign off or both. These are quality criteria because they relate directly to the risk being controlled. The service managers considered the techniques to address this risk as highly effective. However the project managers and developers rated those same techniques in less flattering terms with varying degrees of effectiveness.

Failure to gain user involvement: The risks associated with 'failure to gain user involvement' were recognised and generally perceived to be effectively controlled, typically through customer feedback. One common theme in the effective techniques used was to identify one or more champions or key stakeholders within the customer organisation and to keep these key personnel involved in the project.

Staging problems : For the most part each organisation had one or two techniques to address this risk. Separate development, testing and in particular User Acceptance Testing (UAT) environments is a key factor in controlling this risk. UAT is also a useful way to measure the effectiveness of other techniques such as version control. The participants gave mixed results for the effectiveness of the techniques used to control this risk.

Inadequate knowledge/skills: the techniques used to control this risk within the supplier organisation showed considerable variation although they were generally considered to be effective. This may reflect that the knowledge and/or skills required are very specific to the projects being undertaken. Interestingly some used were targeted at dealing with a lack of knowledge and/or skills in the customer organisation. Yet the responsibility for training users was owned by the customer organisation. This appeared to be an important concern for several of the organisations studied.

Resource usage and performance: There were markedly different practices for the treatment of the risk of 'resource usage and performance'. The participants also reported a mixture of effectiveness rating for those techniques.

Failure to manage end user expectations: In general the techniques dealing with this risk all rely on some form of user involvement and/or interaction during the software development stage. The service managers and the developers considered the techniques used to be effective. However the project managers tended to disagree with these perceptions of effectiveness.

Introduction of new technology: The techniques described to control 'introduction of new technology' can be summed up as being able to be categorised as either training, assessment or testing. No organisation reported using all three types of techniques which suggests that they may be able to learn from each other how to deal with this risk more comprehensively. The participants had mixed views of the effectiveness of their techniques for this risk.

Unrealistic schedules and budgets: There seems to be potential for improvements in how the risk of 'unrealistic schedules and budgets' is controlled. In terms of efficacy it seems that most techniques and most organisations studied manage to control this risk. Yet, fewer than half the techniques used were rated as 'mostly' or 'always' effective. Since this is an important risk, these results indicate room for improvement.

Unclear scope/objectives: In general there was reported more breadth and quality of techniques to address the risk of 'unclear scope/objectives' than similarly important risks. This risk was far more likely to have more than one technique to control it, even though the techniques used were also generally considered more effective. Put simply this risk was considered important and was also well controlled.

Continuous requirement changes: Every organisation had at least one technique to address the risk of continuous requirement changes, reflecting its relative importance. The techniques that were said to be almost always effective were progress meetings with the customer and the use of a formal change process. Issue tracking and release management were also considered mostly effective. There was variation but general consensus was that using a formal change control process which involved the customer

was an effective technique to control this risk. While it was not considered to be a panacea to resolving this issue no other technique used was as effective.

Customer relationship issues: The participants reported that this risk superseded all others. They explained that if these issues were not dealt with effectively then it could undermine the whole project. This risk was so important that it seems the organisations found it imperative to have a technique that was highly effective to control it.

5.3.4 What is done to identify and avoid customer-supplier relationship related risks?

In terms of identifying customer-supplier relationship risks the need to build and maintain a sense of mutual trust was repeatedly mentioned. The early detection of such risks was considered of particular importance. It was thought that formal approaches to risk management tended to identify such risks earlier. However, many of the risks that fall into this category could only be identified by informal approaches, such as chatting to the customer over a coffee. Thus both formal and informal channels needed attention in regard to the relationship.

The suppliers believed that they put considerable effort into maintaining a good working relationship with their customers so as to avoid these risks. This was conducted at multiple levels of the supplier organisation but it was key to the role of the account manager. The importance of preventing these sorts of risks from escalating was stressed by the participants.

5.3.5 What risk responses do these practitioners use to address customer-supplier relationship related risks?

Organisational response to these risks was seen as necessitating a tailored solution to each situation. The initial step typically involved an internal discussion within the supplier organisation, usually involving senior management. Consistent with the findings related to the identification of such risks, it was suggested that some issues could then be addressed through formal project management processes and that others were better addressed informally with the customer.

It was reported that such issues could easily escalate quickly. When a serious customer relationship issue had escalated the suppliers believed that they put in considerable additional effort to restore the project. In spite of this, in certain instances, suppliers had found it impossible to resolve such issues which resulted in failed projects. In some cases suppliers had eventually accepted that the project had failed and that they could not repair the relationship with that customer.

5.3.6 In the suppliers' estimation, do customers prefer a formal risk management style or a flexible style?

When reflecting on the style of risk management that they thought customers preferred the participants provided significantly different responses depending on the market that they serviced. The ERP vendors perceived their customers to have a very low level of maturity in relation to risk management. In contrast, the niche software vendors perceived their customers to have a greater appreciation and understanding of risk management.

The ERP vendors explained that many of their clients, particularly owner operators, did not want to invest in the formal project management component of the services offered, and that they were risk averse. On the other hand, the niche software vendors described their customers as being flexible. They preferred a majority of each project to be given a fixed price for a fixed requirement, with some agreed contingency for changes in functionality or delivery date. In those niche markets compromises may be made by both the customer and the supplier in order to achieve a successful project outcome for both parties.

5.3.7 What trends do suppliers perceive there are in the compromises customers are willing to make?

The perceptions of the ERP software suppliers and the niche software suppliers were strongly contrasting when considering trends in the willingness of customers to make compromises. Both ERP software suppliers interviewed stated that their customers were generally unwilling to make any tradeoffs and their preference was for less risk management, not more. The niche software providers on the other hand considered that their customers had become more willing to make trade-offs between

time/requirements/cost. In addition the niche suppliers discussed an increased awareness of the need for risk management practices among their customers. The niche providers felt they were in a partnership with their customers to overcome problems and achieve successful project outcomes.

5.4 Implications for practice

Practitioners involved in software project management in smaller organisations may have relatively few opportunities to discuss project risk management issues and share their experiences with their peers. This is partly because the subject is difficult to discuss without disclosing commercially sensitive information, and partly because of the lack or absence of a collegial context within their organisation (that may be found in larger groups). These practitioners therefore may find some useful insights in the outcomes of this research.

Smaller software teams may wish to consider the sixteen risks discussed in this research and how applicable these risks would be to their individual organisation. The practitioners that were part of this study were used to considering the performance of their project management practices. However, for the most part, they had not *systematically* analysed their practices from a risk importance point of view. Their practices had generally evolved from ongoing experience but these practices had not been evaluated on a risk by risk basis. Similar teams may find such an analytical exercise very useful to gain insights into how well their practices are addressing the risks that their projects face.

Service managers may need to do more to raise the awareness of the importance of risks associated with ‘customer relationship issues’ within their own organisations. The service managers that participated in this research perceived risks related to ‘customer relationship issues’ as having the potential to supersede all other risks. Although the project managers and senior developers agreed that this was a very important risk they generally did not exhibit the same level of awareness of its potential impact, on individual projects but also on the organisation as a whole.

Project managers may find it useful to know that ‘gold plating’ was a risk associated with new or junior developers only. If junior developers are present on a project then project managers might be wise to explicitly include techniques to address ‘gold plating’ (e.g. careful mentoring) on that project.

Service managers may find that the techniques used to control ‘misunderstood requirements’ are not as effective as they perceive them to be. The project managers and developers in this study considered the techniques used for this risk as significantly less effective than the service managers.

This thesis supports the view expressed in the literature that it is important to identify and involve one or more key stakeholders or champions within the customer organisation in order to address risks associated with ‘failure to gain user involvement’. Practitioners may also be able to more effectively control risks associated with ‘introduction of new technology’ if their techniques include all three dimensions of training, assessment and testing. No organisation in this study reported using all three forms of support. The results suggest that they would be more effective if they included all three facets in their techniques.

The results of this research also indicate that there may be room for improvement in these organisations when dealing with ‘unrealistic schedules and budgets’. (However it was beyond the scope of this thesis to determine how those improvements may be made.) Practitioners may also find it helpful to be made aware of reported techniques considered to be effective for addressing the risk of ‘continuous requirement changes’. The techniques that were said to be almost always effective were progress meetings with the customer and the use of a formal change process which involved the customer.

At a general level, practitioners could consider the advantages of having multiple techniques to address the project risks they face. The results from this research were presented as a risk management portfolio for each organisation. A graph showing each risk, the number of techniques used to address it and how effective each technique was provided a snapshot for analysis that could form the basis of practice improvement. Other practitioners may find this a useful exercise so that they can more readily gain insights into how effective their practices are perceived to be.

5.5 Future research

5.5.1 Specific risks suggested for future research

Three risks stood out as areas where future research might be most fruitful. They were: customer relationship issues, introduction of new technology and unrealistic schedules and budgets. Given their perceived importance, customer relationship issues are discussed in the following sub-section.

The results suggest that a high-quality set of controls for the risk of 'introduction of new technology' would include training, assessment and testing. Further research would be required to substantiate this claim for two reasons;

a) the specific detailed risks and level of risk posed by the introduction of new technology may vary widely between organisations, organisational contexts or even between projects
b) a wider study with more participants would be required to be able to draw out conclusions that may generalised across (segments of) the industry.

If these three aspects of support (training, assessment and testing) were demonstrated to constitute a high-quality set of controls for the 'introduction of new technology' then practitioners may benefit from this knowledge. In this research none of the organisations included all three aspects in their techniques. Hence this may be one risk where researchers can offer practitioners some basic principles that their risk management techniques should include.

There seems to be potential for improvements in how the risk of **'**unrealistic schedules and budgets' is controlled. Three out of the eight organisations studied here used no technique, or used a technique to little effect (as the risk often still occurred). Since this is seen to be an important risk by the organisations studied it would be an interesting topic of future research to verify how important this risk is considered and how effectively it is controlled by a wider section of the industry.

It is the researcher's submission that research can contribute to the improvement of practices in this area without providing detailed prescribed solutions. More flexible general principles based on what other practitioners have found to be effective are arguably more likely to result in improvements being adopted by the industry.

5.5.2 Customer relationship issues

As the study progressed it quickly became apparent that the risk that most concerned these smaller teams was 'customer relationship issues'. In their view this risk had the potential to supersede all the other risks. In other words, if a customer relationship issue was not addressed and it therefore escalated beyond control, then the project may be considered a failure by all parties even if the project technically delivered everything agreed to.

This finding is not evident in the project management literature. It is considered in some depth, however, in the business change literature. Software projects by their nature tend to involve varying amounts of business change. The two are inexorably linked together, since business change drives software requirements and software functionality binds business processes. Hence there is a significant gap in the software project literature in terms of researching customer relationship issues as they relate to software project management in general and project risk management in particular.

This study conducted some exploratory research into this area. The results suggest that, for smaller organisations at least, there is a significant link between business risk and project risk. The customer's business environment appears to have a large impact on the project risks and how those project risks are managed. In some markets customers seem to be risk averse and seek commoditised software solutions. In other markets customers are seen to have a mature understanding of software risks and the value of customised software solutions. In these latter cases, the customers and suppliers seem to be more likely to take a partnership approach to overcoming problems and ensuring a project outcome that both parties can call a success.

There is much more that can be learned from practitioners in this important domain. For example, the perceptions of customers' project risk management and relationship issues could be explored. The role that account managers and those in the supplier organisation play in this area may also provide some useful insights. More research could be conducted on how these customer relationship issues can be identified, avoided, evaluated, and addressed. These aspects have only been lightly touched on in this work.

Of particular interest to the researcher would be to gain greater insight into how and why suppliers and customers develop and maintain a partnership approach to managing customer relationship related risks.

A more holistic approach to risk management in these smaller teams is proposed. This research provides empirical evidence that, in these smaller teams, the links between project success and business success are more direct. This also raises the issue that it can be difficult to make the distinction between what is a project risk and what is a business risk. It is submitted that research into standard project risk management approaches may need to be combined with business risk management approaches to gain a full understanding of the risks faced and addressed by these smaller teams.

Glossary

ACM	The Association for Computing Machinery, or ACM, was founded in 1947 as the world's first scientific and educational computing society.
ANSI	The American National Standards Institute or ANSI is a private nonprofit organization that oversees the development of voluntary consensus standards for products, services, processes, systems, and personnel in the United States. The organization also coordinates U.S. standards with international standards so that American products can be used worldwide.
Artificial intelligence	Information system/s that enable machines to reason and make rational choices in a human-like capability.
Beta Program	A pre-release testing programme
CEO	Chief executive officer
CFO	Chief financial officer
CIO	Chief Information (Technology) Officer
CMM	Capability Maturity Model: A standard model to rate the quality and capabilities of software development teams.
Commoditised	Developed as a commercial product package
CRM	Customer Relationship Management
DEV	(Senior) Developer
ERP	Enterprise Resource Planning systems (ERPs) integrate (or attempt to integrate) all data and processes of an organization into a unified system.
Functionality	In information technology, functionality (from Latin *functio* meaning "to perform") is the sum or any aspect of what a product, such as a software application or computing device, can do for a user.
Granulation	The act of forming something into granules or grains; "the granulation of medicines". Used metaphorically.
H/W	Hardware
Hardware	Physical computer and telecommunications equipment
ICT	Information and communication technology
IEEE	Institute of Electrical and Electronic Engineers
IS	Information Services
IT	Information technology
Interface	Meeting or communicating between two or more parties, devices or agencies
Interpretivist	Interpretivism rests upon idealism. *Idealism* holds the view that the world is the creation of mind; the world is *interpreted* through the mind; e.g., classificatory schemes (such as the classificatory scheme of species into mammals, insects, birds, etc., or of the human population into caucasians, negroids and mongoloids). Given this, we cannot know the 'true' nature of the object world, separate from our perception of it.
K	thousand (dollars)
Operationalise	Implement a process into an organisation so that it becomes

	embedded into the way that organisation operates.
PM	Project manager (role)
PMI	The Project Management Institute (PMI), incorporated in 1969, in the USA. It has published a number of standards related to project management, and manages several levels of project management certification. As of 2006, PMI reported over 220,010 members and over 180,000 PMP certificants in 175 countries. Over 44,000 PMP certifications expire annually; a PMP must document ongoing project management experience and education every three years to keep his or her certification current. There are more than 250 local PMI chapters located in 67 countries, and 30 Specific Interest Groups (SIGs).
PMBOK	Project Management Body of Knowledge (from the Project Management Institute) The standard Project Management Body of Knowledge (PMBOK) guide, currently in its third edition, is the only ANSI standard for project management. This standard is used by the PMI as a base to certify project management professionals.
Positivist	A philosophic system holding that speculation on ultimate causes or origins is futile and therefore focussed on positive facts and developments i.e. someone who emphasizes observable facts and excludes metaphysical speculation about origins or ultimate causes.
Prince 2 Methodology	(**PR**ojects **IN C**ontrolled **E**nvironments **2**) A product-based approach for project management that provides an easily tailored and scalable method for managing IT and other business projects. A PRINCE 2 project is defined by its business case, which is regularly reviewed during a project under the assumption that business objectives may well change during the product lifecycle. PRINCE 2 represents the latest version of a project management standard developed by the United Kingdom's CCTA in 1989. Widely used in Europe, it has gained popularity in the U.S.
Project	A project is a temporary endeavour undertaken to create a unique product or service. Temporary means that the project has an end date. Unique means that the project's end result is different than the results of other functions of the organization.
Project management	Project Management is the discipline of organizing and managing resources (e.g. people) in such a way that the project is completed within defined scope, quality, time and cost constraints.
QA	Quality Assurance
Risk	In this thesis used as synonym of ‘project risk’. Something that threatens the success of a project
Risk management	An organized assessment and alleviation or avoidance of project risks
Risk (response) control	Responding to changes in risk during a project.
Risk response development	Developing a plan of action to enhance opportunities and decrease threats.
Risk Technique	Used in this thesis in a broad sense to mean virtually any response to a risk.

SEI	Software Engineering Institute. A division of Carnegie Mellon. Funded by the USA government as a development center conducting software engineering research in acquisition, architecture and product lines, process improvement and performance measurement, security and system interoperability and dependability. Particularly for software servicing the defense industry.
SM	Service Manager (role)
S/W	Software
Software	Documentation, documents, language and vector devices/products that enables programs and systems to operate on digital electronic computers
UAT	User Acceptance Testing

Appendix A: Phase I Structured Interview Worksheet

The following pages show the template for the worksheet that was filled in with the service managers as they were being interviewed in Phase I of this research.

Discussion Questions

Code: Date:

Note: That a software project includes all activity required to reach sign-off in a User Test Environment or an equivalent stage.

1. Select the option that best describes the software projects the organisation does:
   - Small/medium Organisation focuses on new application development……. ☐
   - Small/medium Organisation which customises standard packages…….. ☐
   - A large IT operation / department with a small application development unit…….. ☐
   - Other – please specify……... ☐

2. Approximately how many software development projects does the organisation initiate in a year?

3. Does the organisation or parent organisation perform a large number of other IT projects? [yes / no] Circle one.

4. Experience of Project Manager responsible for software development projects.
   - Less than 2 years project management experience……. ☐
   - Between 2 and 5 years project management experience…… ☐
   - More than 5 years project management experience. …….. ☐

5. Describe the novelty of software development projects that the organisation initiates. Include the degree of novelty as well as the source of novelty.

• For example: How often do projects involve a task that no one in the team has done before? Is the task new to the organisation? • For example: Are novel tasks typically a small step from existing knowledge? What impact do novel tasks have on the organisation?

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs	**How is it determined if each technique in use is being effective? How is the technique evaluated?**
Unclear or misunderstood scope / objectives.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
Misunderstan-ding the requirements	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
Unrealistic schedules and budgets.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs	**How is it determined if each technique in use is being effective? How is the technique evaluated?**
Failure to gain user involvement.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐	
Inadequate knowledge / skills	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐	
Lack of effective project management methodology	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐	

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs	**How is it determined if each technique in use is being effective? How is the technique evaluated?**
Lack of senior management commitment to the project.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐	
Gold Plating	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐	
Continuous requirement changes	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐	

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs	**How is it determined if each technique in use is being effective? How is the technique evaluated?**
Developing the wrong software functions.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
Sub-contracting	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
Resource usage and performance.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs	**How is it determined if each technique in use is being effective? How is the technique evaluated?**
Introduction of new technology	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
Failure to manage end user expectations.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
Staging problems. *(Implementing developed software into Test environment)*	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs	**How is it determined if each technique in use is being effective? How is the technique evaluated?**
Customer relationship issues.	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
[other] – please specify	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	
[other] – please specify	Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling. ☐		☐ ☐ ☐ ☐	

Appendix B: Sample Demographic Data Collected

Organisation	Project Type	No Projects	Other IT?	PM experience	Novelty
1	new	4	no	>5	high
2	new	25	no	>5	30-50%
3	custom	202	no	>5	60-75%
4	custom	25	yes	>2	high
5	new	100	no	>5	some
6	custom	55	yes	>5	20-30%
7	new	20	no	>5	50%
8	new	25	yes	>5	some

Appendix C: Phase I Results

The following pages show an example of a partially completed worksheet with the responses from Phase I questions. Note that columns for the measurements of effectiveness have been truncated off this example for clarity.

This example is also the same format of the worksheets that were provided for Phase II interviews where different perspectives from project managers and senior developers were collected.

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs
Unclear or misunderstood scope / objectives.	Worth controlling and a technique is used. ☐ →	1. Large Project – scope study incl. interviews/methodology of client to inform client of risks and sign off. This step 10 – 20% of value of project. If customer can't work this way we walk away.	☐ ☐ ☐ ☐
	Worth controlling but a technique is often not used. ☐	2. Small project – work statement .	☐ ☐ ☐ ☐
	Usually not worth controlling. ☐		☐ ☐ ☐ ☐
Misunderstan-ding the requirements	Worth controlling and a technique is used. ☐ →	Business Requirement Review documentation and sign off.	☐ ☐ ☐ ☐
	Worth controlling but a technique is often not used. ☐		☐ ☐ ☐ ☐
	Usually not worth controlling. ☐		☐ ☐ ☐ ☐
Unrealistic schedules and budgets.	Worth controlling and a technique is used. ☐ →	1. <u>Regular</u> Project Reporting – metrics of progress on weekly basis.	☐ ☐ ☐ ☐
	Worth controlling but a technique is often not used. ☐	2. Honesty/Realism in predicting effort required. The appropriate company culture is required to allow this to happen.	☐ ☐ ☐ ☐
	Usually not worth controlling. ☐		☐ ☐ ☐ ☐

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs
Failure to gain user involvement.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	Note: considered not very significant except for opinion leaders. Locate a champion and opinion leaders and include them into the project team.	☐ ☐ ☐ ☐
Inadequate knowledge / skills	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	[Problem with client: May draw to the attention of the client's project sponsor]	☐ ☐ ☐ ☐
Lack of effective project management methodology	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	[Problem can be lack of adherence to methodology] Use methodology.	☐ ☐ ☐ ☐

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs
Lack of senior management commitment to the project.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	1. Person overseeing project manager works on relationship with client at highest level. 2. Senior management ability to contribute to the project identifies real business drivers in goals/objectives session.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Gold Plating	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	Identify Gold Plating and determine if it has additional value – turn risk into opportunity. Reporting systems vs. budget. Project charter – "continuous improvement" for future phases.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Continuous requirement changes	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	Formal Variation Request procedure.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs
Developing the wrong software functions.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐
Sub-contracting	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	Do not sub contract if possible.	☐ ☐ ☐ ☐
Resource usage and performance.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	1. Resource planning incl. 3 meetings per week tracked on intranet. 2. Performance reviews as needed. 3. May have to pull people off projects due to stress 4. Training program plan aligned with skills needed.	☐ ☐ ☐ ☐

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one]			
			Always effective	Mostly effective	Satisfac-tory	Often, risk still occurs
Introduction of new technology	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	[Note: Lack of integration] IT review included in business requirements.	☐	☐	☐	☐
Failure to manage end user expectations.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐	☐	☐	☐
Staging problems. *(Implementing developed software into Test environment)*	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	1. User acceptance testing. 2. Check in check out version control. Development/test/User Acceptance environment.	☐	☐	☐	☐

Risk	**Importance.** Is the risk important enough to spend the time to use a risk management technique? [tick one]	**Techniques used to control each risk.** List any techniques that are regularly used to control this risk.	**How effective is each technique to control this risk.** [tick one] Always effective / Mostly effective / Satisfac-tory / Often, risk still occurs
Customer relationship issues.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.	1. Communication at all levels including informal. 2. Invest in extra effort beyond what was contracted in order to improve customer relationship.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Consistency of project manager style.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
Didn't deliver the business benefits.	☐ Worth controlling and a technique is used. ☐ Worth controlling but a technique is often not used. ☐ Usually not worth controlling.		☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Appendix D: Phase II Results

Variation in techniques used

- 'unclear or misunderstood objectives' PM: technique does not include the project plan, as suggested by the service manager.
- 'Misunderstanding requirements' Dev: identified area not addressed by the technique of requirement docs – i.e. in some cases a 3rd party does the requirements which may not be peer reviewed and may be poorly done.
- 'Misunderstanding the requirements' SM: Not worth controlling, PM: worth controlling and use technique of; communication plan – esp. who to discuss clarification with → also useful as a historical resource (however only Satisfactorily effective).
- Dev pointed out several times that things are effective when they are followed. He also pointed out problems with implementing techniques such as lack of time, introduction of new people, problems identifying key stakeholders, etc.
- Dev: Considered that work was directed not allocated by consultation as inferred by service manager.
- 'Unrealistic schedules and budgets' – SM: Worth controlling but a technique often not used. PM: Worth controlling and use technique of; good estimations and historical estimations (mostly effective)
- Unrealistic schedules, regular reporting PM: Always effective if actually done.
- Unrealistic schedules, realism in predicting effort PM: not always done.
- 'Failure to gain user involvement' SM: Not worth controlling, PM: Worth controlling and use technique of; nominate internal "user", Dev: 4/5 day cycle build.
- Failure to gain user involvement SM: locate a champion and opinion leaders into the project team. PM: not always done.
- 'Inadequate knowledge/skills' SM: usually not worth controlling PM: worth controlling and use technique of; upskilling/education – regular reviews (always effective) + Dev: (a) senior developer involvement (Satisfactory) (b) reviews / training (mostly)
- 'lack of effective PM methodology': PM noted that they use their own methodology which they consider to be effective. Potentially this raises the issue of consistency of project management.
- Lack of effective PM methodology: technique training in PM: PM pointed out that only one person has been trained + Dev also pointed this out.
- Lack of effective PM methodology: roles: PM pointed out only recently introduced.
- Lack of effective PM methodology: roles: PM pointed out there is not a consistent methodology + Dev also pointed this out.
- Gold plating SM: not worth it, PM stated used code reviews
- Continuous requirement changes Pm pointed out that release manager just appointed. + Dev: noted that release management listed included a policy to early release / often. Dev noted prototypes always effective when used and that key people need to view the prototype.

- Introduction of new technology: Service manager: worth controlling but no technique used, PM: actually use 2 techniques; (a) proof of concept sometimes (mostly effective) (b) peer review sometimes (mostly effective)
- Introduction of new technology PM added 1 more technique; product architect/lead developer assessment. + Dev pointed out that may use technology not quite ready yet or is not best fit for product.
- 'Staging problems' - use separate dev and UAT environments: Dev pointed out flaw in technique where UAT environment not always same as production environment.
- Staging problems, use of version control, PM said only used for the main product.
- 'Customer relationship issues' – multilevel communication: Dev pointed out that developer and customer do not always have direct communication.
- Customer relationship issues: SM: worth controlling but no technique used PM: may change with new appointment of project manager.
- Dev wrong s/w functions. SM: not worth it. PM: worth it and use technique of scope & design document (mostly)
- Resource usage. SM listed 4 techniques but PM added another 3 techniques of; (a) project planning resource allocation (b) monitoring of plan & distributed and reported (c) weekly project report.
- Failure to manage end user expectations SM: worth controlling but technique not used. PM: scope/design documents (mostly)

In 13 out of 16 risks the project managers and developers either considered a risk worth controlling and described a technique used or else added additional techniques to those already described by the service manager. Partly this is due to the research process used, since the project managers and the developers where provided with the list of techniques described by the service managers. Whereas the service managers were given a 'clean sheet' to describe the risk management techniques used. This effectively placed the project managers and developers into the position of being able to critique and elaborate on the original list of techniques provided by the service manager.
There is also the aspect that the project managers and developers perform tasks to control these risks on a day to day basis and thus they are more likely to provide a comprehensive list when queried.
There may also be the situation where certain process are working so well that they address a specific risk to the point where the service manager is not conscious of the specific technique[s] being performed by their project managers and developers.

In one case a project manager disagreed that a particular document addressed the specific risk being discussed. However in general project managers and developers added to the repertoire of techniques rather than deleted them from the list.
In some cases, notably 'unrealistic schedules and budgets' and 'lack of effective project management methodology' the project manager clearly disagreed with the service manager. The project manager was able to clearly describe certain techniques which address these areas. This discrepancy is perhaps because these areas are more central to the project managers role than the service manager.

Developers sometimes pointed out areas or situations not addressed by the technique. This may indicate they are more aware of the exceptions which are not well covered by the standard technique. Developers pointed out several times that things are effective when they are followed. Sometimes they also pointed out problems with implementing techniques such as lack of time, introduction of new people, problems identifying key stakeholders, and such practical issues with implementing the technique.

Appendix E: Customer Relationship Risk Management - Service Manager Responses

Exploring customer relationship risk management issues

1. A multiple level contact approach is used to manage customer relationship issues which threaten project success. What other things to you do to keep a positive customer relationship and to identify any emerging challenges?
2. When these interactions occur, what do you and your colleagues do/say to draw out/discover issues?
3. How do you/your company respond?
4. What do you think customers prefer and/or think about formal risk management controls versus flexibility? (*Note: this question focuses on the style of the project management methodology that is adopted).*
5. Have attitudes of clients changed over the last 10 years in respect of trade offs between time/requirements/money and how to resolve these issues once the project is underway? *(Note this question is probably best answered by considering specific situations because it suggests the approach taken when things head off track).*

Results

Question 1: A multiple level contact approach is used to manage customer relationship issues which threaten project success. What other things to you do to keep a positive customer relationship and to identify any emerging challenges?

Organisation 1

Regular communication/mtgs/phone calls.
Informal interaction – establish report / camaraderie

- Establish teamwork
- "working for them"
- Taken aside for a "coffee"

Identify sooner rather than later.
Avoid surprises
Makes it comfortable to bring up issues and deal with awkward situations
Project T-shirts / parties / project communications – doesn't happen in NZ

Upfront about challenges of projects – isn't going to be easy.
(after project)
Dinners
Establish overtime policy and expenses [at customer end]

Organisation 2

Context:

CRM - account manager maintains interest throughout project
- development team not involved until functional spec already understood

Issues

Distance - off shore

- Physical distance
- Developer – customer communication goes through one channel – account manager
- Typically development team do not have on-going relationship with customer.
- Language barriers sometimes
  - Results in time consuming and ambiguous
  - Lack of appreciation for problems

Core product

- Extend life of product
- Improve fit
- Ongoing maintenance

Separation of control

Development team independent of financial agreements but not sheltered from the elapsed time constraints.

Answer to question:

On rare occasions send person to assist deployment.

Organisation 3

- Account manager
  - Develops personal relationship, depth and trust in customer relationship
  - Becomes trusted advisor
- 4 people from supplier have teleconference to compare notes.

- Social chats with customers – over coffee etc.
- Information from partner organisations also working with customer organisation.

Organisation 4

Channel manager

Project team between supplier and reseller
Larger projects have supplier and reseller and end customer
Also larger projects have involvement of supplier customer services mgmt.

Usually informal involvement – reactive. The problem is that problems are identified later than formal approach.

"Pick up phone"

Helpdesk calls – escalate to development team.
Channel manager

Fortnightly meetings support team and product experts / QA/ development BA

Beta programs → direct to development

Quarterly mtg of top 7/8 resellers to identify issues.

Question 2: When these interactions occur, what do you and your colleagues do/say to draw out/discover issues?

Organisation 1

Depends on experience to know what questions to ask
Open ended questions.
"How do you feel the project is going?"

Business Issues	**Project Issues**
Business analysis interviews	
Issue log	
Issue form	

Transfer ownership to client: "Our system"
If they talk about "your system" then bad sign.
Inattentive or don't turn up – bad sign
Get a feeling – from non-verbal / snide remarks / conflict / disrespect

Organisation 2

Refer to context explanation in question 1.

On rare occasions send someone to assist deployment and establish design for 2nd phase.

Organisation 3

Find out about an issue from different levels of the organisation – different view points. Weighting depends on the source's knowledge of the business and knowledge of the project.
Hopefully reset expectations at the source.
E.g. project may be dependant on a key person who is incompetent so supplier highlighted this work has not been done and is a dependency and customer organisation sidetracked that person.

Organisation 4

Rely on channel mgr to test the water.

Development team
Sometimes don't want to drill into unrealistic expectations. E.g. delivery time frames.

Constant communication on what dev are doing and when.

Send development person on site to do training and presentation and discovered key user was over worked. Then involved reseller to work with customer mgmt to address overloaded worker.

Question 3: How do you/your company respond [once an issue has been identified]?

Organisation 1

Have written letter / project report

- To the person who is doing something wrong
- Or highlight people who are under too much stress

Sometimes informal

Sometimes nepotism - didn't deal with it.
Jerk / lieing /abusive – didn't deal with it.

- Consultant
- New team

Lost business

There are times when walk away from business.

Minor issues → put into formal PM context.

Organisation 2

Delivery time gets extended or some rework. Product team/customer dialogue.
Pressure to deliver increases

- May work overtime
- Chain of redefinition

Creates conflicting demands for different projects.

Project Mgr [was not a formal role previously] → customer relationship is new.
This role will not always be assigned.

Growth - number of projects
- increasing complexity
- need for additional focus on individual projects

Organisation 3

Internal

1. Discuss issues that are project threats
    a. Regular project meetings
    b. Informal discussions around the office.
2. Decide action → try to provide customer with options
3. Discuss how to deal with the issue with the customer. May push back the business consequences onto the customer. Provide options and often make recommendation and try to explain issues that come with options.

Organisation 4

For example:

- Bent over backwards to try to accommodate wishes of customer
- Webcasts to who progress
- For big projects send people out to define requirements on site and do more iterations "showing the journey rather then getting the result"

Question 4: What do you think customers prefer and/or think about formal risk management controls versus flexibility?

Organisation 1

Customers don't "get" formal risk management.
Not taken seriously – customers don't want to pay to do Risk Management
Worry about it when it happens attitude in customers.

Flexibility – customers love it but….

- Not flexible with date
- Not flexible with $$
- Customers usually don't want to give up functionality.
- Sometimes supplier has to "give away" functionality.

Business level spec. – developer works out how to deliver
BUT – creates a lot of work
HOWEVER – good staff provide "smarter" applications.

Can be more upfront with business owners of private companies about contingency budgets.

Organisation 2

- Flexibility of development service is strong point.
- Fixed price
    - Removes financial risk
    - Primary risk is delivery date
- May have iterative prototype environment. Send regular "build" into test environment but have issues:
    - User interface
    - Environment
    - Functionality change / clarification

Organisation 3

Generally prefer requirement spec. with some contingency.

Don't have a formal register except at the instigation of customer and there will be at an extra cost to customer.

Organisation 4

Many owner operators don't want to invest in formal project mgmt component. The socio-economic level of market makes this difficult to sell.

Some resellers selective about who they will deal with. Also try to target good fit.

Comprehensive packages so customers expect more and expect less risk and less need less customisation and more…

But same variety people do changes.

Customers take on responsibility but don't resource it. Therefore supplier has to do it and costs increase.

Question 5: Have attitudes of clients changed over the last 10 years in respect of trade offs between time/requirements/money and how to resolve these issues once the project is underway?

Organisation 1

Fixed component	50%
Discretionary	35%

	15%

Spending less / expecting more.

S/w project disasters hit mainstream media has resulted in less trust in customer / supplier.

→ Changed from RFP – decide requirements during sales process and supplier does requirements analysis.

Expectation that s/w is easy now but 10 years ago didn't know if it was easy or hard.

→ trend is <u>less</u> risk management not more.

Customers less value add therefore have less margin.
Manufacturing - analytical
Distributors – not so.

Tendency to avoid customisations if forced to pay costs.

Will trade off time before cost / functionality.

Organisation 2

Customers during negotiation phase are realistic over priority vs. money.

Once fixed price agreed customers are more ridgid.

Trend

Depends on length of relationship w/ customer.
Long established customers understand methodology and recognise issues that might occur and they have faith in supplier as an organisation.

Size of customers have increased dramatically

- Supplier have had to increase professional
- Increase in formality of dealings
- Increase of IT capabilities of customers
    - Easier to run test/prototype environment and run significant tests.
- Better forward planning and pre-implementation testing.

Negotiation has become more realistic.

After fixed price customers

More likely to pay for customisation
Supplier more likely to give away customisation to win business.

Customer aware that customisations will work into base product. Could result in discounted customisation.

Supplier born out of a joint a venture between customer and supplier partnership and this partnership approach has been key part of success.
Supplier positioned itself as partner. Supplier has become more flexible and more concerned with successful outcomes then cost/benefit.

Proportion of revenue from licences and maintenance vs. development → has increased → so licences and maintenance.
May also benefit the product. More values.

Organisation 3

Expectation that dev s/w is easier cheaper and quicker because tools and methods better and more modern.

Also expect higher quality s/w

Also more willing to except trade offs between time / requirements / cost

- Because of knowledge of large failed projects in the press
- So therefore not easy to make s/w do what they want in their requirements.

No general rule of whether more or less likely to pay for customisations.

More people experienced trade of customisation value / cost – so more aware of the options.

More willing to trade off requirements and time against money. If give customer 3 options:

1. cheapest
2. medium → probably pick this one.
3. most expensive

Customers probably pick the medium one because customer will recognise value of having something slightly better than the cheapest to help them sell customer base.

Driven by perceived business value. 10 years ago less understanding of s/w dev process and therefore less understanding of why there was a trade off and therefore less willing to accept a trade off.
Customers used to be much more argumentative about the trade off and take a harder line.
Now customers are partially willing to make a trade off up front – but not accept a trade off once the project is underway.

Organisation 4

Attitudes hardened a little because expect more to be built in and don't want customisations. Plus don't want to have to maintain customisations during upgrades. Also need predictability of future costs.

Ones that are growing rapidly or want to lead their industry are the ones prepared to invest in customisations.

Example transcript of an interview

DAVE CROSBY'S MASTERS THESIS MCIS AUT
TRANSCRIPTION OF INTERVIEWS
Tape 2: Organisation 2 SM: 4/12/06 Side A:

DC: "What I want to do is talk about customer relationships issues–not the whole subject but – how they impact on projects and the decisions that you have to make in order to trade off provisions in the project." And going back what we talked about last time, what came out quite strongly – not just in the interview – but with all the ones I'm doing – is that customer relationship issues can completely derail projects if they go ..? bad.

So I didn't ask you specifically about you about these.. …. as risks to the project. 228

A: Customer relationship issues are typically handled by the account manager who tends to have much more of a sales focused role but also has reasonable amount of technical knowledge around the product. So certainly in the initiation phase of almost all of our projects the development team is not directly involved . So at the point that we become involved – certainly from a delivery perspective - there's a reasonably well understood functional requirement specification. 235
And the customer relationship .. the account manager retains the leadership of the customer relationship throughout the project. So the PMs interest is much more specific to the actual Project The Account manager stays with the actual project. The PM may work for a different custome so theres no ongoning link with a cutomer so his responsibility is purely the successful outcome of that project. Apart from the company-wide incentive in succeeding in what we do, he doesn't have a specific brief to build or nurture a relationship with the customer himself. So from our perspective the primary risks in the customer relationship is distanced because alot of our work is off-shore.

So that distance has 2 components I guess: One is the straight physical distance, - We well could be working for someone in Mexico – or Aus. Which is relatively cose – or Canada –And then there's the distance in the sense where we tend to be one layer deeper in the relationships. So the relationship is fronted by our CEO or our account manager so the PM often experiences our own product team as the "customer" even in situations where they aren't the customer. So the problems that we may be having with a particular development is not necessarily taking that back to the customer himself. Were taking it back to the product team & saying what you're asking us to do here is difficult/ impossible / ill-defined , whatever the problem may be & they ,in turn, are liaising with the customer to come back to us with a solution. That creates some problems for us in terms of ..I guess at times there's the frustration that were not able to deal with the customer ourselves directly & hammer out issues. 259

Q: Is that the Account Manager or project manager?

A; Well we have those terms pretty much simultaneous for us because we have .basically .5 people who function as a product role. One is the CEO and 3 or 4 are what we call Account Managers. And they all have a broad product knowledge over this. suite we're offering .. so they're focused on a customer rather than a particular product.

Q: And are they primarily focused from a sales perspective as opposed to a product perspective.

A: Yes. So they're selling licenses if you like. And they're requesting S/W development from us to facilitate & increase their sales.

DC: OK. I'll call them Account Managers. But they also they are also the liaison. For work in progress?

A: Yes. 264
So, for instance, at the moment we have 2 gentlemen here from S.Africa because we are working for a firm over there called Metro and they are spending all of their time with the product team. And any engagement they have with other parts of the company are essentially organised and managed by that team. So the product team have responsibility for the relationship. They'll do the wining and dining and the demonstrations & general relationship building with the customer whilst they are here. 269

Another example: We've got another customer CEO coming next week for 3 or 4 days & in this case the product team have actually put together an agenda of what were going to do with this person. And one of the pieces of that is that the Development Team Manager, that is myself, will meet with him to give him some idea of how we operate, how they might interact with us & what we require ?? outside. So my part of that is very much structured by the product team. They'll snap me in and out as they need to. And there's no expectation that I'm part of the lasting customer relations. That will be managed by the product team.

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DC: OK. That's almost a third aspect of this. The development team don't have an ongoing relationship with the customer?

A: Typically not. While it sometimes creates some problems for us during the actual S/W development project, from the post deployment point of view its actually a good thing because its very easy to switch their support requirement on to our support services team where is where it belongs rather than them having built relations with my people in the technical team so that the support person is part of the support services team. And that's their function. Rather than my guys getting harassed directly by the customer over particular problems about something we've delivered to him. By which time we're on another project. We just want that one to lie down and die.

Q: You want the client to take ownership of the S/W.

A: Yes. So it works quite well from that point of view. Though, there are times when its frustrating for us that we cant liaise directly with the customer early in the process as to how we are going to do some things. Because we do get presented with a fait accomplait by the product team guys –who are great – they do have excellent product knowledge, but sometimes they just have enough to be dangerous. So they get us in situation where they say you can do this and we say "What?!"284
I guess the other situation in this thing that causes distance is that we do work across a language barrier as well. At the moment we have a project going in Thailand, and we're not even sure what sex the people we are working with because we cant tell from the

names. Their certainly is a language barrier. Its happening in English & their English is not fluent –pretty stilted communication.

Q: So you're not sure that you understood what they really want?

A: Yes. Exactly. So its actually quite difficult to get to the nitty gritty of what the requirement is at certain points 'cause often people ? at a high level. The developer will say well what happens .for .this ,this & this? So you go back to the product team person & he'll say "Oh yes. I didn't think of that." And then actually conveying that complex point through the distance & the language & getting a meaningful response can be quite a time consuming & ambiguous process. Of Course at our delivery level, nobody cares that we bumped into a piece of complexity that was not immediately visible, or that the customer had an expectation that is critical to them but not properly conveyed to us. Because our upper CIO/CEO level are working on a set of dates & how're you doing? They don't really care what's happening underneath. So that creates a few issues for us as well.

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A: So getting back to your Controlling. ..in terms of technique ..
The Project manager that your going to interview is a person that's come to us in the last 2 or 3 months. He's come from a development background, demonstrated an aptitude & desire to work in that PM space so we essentially encourage that. Created a further PM role.

Q: So we can tick that middle one in that case. Primarily that's just the way your…is structured.

A: Yes. I guess the other thing that's different from other S/W houses I've been is because all our customers have purchased our core product but relationship from our perspective is based on extending the life of the product and improving the fit so its not a particular job you want done , we'll come in, do that & your gone. Because the relationship is on going in the sense that the customer is paying an annual maintenance fee for the ongoing support and the upgrade facility I guess. The customization projects that we seem to be involved in tend to be – from our point of view – are part of a larger ongoing relationship with that customer.

Q: What are the implications of that in terms of when you have to make difficult decisions? Like do that have an impact.

A: Yes it does. Absolutely it does. I guess the development team is relatively independent of the financial benefits or consequences of what we are asked to do. So while we participate in the pricing process in terms of asking us for input of effort required, our responses are typically based on time rather than rate & often the financial criteria for the job is not something that we're concerned about. So in terms of the benefit of the particular piece of work, either the product or to the customer relationship or the sales process, the call as to its financial value is made by the product team. So in .. we go back and say "Its all in a days work. Its think itsa $30,000"
He may say OK I'm going to go to the customer & offer him a discount. (say $50%) for such and such.

DC: So he might sell/ draw other licenses. For other business.

A: Yes. Yes. Their target is increasing the sales base & increasing that maintenance revenue flow as much as their targeting the profit from the individual customization. So, in a sense we're sheltered from the financial – and we don't make those decisions - but we're not sheltered from the time. That's it I guess. So that is the critical thing for us. The elapsed time. Absolutely the elapsed time rather than effort time. So its probably quite true to say that the product team don't actually care how much difficulty or how much effort we have to put into the delivery, they care about whether its ready on the agreed date. And the customer too. Beyond that, as long as the functionality is close enough, they don't care whether we had 6 people working for 6 weeks or 3 for 2 weeks. We're not targeted nor measured currently from that perspective. It's targeted on delivery so that's about customer satisfaction.

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DC: It would be interesting to ask some of your Account managers these questions. This first question –your perhaps a bit different here - but most of the others I talked to have multiple levels of contact with the customer. For example: One at a senior management level one at, for example a project manager or medium management type level and one at a developer customer type.

R Yes

D But the contacts quite different here.

R Well, the other thing that's quite different here is its pretty rare for us to have the opportunity to sit down and read(?).with the customer, because typically they are quite a long way away. So that tends to mean that its much simpler for us if its managed through a relatively narrow, contact point anyway . We do often put service people onsite with the client but that's around , actually in Singapore. It's not there We ran quite a big project a similar organisation in Thailand at the moment and we will put our technical lead onsite in Thailand in the New Year. A couple of reasons, one, reason is to assist with the actual deployment because the guy, he's very technical, he's onsite and will overcome somewhat the language and distance difficulty and will enable us to make sure that the initial implementation proceeds quite smoothly.

There's a second stage to the project which John is ……the developer has a particular expectation so its quite useful to have him onsite ,,probably be the first one and will probably be able to do some onsite prototyping. Obviously with phases of the development with John actually there in Thailand because he's going to sit down with them and say "This is how it's going to look, what do you think? This is how it's going to work and basically take them through some of the user interface design which is quite difficult to do across the language and distance.

And the other thing that I've been clued up about is that from the tour(?) perspective we want to give our rising stars, if you like exposure to customer activity in the way that business processes unfold on that coalface as it were. So there's a two phase thing going on for us there.

There is , relatively unusual mainly because of the distance

D. So would it be alright to say is on rare occasions you'd send someone to….

R. Yes. Yes.

D It sounds like there are elements of deployment primarily but it sounds like also it might be twenty million(?) …….and so on.

R In this case ,,, I've met him, he would actually be refining with ……the design with the user interface in the second phase of the project so the piece that he takes up

there he may be able to vary if necessary to get the deployment under-way but its pretty unlikely that he would embark on any significant change to that application
at that point because essentially its done and dusted. The second piece is the early phase of the project and he'll be endeavoring to make sure that our expectations are aligned.
We've done a similar piece of work in Mexico and we had real difficulty there because we could not get the answers we needed on particular technical questions. They tended to come back to us and say, "You're building it, you do what you think is right." But then when we actually delivered it they said, "Oh. We were expecting a bigger……(oh shit?) " We hadn't actually got that from the engagement so a little problematic trying to sort out the fine details of some of these things over that kind of distance especially when the parties do not understand each other particularly well.

D If you do run into those kind of problems what sort of things do you do to address……
R What generally happens is the delivery time is extended.
D Does that imply some rework?
R Yes. You rework or extension.
D Sorry. You said 'or extension'
R Yes. Or Extension. So it may be that it doesn't function or maybe what we've done is incorrect from their perspective. Or maybe there's a piece of functionality missing that I have assumed was going to be there.

Q: So . The error is because they might go ahead but without a certain piece of functionality?

A: No. Not to delay. Whether its wrong or whether its missing, its critical as far as they're concerned – quite typically. So they'll say no. We can't . This isn't going to work for us. So then there'll either be a product-to-customer kind of dialogue I guess about where the fault for that might lie and whether the additional work is chargeable. I guess. But again, from a development perspective .. we are not necessarily directly engaged in that but we are subject to the dissatisfaction of what the product team is to the customer as to what they've got to what they needed to go live on a particular day. So, I would say, from our perspective, what happens is the delivery time gets extended. The pressure to deliver increases substantially. There's a critical situation. 002

Q: What do you do in that situation when the pressure has gone up & it all becomes a lot more difficult?

A: Well in the worst case like this we'll ask some critical people to work some extra hours. So we'll say some credit time. That's probably the primary manifestation. Obviously there'll be some rework or extension. Along the whole chain if you like. ("Chain of redefinition?") Yes. Sometimes these things will have a relatively large effect from an architectural perspective.

So. For example: We're doing a relatively large project in Lithuania at the moment. So you can imagine the commonality between Lithuanian & English is not that great. We have dissimilar alphabets for a start. But they are implementing a ..? system which is good for us because its separate. It's in addition to the main product. But the have some peculiar requirements over there in terms of what they call fiscal receipts where the government is involved in . The government wants comprehensive receipts

essentially. So they have these natty little things called a 'fiscal printer' which actually got its own tiny hard drive & every time you print a receipt this thing takes a copy of it & gives this record to the government so the government can then check that. .. Presumable to encourage them to Paying a little tax initially. ..
These fiscal printers tend to be relatively obscure, stand alone pieces of technology & we have to generally write a driver to talk to them each time we encounter them. They do the same thing in Argentina. 002
In this case we write the driver according to the instructions. They then bought the loyalty package which means that they now can use a loyalty card to make purchases so they don't need cash – like Flybuys – You might get a free ticket or you might have enough credits to buy a ticket. Another sought of sales mechanism- another sales channel I guess going alongside the cash/ credit card transaction. So all of a sudden the receipts printed from the fiscal printer don't show this loyalty information on there & they come back to us and say: "Where is it?" We're saying; "You never asked for that". And the specifications that we've got actually cover this point quite clearly and say "This will not be required". Meantime they bought the loyalty in good faith applied it to their system and said "Oh! We want to see the loyalty points information on this fiscal receipt. We're saying : "We don't do that. So now they're saying they're wanting it the middle of last week. As usual. We're saying: "No-one told us you needed this." Our rep. in the UK is the closest we get to them who is actually one of our team so he's on our side- is caught between the development team saying "Hey! Guys. This is not a fair go" and the customer saying: "I want. I want". And for us. We'll have to do it. And we'll have to do it as soon as we can deliver to them. But the call on that sort of priority time will .necessitate. I go back to the product team & say I've got this, this and this and you want all of these by this stage. And now we have added this into the mix. Tell me what to do here. What do I delay in order to deliver. So we're relatively shielded from the angry..- Lithuanian – customer but we do have to deal with the frustrated product team. So the frustration is translated into an internal customer.

Q: Do you ever get a sense of ..where for cultural personality reasons there could be some kind of problem between the 2 organisations develop & customer?

A: We've not experienced that at first hand. That's probably the nitty gritty of that. But that is probably changing a bit now because we have this PM role first time. Because once the account manager has pretty much got his functional requirement & got the approval of the project then he's also asked to Please provide a letter of introduction to TIM? & our PM. Then PM will manage the relationship so far as it affects our project . So , for instance the development of we're doing in Thailand is another one of these loyalty things so personally we have to get it underway. We need the H/W to redevelop the card and & we need the S/W that defines what the application interface for that H/W looks like so we can aply .. to it.. So Tim's first job is to say "Hi" I'm the PM. I'm here to be working on this with you. And these are the things I'll need from you before I can get started. Send it over. And, by the way, I'm going to send John up there in January so please prepare for this; and these are our dates. etc. etc. He does take over the customer interface now.
013
013
And that's a relatively new thing for us I guess in that it doesn't necessarily happen every time either because often we are working through a distributor or our own personnel on site such as we have our own full time employee in the UK.

So stuff that's been deployed to customers that that person's managing typically go to him in the first instance.

017

Q: Why was that role created: a difference- in that role? The PM role?

A: Because we're growing I essentially. Up until before that the products were essentially managed by the product team and that product team had the customer relationship so that because the product team had a technical background anyway, they were reasonably capable of doing that. So the model was more like an account manager and technical leader. Whereas the model now is more like an account manager - project manager. The technical leader and PM are project specific and the Ac M is over him.

Q: What is about the roles that drove that separation of those two?

024

A: The number of projects for a start. Also I guess the increasing complexity . And I guess the need for additional focus. So that the Account manager role is not to become tangled with the technical delivery obviously but needs to be ranging over all the customers licensing, maintenance so that the product enhancement or extension are rather peripheral to that person's role.
Well. From a development perspective the focus on management of produce and from an Account manager perspective they're focused on the sales role.

DC: OK: So that probably covers the first 3 questions.

032

A: Right. (Q4) I'd say flexibility is one of our strong points. We emphasize our ability to be flexible responsive & flexible as part of our sales process. (Why?) So, for instance, XX has this nice little graph that he does in his sales process around the way our products tend to be implemented. And their life cycle within a particular organisation. And what tends to happen in actual fact is that there's quite a different curve(?) there's a short term gain, hen there's a leveling off, a deterioration as the product fails to keep up with the operational and technical changes so the rate at where we pitch ourselves is that we sustain that we sustain that upward trend much longer by offering a rapid and flexible development service, so that if a customer has changing needs we're positioning ourselves as an organisation that is built to meet those.
So its more a flexibility rather than risk management. I would say that, while we're not a seat of the pants or cowboy type of organisation in the terms of the way we respond we e very aware of. the need to make our product meet the change in technological environment.

Q Thinking about that in the context of a single project there's and how that project is run, the development project, I'm not quite sure how that works. Do they …do customers ….

A: I'm talking about……the customer perspective our approach is typical of ----------Price (?) so, they don't have the financial risk , The primary risk they are paying here is that we will fail to meet their preliminary date. And that is a huge risk for them because the delivery date is typically predicated to match either particular points in a similar season, or the implementation of a suite of hardware or physical changes in their premises they need this software. There's no way we can say, "sorry we are a week late" because they probably have a whole marketing campaign

around the thing...So the primary risk for them is that we will meet the delivery date and to a large extent flexibility is not in it. At that particular meeting point it is often very difficult for them to slide dates and this is the real crunch . This is where we find ourselves in difficult situations from time to time, regardless of the cause.

Q: Do you have progress reports back to them? 031

A: Yes. We do. If one can work in a kind of .a .prototype environment .. we certainly will because that facilitates us being responsive in a flexible way & it also provides the customer with an early view of the delivery.. so they seem to get much closer to the arrival of it expectation early in the project. Whereas if we disappear for 3 months & push the software under the door & say "Here you are See you later" The first thing they're going to say id "Where is this, or this or so forth?"

Q: Do you have – in this prototype environment – any other any.. they can have look too? (Yes) I just trying to grasp how you perceive the customer react to The different ways you can do that. You could open that up. And you could use that to help clarify the requirements & then – if difficulties - you could change it , & then bring it back to them & go thru that process several times. So you think have quite prominent structures around that. You could then sign off on that bit, then this bit. Or it could be we're not sure exactly what you want so do some functions for a period of time & we'll see how we go. ??

A: Typically ..when we're deploying in that profile environment the customer has a test environment. We are providing .. of S/W on a regular basis. We have a project going in the UK at the moment we give them a bill every Friday. They can relay that bill to the test environment. They can run the S/W with the functionality that is currently enabled, they can see the user interface & they can get some indication of how its actually going to behave & its performance etc. And as a result of that they may come back to us with requests for changes to the user interface. They may report problems that they have getting the S/W to operate in their environment. Or they may identify or clarify areas where we didn't quite know what they wanted or they didn't quite know what they wanted. So the process of seeing part of the system on the screen is very helpful to them in defining how they want some of their requirement are for competent operation. (Functionality issues? Yes) The other thing that's is a real issue for us -very often there's an internet component. So we've got the value of there's very often a WAN component. Because the larger customer's are interacting with a number of cinemas over a well distributed WAN. And that prototype environment ensures that the system will work on the other side of the world essentially. The situation where something works perfectly well here, the customer may not be able to even get right staff …c.f down the road it would work. There's not much to it. But on the other side of the world it far more frustrating , especially if you are late in the development cycle. So we think its finished we deliver it to them & 3 days later they cant even get the bloody CD to run on the system. But if your in a prototype environment you've encountered that early on. You've got your back against the wall you've got the prototype to run & you're fairly certain that the actual environment fits. So there's benefits for both parties in that type of approach & then can we can redo that. (OK) Our focus is more on flexibility than on risk management. I think. That's fair comment. And *the primary risk is the actual delivery date. The primary risk is timeliness.*

911

DC: OK. I would say that technique is primarily risk management. That technique. (Yes. It is). The last thing I wanted to ask you was just how you viewed

…….we've been talking about time and requirements , money, that will come up if you just read that back, but it is just come up in the mix. You need to explain the cost of this is going to be to the account/company (?)manager. It might not be to the customer , that sort of trade off that you're preventing . so we've talked around about that, but I just wanted you thought about the trend about that over the last 18 years or so. In terms of how the customers perceive that. I guess there are two ways of looking at that. One is their expectations, but the other one is in terms of, OK the situation has occurred now, I mentioned some examples before, there's the ……programme and so on, do we accept a later delivery time do we put our stick in the ground and stand firm . How do we?

R From a customer perspective.

D Yeah. I'm trying to get a sense of, if they-- how ever it is - do they respond to that difficult situation, whether the trend, has it changed over the last 10 or so……..

R I would say that our customers, that during the negotiation phase there is a fairly realistic position that we often take, that priority will often cost additional money. That if you want this by this time then you are going to have to pay more. Than if you had said I want this renewable(?) Forget it. So. That's very much in the negotiation phase. Because we operate in a …cross(?)….glasshouse(?) environment once that is done and dusted, the customer tends to take a more rigid view of the deliverable. So that if there are difficulties in the delivery it is up to us to resolve them, and unless there is a clear fault on their part or a clear extension of functionality . I wouldn't like……..

D. And would you say that over the last…..

R. Or, or, countables…of the day…(?)

D. Yep,yep,yep. Would you say that's kind of become more polarized? Over the last year or so or more obvious? So…..you've got the realism prior to the negotiation more stringent measures after the ….prices have been agreed .

R In some ways it depends on the relationship the…….has with the customer, because there's an element of mutual trust I guess, so what our role with established customers they are, …they tend to understand our working methodology, they tend to have a reasonable recognition of the operational difficulties we might face and they also have a high level of faith in our organisation I guess. So the other side on this for us when you're talking about the last 18 years the size of our customers has increased substantially so we are not talking about of the size of some of these cinemas here in NZ (8 or 10 cinemas) we are talking about the huge chain in Britain which is 60 cinemas. The Cineplex cinemas in Canada which is 135 cinemas, so we have to increase the professionalism of our own approach to match the much more corporate demands of those organisations.

D And looking at it from the other way round when you come to their approach during the negotiation and the approach after, is there a change you notice relative to the size of the organisation that you deal with?

R Yes, there is. There is an increase in the formality of the …….we're dealing with but there is but there's also a substantial increase in the IT capability of the customer organisation.

One of the key things there is ……This prototype organisation approach that I'm talking about that we're using with Kenya – with small customers its actually quite difficult to do that because ……we don't have the Regionals to run a test environment. Let alone the resource to actually do anything significant with the software in a test environment. But, with organisations like Simatext in Canada or Village in Australia, those guys have an IT department that is significantly larger than we are so, for them to have a test environment That do some substantial testing on our applications is both feasible and useful to us so that has changed our delivery approach. And will release stuff into a customer…pilot……environment which essentially means there is a release and a …….in the delivery for us., because typically we are delivering to – their test environment if they can assure themselves that its ready for a roll-out which is a little bit further , whereas .the earlier model when we started it we were in there installing our software while they were vacuuming up the sawdust from the cinema construction, and the thing was going live the next day and there was no testing or prototyping in the system outside of our own facility. That's probably a substantial change for us in terms of our completion, deployment if you like.

D Right, OK and over this 10 years, whatever, have you found that the customers are, for example more realistic over the priorities versus money, functionality……between the negotiation phase and another example, they might have become more rigid in their expectations once the fixed (?) price increased.

R I think that ……..mumble…….

At the end of the picture I think that for us, quite often, David, that the bulk of the customization ……..that we might do for a particular customer often happens as a integral part of the initial sales process. So we will go into a path that with a significant customer, either as part of an RSP or just a cold call type of approach, and end up in a situation, where we're demonstrating a particular product, and they're saying, Yes, that's great but here we do this, this and this, and you couldn't ……their product without that, but if it had that functionality , and quite often, they would actually …(end of tape?)…… 937

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