Risk Analysis and Preventing Information Systems Project Failures

A thesis submitted in partial fulfilment of the requirements of Liverpool John Moores University for the degree of Masters in Computing and Information Systems

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ABSTRACT

This dissertation describes research on the connection between the issues of risk analysis, information system development, project management and the prevention of failure. There are obviously links between these themes, but the interfaces are often unclear. There also appears to be a lack of alignment between systems development, project management and the risk analysis processes. Before a project failure occurs there must be some indications and some practical information that should be fed back into the risk and project management model so that preventative action may be taken. An attempt is made in this research to re-engineer the project/risk management activity and create a new model for that process.

The research describes systems and project methodologies and factors leading to successful and failed outcomes. Some projects fail due to lack of commitment and indistinct business objectives at the outset. However, projects have failed even when justified by valid business objectives and where the planning is in line with accepted standards and methodologies. Therefore, the focus of this research is on preventing project failure after the point at which the project has been justified in business terms and initiated in a manner according with best systems practice. This research is also focussed upon larger-scale projects, but may also be appropriate for smaller projects.

A number of case studies are reviewed, which have resulted in project failures and lessons to be learned from them are highlighted. This research illustrates the design of models, describing risk analysis and risk management within the project management process. The models lead to a greater awareness of factors arising during the course of the IS project that may indicate the potential failure of the project. Using the models encourages the constant review of the important factors to avoid project failure.

It is the intention of this research to help prevent failure in the development of Information Systems and projects in general for the future.

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Contents

CHAPTER 1. INTRODUCTION

1.1 Objectives of the project

The main purpose of this project is to examine the factors influencing an Information Systems (IS) project and to develop a set of models that will help to prevent project failures in the future. The research is focussed upon large-scale projects that would normally require adherence to a full Systems Development Life Cycle (SDLC) and formal project management. The resulting models will illustrate the project management process and will also emphasise the importance of the risk analysis and risk management activity. The models will link risk analysis with the project management and risk management activities that should be performed at regular intervals during the course of a project. The research undertakes an exercise to re-engineer the project management process, adding risk management.

It is the contention of this work that the project management methodologies emphasise the deliverables of a project and neglect to describe fully the processes of how the deliverables should be achieved. It is also the contention of this work that the risk analysis and risk management activities are not fully understood and consequently their position in the project management process is not realised.

This project is concerned with the research into Information Systems project failures and learning lessons from those failures. The tasks set for the researcher are to investigate books, papers and articles on project successes and failures. The reasons given for the failures and the factors identified as vital for success in much of the documentation will be reviewed. The research project will also consider the standards and methodologies that have been designed to guide projects to successful completions. These standards form the best practice that has been adopted by many organizations, including UK Government. This research attempts to understand the reasons for project failures even when standards have been applied and experienced teams are involved.

To better understand these failures an attempt will be made to answer the following questions:

a) Are Project Management methodologies & the standard SDLC failing large IS projects? Is there something fundamentally wrong with PRINCE2 and the Systems Development Methodologies that are used in large UK Government projects?
b) Should Project Managers be conducting a continual risk management activity?
c) Do the methodologies describe the way that the project manager should perform Project Management? Or do they only act as checklists, giving the 'what' of Project Management, but not the 'how' to do it?
d) If Project Managers use a 'systems thinking' mindset would this provide an element of safeguard against failure?
e) Is it accepted that Project Management connects with the Risk Management process, or are they considered to be entirely separate activities?
f) Do the standards and methodologies encourage an attitude of invulnerability and complacency, which inevitably leads to failure?
g) Is there an unacknowledged contradiction in the Project Manager's role? That is, they strive to ring-fence requirements to enable a fixed base upon which to develop an Information System, but there are eventualities that arise within the duration of the project that should be taken into account and perhaps the project direction should change accordingly.

This is a vast area, with numerous areas of contention. It is also an area where vital information may be missing. Due to the embarrassing nature of project failures, sometimes information is not readily available. However, the UK Government has a policy of formal review of their IS projects, conducted by the National Audit Office (NAO), the Public Accounts Committee (PAC), or Parliamentary Committees. Consequently, there is information for those projects. As the field is so vast, it has been decided that concentration would be focussed upon the management of projects after they have been initiated.

This research work highlights the 'how' of the project management process, whereas the standards and methodologies have tended to illustrate the 'what'. In this manner it

emphasises the importance of the process over the deliverables. This is an important factor in safeguarding a project against failure during the course of the project.

There is an acceptance that the individuals working on some of the failed projects highlighted are undeniably skilled and experienced in project planning, system design and development. Yet things still go wrong. So, this research begins from the assumption that the project is set-off on the right course. Therefore, the focus of attention is on the manner in which the project is managed after its initiation and up until its implementation. Further, it is assumed that the risk management and assessment activity should be performed at regular intervals throughout the project. It is seen that this regular risk review could coincide with the movement of the project from its stages of the Systems Development Life Cycle (SDLC). These 'stage boundaries' seem natural junctures in the project, at which it is appropriate to conduct the risk review.

The activity to safeguard against failure revolves around the project management and risk management processes. It is assumed that the planning of a project can be performed to a satisfactory standard. The project planning and development is helped by all the standards, methodologies and techniques that lay down the framework for best practice. There has been a considerable expertise in these skills within the examples of failed projects highlighted in this work. Therefore, this research considers new processes to apply to the management of the project. These new ways involve a combination of project management and risk management.

The main aim in this research is to bring together the many related factors that need to be taken into account to ensure a successful project. In order to do this, I will challenge the accepted wisdom of Systems Development Methodology and Project Management. I will consider the phrasing of project deliverables in terms that are appropriate for Risk Analysis and consider the questions that will help to simplify the risk management process. This is necessary for the Project Manager to be able to more easily identify the major risks at each stage during the course of the project. Therefore, by following the approach outlined in this work the Project Manager will be able to monitor the project in a more appropriate manner. The monitoring will not merely encompass the progress chasing and comparing the resource expended with

project estimates. It will also include continual reviews of internal changes and changes in the external environment to ensure that the original project objectives remain appropriate.

1.2 The Motivation for this Research

My personal motivation for this research topic arises from over twenty five years work on Information Systems projects and trying to ensure project success. From my own experience, the standards and methodologies provide excellent guidelines. These guidelines form the foundation for a project to be conducted in a manner, which should guarantee success. However, at various times when managing a project, I have felt that something was moving out of my control. It was not something that could be clearly defined at the time apart from a feeling that the project was being overtaken by a combination of factors that were pushing the direction away from a successful outcome.

Like anyone with a social conscience, I am very concerned when I read of high-profile project failures that have wasted countless millions of public money. During the lectures for my MSc, I learned of more project failures and the reasons cited in the text books for these failures didn't seem to hit the mark, or tell the whole story. Having the luxury of time to conduct this research for my MSc dissertation has provided me with the desire to study this topic more closely. From the documentation of these project failures the analysis of the reasons owes too much to hindsight. The indicators of failure must be detected within the duration of the project, before it is too late. This research attempts to provide some guidelines to help this identification to prevent failure before it happens.

My motivation is also derived from the surprise that projects following accepted standards and methods have suffered and continue to suffer failure. In the light of this phenomenon, best practice must be challenged and improved.

1.3 The Structure of the Dissertation

The conclusion of this dissertation is to describe the models and processes that can help the project manager identify risks and prevent failure. Therefore, the dissertation is structured in chapters that provide the research information leading to these models and processes in a logical manner.

Chapter 1 gives background information, outlining the problem situation, describing the importance of the research subject and introducing the main objectives of the dissertation. It raises some questions on the validity of current thinking in project management and systems development. It also summarises the main themes that combine to affect project management and the complexity of achieving project success. Chapter 2 describes the research methodology and the planning of the project.

Chapter 3 provides a comprehensive review of literature on the subject of the research. As more project failures occur, this literature is being accumulated all the time. Therefore, the literature review will never be exhaustive. However, it is sufficient to illustrate the general themes, or ideas that combine to affect the success or failure of IS Projects.

Chapter 4 provides the analysis of the literature and the rationale of the research. It describes the extent of the research subject and the limitations to the scope of this project. It addresses the questions raised in chapter 1 and includes a number of alternative propositions that are suggestions to help resolve the problem situation.

Chapter 5 describes the models of the project management process. It also describes some previous models and illustrates how the new models include risk management. And Chapter 6 concludes the dissertation with a review of the original objectives and some recommendations resulting from the research.

1.4 The Problem Situation

From my 25 years of experience in Information Systems my main concern has been to always attempt to ensure project success and avoid failure. However, there have been a considerable number of IS project failures that have occurred over the recent past. The UK Government seems to have suffered more than its fair share of these IS project failures. However, this may be due to the relative transparency of the results of public IS projects. Whereas the private sector does not have to account to the National Audit Office and may keep their failures more low key as a result. However, the publicity afforded the IS failures has led to a significant amount of public interest and coverage in the media regarding IS project failures. The question remains as to why IS projects continue to fail, even with the benefit of systems standards and project management methodologies.

The vast amount of public money that is allocated to fund UK Government IS Projects also makes the subject a particularly important one. For example, The UK Inland Revenue spent £150m on a 'failed' system to pay new tax credits in April 2003. There is another significant issue with regard to the waste of money, resources and manpower; that is the redirection of effort and resources. The effort and resources on failed projects results in other projects not being undertaken. These other projects may have a greater possibility of success and may have provided an equal benefit for the community or organization. No organization has limitless resources. Therefore, there are only a limited number of projects that may be undertaken at any one time. If these resources are spent on a failed project, then they will never be recovered to enable another project to benefit. For example, instead of the UK Government spending £Millions on the failed IS project for the Individual Learning Account (see Literature Review for details on the ILA), this public money could have been used in the NHS. It could have provided more doctors, more beds and perhaps reduced waiting lists.

Therefore, there is a LARGE question here that does not always receive its due share of significance regarding the decision to initiate one project rather than another. Obviously, for UK Government projects, there are considerable political factors that

influence this decision. Perhaps this raises another important issue for making successes of IS projects; that is to select the appropriate project in the first place. This point is highlighted where systems are foisted on to a user community and they are never fully accepted. If the decision on what project to embark upon had been taken correctly, the users would have been fully involved in the decision-making process. And with the user involvement from the start, the project would have been accepted and this would have been a springboard for project success.

The UK Government has suffered some high-profile project failures, even though there is an adherence to PRINCE2 project management standards. Therefore, standards and methodologies seem to be no panacea for this problem.

Many IS projects fail. W. Wayt Gibbs (1994) gives statistics as follows,

- On average, large projects take 50% longer than they were planned to do;
- Three-quarters of large projects are operational failures;
- One-quarter of large projects are cancelled.

Following recognised standards and methodologies is an objective manner by which project success is more likely. Nevertheless, this 'appearance of objectivity' may also be a central factor in how the Project Manager can be fooled into thinking that all the issues have been covered. It encourages the thought that following standards and frameworks will guarantee a successful project outcome. It can engender a feeling of false confidence, or at least diminish the feelings of caution.

However, the world does not stand still. There are changes to other companies in the wider organization. Competitors and the market-place also experience changes. Consequently, business strategies change to match the newly changed environment. The external influences, must be monitored as there may be effects on the project that have not been foreseen. It is almost a case of the right hand not knowing what the left hand is doing. The successful project must continually monitor the external influences for any new potential risks. Unfortunately, this is one of the most difficult things to do, as it requires the understanding of the impact of the external factors.

So, we find that without formal project management methodologies and SDLC frameworks, there is less chance of achieving a successful project. However, project management methodologies such as Prince2 and systems development methodologies such as DSDM, SSM and SSADM do not guarantee successful projects. Yourdon (1996) quotes Capers Jones as he pursues this line of reasoning, when he says that according to the latest statistics,

> "ISO certification does not appear to affect the failure or success patterns of software projects, or even to benefit software quality in a tangible way".

Currently, there are a number of UK Government projects that are in the initial stages, including the National ID Card and the National Programme for IT (NPfIT) in the NHS. These are multi-billion pound projects, using public money. Unfortunately, the UK Government does not have a good track record for successful projects. Therefore, my research and other research programmes on this topic are vital to uncover any issues that can help prevent project failure and save the wastage of public resources.

1.5 The Context of the Research

There have been a considerable number of papers on best systems practice. Yet more papers describe the standards and methodologies that development projects should apply. Further papers have attempted to identify the factors that are critical to the success of a project. There are also papers that have described the factors that combined to produce project failures. In order to strive for success, therefore, an awareness of the factors that result in project failure is vital. Lessons need to be learned from both the successful and the failed projects. Consequently, project failures need to be analysed and researched. Therefore, these research papers and books analysing project successes, or project failures will be reviewed within this research.

Research on project management techniques and the prevention of project failures has been undertaken since computers came into existence. Besides my personal concern to attempt to avoid project failure, there is a considerable public interest and coverage in the media. The vast amount of public money that goes to fund IS Projects also makes this a subject that has seen a substantial amount of attention from the media. There are also a significant number of academic research projects that have addressed the issue of project failures. From personal experience and the analysis of a number of these high-profile IS Project Failures, the context of the research comprises a large body of study.

In the early days of computers, programs and systems evolved in an ad-hoc, organic manner. A more organised approach was applied as the emerging discipline began to grow. Experience gave insights and best practice was gathered into standards and methods. A body of knowledge was built, academic institutions taught courses in IT and IS and professional bodies were formed. Systems developments were then based on a good framework. The systems development methodologies include Structured Systems Analysis and Design Method (SSADM), Soft Systems Methodology (SSM) designed by Peter Checkland and more recently Unified Modelling Language (UML) and Dynamic Systems Design Method (DSDM). The systems development methodologies provide the guidance needed for managing the building of Information

Systems. The Systems Development Life Cycle (SDLC) was initially perceived as the 'waterfall model', where each stage in the SDLC followed in strict sequential order. This remains a valid model, identifying each stage separately, but it does not reflect the iterative nature of the systems development process. Therefore, Boehm developed the Spiral Method, which proceeds through stages a number of times, refining and perfecting with each cycle around the spiral (see Appendix A).

As time went on, the systems became more complex and the inter-related issues became more difficult to manage. The focus of attention was to manage the development as part of a project, which included business processes and multi-disciplinary teams. This saw the advent of quality standards and project management methodologies, which added the organising framework for the more complex IS business projects. TickIT added a structure specific to systems developments related to the ISO 9001 quality standards.

The project management methodologies, particularly PRINCE2, provide the guidance to plan, monitor, manage and control the progress of the project towards its objectives. Risk analysis was first considered by Boehm, and has since been accepted as an integral part of the systems development process. However, it may be argued that risk analysis is not fully understood by IS practitioners. Assessing and managing risk is vital in aiding the awareness and identification of factors leading to potential project failure. Another important factor in the context of the research is that of 'Systems Thinking'. Stafford Beer, Goldrat and Checkland have written extensively on the subject. It is the frame of mind that builds upon systems theory and cybernetics, considering the whole as greater than the sum of its parts. It considers the manner in which updates to parts of systems will affect other parts of the system down the line. It also contends that introducing new systems will affect other systems in an organization. It also proposes that the organization will be affected by external influences, such as market forces and government actions. The Project Manager should embrace 'systems thinking' to be in a better position to identify eventualities that may arise that could cause problems in the project.

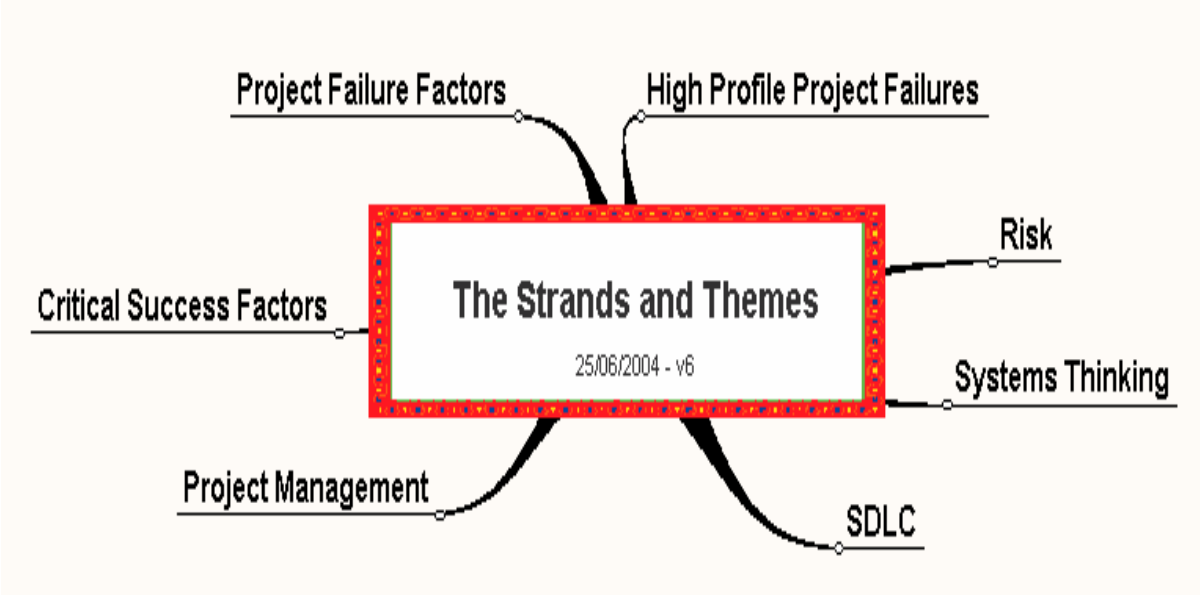
However, even with the frameworks provided by the standards and methodologies, there are still project failures. These have been documented in books by Flowers and

Yardley and in research by Wayt Gibbs, Lorin J. May and the Standish Group among many others. There have been a number of high-profile failures, such as the London Ambulance Service System, the London Stock Market TAURUS System, the American Airlines CONFIRM system, planned to replace its SABRE System. The UK Government has also suffered a number of project failures, such as the Passport System, the Criminal Records Bureau System and the Magistrates Courts System. The UK Government provides information on these project failures through reviews by the National Audit Office (NAO), the Public Accounts Committee (PAC) and reports from the Office of Government Commerce (OGC). These reports highlight issues that have caused the failures. However, they are always after the fact. From reading these reports, it seems obvious that the project would fail. The indicators must have been there to see during the course of the projects. Unfortunately, the indicators were not recognised while there was still time to rectify the failings.

This research attempts to highlight the indicators of failure as 'risks'. It attempts to follow-on from the writings of Pfleeger, Roberto Meli, Yardley and Webb. The models of Kontio are also used as a basis for the project/risk management process models that are the end result of this research. There are also a number of Critical Success Factors (CSFs) that have been identified by the Standish Group and others. These CSFs form the basis for MS EXCEL Spreadsheet models that are described in the concluding chapter of this research. These spreadsheet models may be used to evaluate the confidence for project success at various stages in the project. They may also be merely used as checklists of questions that should accompany the risk management process.

This dissertation attempts to consider this wide range of issues that can impact an IS project and may be contributory factors in the project failing. These issues can be grouped as themes, which the work will describe and analyse more fully. These themes include factors of project failure, factors of project success, risk, systems thinking, project management and the Systems Development Life Cycle. All of these themes coincide and collide in the evolution of an IS project. If they collide in a destructive manner, then project failure will result.

The main themes of this research are shown in the following mind-map,



These themes and others need to be described in the manner in which they affect project failure and how they will be addressed in the proposed models. The analysis includes various strands that influence IS projects. There is an attempt, in this work to tie them together into themes that will shed light on the project failures and successes.

The main themes of the research include,

- Learning the lessons from IT/IS Project Failures. There are critical success factors that have been identified, which need to be analysed and used in planning for the success of future projects;
- The 'what' and the 'how' of Project Management. Do Project Management Methodologies & the standard SDLC give checklists of 'what' is needed, but they neglect to give descriptions of the process of 'how' the deliverables should be produced;
- The 'soft' nature of Systems Development. It is an activity that necessarily involves people. The 'hard' issues, including the technology and the systems build, are far more straightforward to manage. However, when human beings are involved, things become notoriously difficult. The 'soft', people issues are determined by ambitions, emotions, feelings, the social attitudes and team

dynamics. To handle all of these 'soft' issues, the Project Manager needs special skills and years of experience;

- Managing projects in a changing world. Project Objectives need continual review and revision throughout the duration of the project;
- 'Systems Thinking' is an attitude of mind that it is important for the project manager to learn. Organizations are dynamic systems and the requirements for an Information System cannot be simply represented as a Static Snapshot. The project manager must always consider that the project is unfolding within an ever-changing environment. 'Systems Thinking' should also lead the project manager to view the whole picture and not merely a sub-set. The IS should fit within a framework of other systems and procedures that are already in place within the organization;
- Risk Analysis/Assessment & Risk Management. The project manager must continually review the external environment and the internal organization for activities arising that may influences the direction of the project. The risk analysis and risk management processes are not fully understood by project teams. But, perhaps wording the deliverables from the stages of the System Development Life Cycle (SDLC) in a manner that describes them as 'risks' could help make them more understandable;

This dissertation draws together the themes to focus on the issues of risk analysis and project management in the pursuit of preventing IS project failures.

1.6 Hypotheses

There are a number of options that may be possible candidates for resolution of the problems under focus. The options for resolution of the problem area are:

a) To critically examine the concept of Project Management, questioning its underlying principles and the thinking of its practitioners;
b) Review and highlight the critical success factors, drawing attention to those that have not been thought important and say why they are significant;
c) Attempt to identify any common strands or trends in project failure;
d) Consider the wording of project deliverables in terms that are meaningful to risk analysis. This should enable the management of the risks more readily by the project manager;
e) Consider the combination of themes from my experience and the literature review and highlight the way that a re-orientation of the project manager is needed to ensure success;
f) Produce new models for the process of Project Management, which include risk management.

The working hypotheses of this research are: -

a) The current project management methodologies have faults, or omissions, as projects are still failing;
b) The checklists in the methodologies do not fully describe the process needed for project management;
c) The Project Management process needs to be illustrated in a model describing the actions needed to be performed by the project manager;
d) The Risk Analysis and Risk Management processes are pre-requisites to, and an integral part of good Project Management;
e) The Risk Analysis and Risk Management processes are not fully understood by project teams, or project managers;
f) Project Managers need to employ a 'Systems Thinking' attitude to their role in order to consider all risks that may affect the project;
g) A checklist of previously identified risks is needed to use alongside the new model;

h) The project manager can handle the risk management element within the other activities at the time of the review at the end of each stage of the Systems Development Life Cycle (SDLC);
i) The actions needed at the stage boundaries of the SDLC need to be described in a detailed process model for the project manager to better understand his responsibilities regarding risk management;
j) The Project Manager can be led into a false sense of security by blindly following a standard methodology;
k) Smaller projects are easier to manage than larger projects (I believe in stating this even though it should be blindingly obvious);
l) Internal teams are easier to manage than external service providers;
m) Internal teams are more responsive and give better turn-around of resolution of issues during the development of the IS project;
n) Managing the stakeholders is by far the most complex task of the Project Manager;
o) Managing stakeholders is more straightforward if there is a standard framework that is communicated, understood and documented in the form of a process map;
p) Project Management is all about dealing with risks and issues after the planning has been completed and the project is underway.

CHAPTER 2. PLANNING THE PROJECT

2.1 Proposed methodology and approach

The main approach to documenting this project will be to follow the advice of Denscombe (1998) when he states that,

> "…competent social research can be stated in straightforward language."

This dissertation will be written in clear language that is understandable by the general reader. This is particularly important given that the individuals making decisions regarding the level and potential cost of risks are usually non-technical executives.

Information will be researched on models and methods for risk analysis, risk management and project management. The method of gathering this information will be mainly from books and academic papers on the subject. These will be reviewed for their relevance and notes taken, over the period from the start of the project in mid December 2003 through to the end of April 2005.

One of the assumptions of this research is that there is something wrong with the methodologies because there are still project failures. Therefore, I will use deductive reasoning to derive explanations for the problems and predictions for resolutions to the problems in the area of study. My prime emphasis is on gaining understanding from the systems development methodologies and the numerous reports of project failures. It is my intention to derive models that map the project management process, which incorporates new insights in risk management.

The research design is straightforward. In the terms of Easterby-Smith et al (1999, p6), it is 'pure research'. It requires reflection and also stems from my direct experience. It involves the reading of books, articles and papers on project planning, management and examples of project failure. This includes the standards and methods currently followed for projects.

As Easterby-Smith et al (1999, p7), define reflection,

> "This is where an existing theory, technique or group of ideas is re-examined, possibly in a different organisational or social context. Results from the comparison could lead to revision and modification of the theory…"

There is an overwhelming amount of information on the subject of project failures. I need to review as much as possible to gain an understanding of how that information reveals the research problem and provides the insights on which my theories are based. As Ghauri and Gronhaug (2002, p27) state,

> "Research design relates to the choice of strategy to collect the data needed to 'answer' the stated research problem… research problems are multiple, and they come in many forms. In some cases the purpose is to understand a specific phenomenon. This will often be the case in 'qualitative' research."

My intention in this design is to understand the problem and produce new insights on the subject and add to the body of knowledge.

Checkland developed the Soft Systems Methodology (SSM) to address the analysis of organizations. Avison and Fitzgerald (2003 p47) state,

> "…soft thinking attempts to understand the fuzzy world of complex organizations."

Avison and Fitzgerald (2003 p46) observe that,

> "Organizational systems are not predictable as they concern human beings."

Systems Theory helps, but does not give the full answer where human beings are involved. Avison and Fitzgerald refer to the 'unpredictable nature and difficulty of modelling organizations.' However, this is where standards and development methodologies are important to provide a common framework and mode of working.

Systems Development is of this 'soft' nature. Therefore, this project requires qualitative research methods to be employed, rather than quantitative. Information

Systems is a technological subject and being unable to conduct purely quantitative research has been something of an embarrassment in the academic IS community. However, IS touches on people issues, which necessarily require a qualitative approach. Measurements are not straightforward in this line of research. Therefore, an attempt to understand the current activity and the place of a new model will require reading books and academic papers and using the researcher's impressions from his own experience. This will help the researcher understand the context and environment of the subject for which a model is to be developed.

The research design does not include experiments or specially developed case studies. It relies on the case studies that have already been conducted and are well documented. It does, however, include the development of a number of models. These models are of two distinct forms. Firstly, they comprise the diagrams that map the processes of project management. Secondly, they include a number of spreadsheets that give a graphical indication of the risk of project failure. They may be considered as indicators of project risk and the researcher has used these models to introduce the topic of risk management to executives and project teams of large financial organizations.

It would be difficult to validate the proposed models within the period of the MSc course. The validation of the models would require a long-term IS project and would be more suitable for a doctorate thesis. This could be the subject of future research, working as part of an IS project, using an ethnographic approach and applying the new model.

2.2 Programme and Plan of research

An analysis of the tasks involved in the project has been conducted and the time for each task has been estimated. Some of the tasks are known, such as the final dissertation, other tasks, such as an exercise to review the literature, have been identified from the lecture notes of the Research Methods module.

A number of milestones have already been determined by the deadlines for specific tasks within the project. These are to be recorded on the plan and include: -

a) The Project Proposal - needed by the end of January 2004;
b) The interim report - needed by the end of April 2004;
c) An oral presentation in the first weeks of September 2004;
d) The dissertation itself to be completed by the end of May 2005.

2.3 Management of the project

The project activity will be based upon the plan created in MS Project. In order to manage the project, estimates of time will be recorded for each activity on the project plan. This will enable the tracking of the actual progress of activities against the estimated times on the original baseline plan.
A number of milestones are to be recorded on the plan. Direct comparisons will be made against milestones in the plan. Regular weekly (or fortnightly) meetings will be held with the supervisor of the project. These meetings will provide an objective review of progress towards targets and milestones.

Time will be needed to read the papers in the field and select those relevant to this specific area of research. Access to these papers will be provided by the JMU Learning Resource Centre (LRC) and the Liverpool Central Library and the British Computer Society Specialist Groups.

The researcher has substantial experience of systems development and project management from his career in ICT Management over 25 years.
Familiarity will be needed in Computer Security and for this purpose the researcher has taken the optional module on computer security in the second semester of the MSc course. Unfortunately, the module on 'risk assessment' is unavailable during the 2003-2004 academic year. Therefore, familiarity will need to be gained by individual reading and study.

2.4 Stewardship of resulting data sets

In order to ensure that the results of this project are available to academics in the future, they will be recorded in a number of different ways: -

- A copy of the final dissertation will be provided for the JMU Library;
- A copy will be translated to a PDF File;
- The research material, results, models and the final research dissertation will be available on a Web Site

(URL - http://uk.geocities.com/ron.cooper2@btopenworld.com/Dissertation.pdf)

To ensure the long-term storage of the dissertation and data from this project, it will be burned to a CD-Rom.

During this project it has been difficult to locate some research papers from tutors at JMU. A formal manner of recording all papers from JMU academic staff would be of considerable benefit to all researchers. I would recommend that a project should be initiated to develop a database of all research papers.

2.5 Proposals for dissemination of results

As with all MSc research, copies of the final dissertation will be available in the Liverpool John Moores University Library.

An offer to make a presentation of the findings of the research will be made for the local branch of the British Computing Society. This will make a wide audience aware of the existence, importance and detail of the research.

A number of other actions will be taken: -

- Approaches will be made for publication to learned journals;
- An executive summary will be created and sent to local businesses;
- An offer will be made to make presentations on the research to the local business forums.

The executive summary will also be sent to the Project Management Special Interest Group of the BCS.

CHAPTER 3. LITERATURE REVIEW

The literature review is by no means exhaustive. As this is a 'pure research' project, it mainly deals with books and research papers to provide a context and the background to the chosen subject of research. Therefore the literature review is extensive, covering a wide range of themes. There are a large number of issues that converge on the project and may influence to outcome. These issues are covered in this literature review as a series of connecting themes, including:

- General Project Failure
- High-Profile Project Failures
- UK Government IT Projects
- Risk Analysis & Management
- Project Management
- Systems Development Methodologies
- Critical Success Factors

3.1 General Project Failures

Turban (2002 p 112) says we should learn from examples of IT Failures, stating of some IT Projects that,

> 'The magnitude and complexity… may result in partial or complete failures… the cost can be extremely high… a company may even go bankrupt as a result.'

Turban (2002 p 112) cites the example of the drug company FoxMeyer, who attempted and failed to implement an ambitious Strategic Information System (SIS) in 1996. The resulting costs forced the company into bankruptcy.

Lorin J May (1998) refers to the experience of Shari Pfleeger, who when asked to consult on a large project that was in trouble. She asked the managers to develop and document a process model for the project. She did not necessarily want the model for her own use, but wanted the managers to talk to the developers. They soon discovered that the project had become so large that they had two separate teams testing the same piece of software code. These problems can arise on large projects, especially if the team is split across multiple locations.

Yardley (2002, p12) states,

> "Whilst there is a clear relationship between the project and the process to manage that project, successful project management will not necessarily guarantee the success of the project."

This raises the issue of the initial business objectives of the project. If those business objectives were unsound, or if the marketplace changes, then even good project management will not help the project to become a success.

Yardley (2002, p10) suggests that IT project failure is characterized by the following events: -

- The degradation of an existing business capability;
- The degradation of competitive advantage;
- An increase in operating costs;
- Failure to meet critical business requirements.

He doesn't mention the waste of money, time and resources. Nor does he mention the fact that the resources had been directed to a failed project, when another project with a greater chance of success could have been initiated instead.

Goodwin (2004) expresses the hope that legislation will require companies to reveal their project failures, when he says,

> "Under proposals due to become law next year, companies will be required to publish Operating Financial Reviews to show shareholders that they have been good stewards of company funds."

Goodwin quotes Patrick Bossert, an analyst at KPMG, who said that shareholders were increasingly holding companies to account over their IT investments at annual general meetings. He quotes Bossert as saying.

> "The whole issue of IT projects and accountability has really come to the fore in the last 3 years as companies have looked how they are spending the money, and shareholders have forced them to be more open,"

In an On-Line article (McCue A., 2004), Andy McCue says that,

> " UK firms are each wasting £13m a year by not ditching failing IT projects, according to new research presented at the IT Directors' Forum last week.
>
> The survey of 300 IT and business managers found four per cent of failing projects are continued when they should be scrapped. This equates to £13.4m a year for the average large UK business with 159 projects on the go, according to Microsoft, which commissioned the research. "

McCue cited the main excuses for cost overruns were changes to plans, a poor brief and a lack of resources.

The main issues highlighted in the **General Project Failure** section include:

a) Large, complex projects should only be undertaken if staff of the required level of expertise are available;
b) Project Managers sometimes lose focus when they are involved in a large, complex project;
c) Project Teams should have regular updates to ensure that there is no duplication of tasks and to ensure that tasks are not 'forgotten' as assumptions are made that they are someone else's responsibility;
d) A project should be founded on sound business objectives;
e) Information on failed projects is not easy to obtain;
f) Monitoring by the project board should identify the need to cancel a failing project.

3.2 High-Profile Project Failures

There are too many high-profile project failures. They occur in both the private and the public sectors. They include

- The Confirm Booking System;
- Criminal Records Bureau;
- Libra, the UK magistrates courts system;
- The Individual Learning Account;
- The Child Support Agency;
- UK Inland Revenue Tax Credit System;
- London Ambulance Service;
- Taurus;
- UK Passport Agency.

The CONFIRM system was hoped to be better than SABRE, which is accepted as one of the great successes of the IS world. SABRE gained considerable advantage for American Airlines over its rivals with its computerised reservation system (CRS). The 'Confirm' project started in 1988 as a joint venture between AMR, Marriott, Budget, and Hilton. Confirm was hoped to gain the competitive advantage for Hilton, Marriott and Budget that SABRE had gained for AA. Flowers (1996 p33) suggests the main reasons for failure with the Confirm Booking System were a combination of: -

1) Using pioneering technology;

2) Attempting to connect untested sub-systems, leading to system compatibility problems;

Tony Collins (2004) summarises a report by the National Audit Office on the project to introduce an integrated system for the Criminal Records Bureau. He states,

> "A report published this week reveals how a criminal checking system, although fundamentally flawed, was allowed to go live by the Criminal Records Bureau. The need for a radical reform of the way government manages IT projects was underlined by a report published last week by the public spending watchdog the National Audit Office."

If this system had been in place, then perhaps the Soham murders would not have happened. Collins notes the fundamental mistakes highlighted by the National Audit Office including:

- Timescales too tight;
- Constructive criticism ignored;
- Beware the cheapest bid;
- Effective consultation with potential users came too late**;**
- The cost of problems fell in part on the taxpayer;
- The system lacked flexibility;
- Poor communication between the supplier and customer.

An article in Computer Weekly by Tony Collins (2003A) describes the problems of the LIBRA system, which was intended for UK Magistrates Courts. In his article of 11/11/2003, Collins summarises a report from the Public Accounts Committee (PAC),

> "Under Whitehall's original plans, magistrates courts were supposed to have replaced their systems from different manufacturers with standardised systems by 1993. Now, over 10 years later, after three failed projects with a variety of suppliers, magistrates courts still do not have standardised systems to handle cases."

Computer Weekly has identified a lack of accountability in the higher echelons of Whitehall and the ability of mandarins to take risks and spend money without fear of personal consequences. They say that this sets the public sector apart from the private sector. The strategic decision to start a project must be taken for valid business reasons. If this is not done, this is a very important factor in project failure. However, business reasons are often combined with and complicated by political issues with UK Government projects. The stakeholders for a UK Government project are not so straightforward to identify with specific roles. The sponsor is often the department, or minister of state. This is necessary if a centralised system is needed for the whole country. However, this is diametrically opposed to the tenet that users should be fully involved at the earliest stages of a project to ensure success. The users in the cases of country-wide systems have not been the driving force and have not initiated the projects. Therefore, there will be a tendency for the regional users to feel that the

system has been imposed upon them. This feeling will further result in a lack of cooperation and perhaps direct opposition. This generation of new projects from a centralised position leads to UK Government projects being 'special cases'. It sets them apart from the projects that are generated in business organizations.

Accountability is also an important issue when Computer Weekly describe a major internet-based project at Prudential Europe collapsed in 2001, an entire layer of senior executives lost their jobs and had to leave the building within minutes of being told. However, on the Libra project, the accounts committee's report pointed out that nobody in the public sector has been held accountable for the disaster. "As a result of the failures on the project, some people [at Fujitsu] had their contracts terminated and ICL had bought in new management".
Collins extends the argument to a discussion of lessons for the NHS. There are remarkable parallels between the problems of secrecy and lack of consultation causing disaffection and scepticism among Libra's end-users, and the criticisms of the Department of Health as it approaches the signing of IT contracts with local service providers, worth potentially billions of pounds.

This is very worrying, as the NHS contract is progressing amidst reports that the BMA is unhappy and NHS staff are not being involved. It should be the subject of future research.

UK Government projects are complicated, but the costs of failure are too high to leave lessons unlearned. Some factors are known to almost guarantee project failure and it is obvious that a number of UK Government projects are failing to identify these. The decision-making over what projects to start and how to initiate projects does not seem sound. This results in project failure at the very first hurdle. The major factors in ensuring project success at the start of a project are: -

a) Systems should require a valid business justification;
b) The business justification should also include regional users where a central, country-wide project is entailed;
c) Identify stakeholders;
d) If users are not involved at the earliest stages, the system will not be accepted;
e) A feasibility study and cost/benefit analysis should be conducted;

f) The costs and benefits should be measurable and monitored throughout the duration of the project;
g) A mechanism for changing, or cancelling the project should be established, which is triggered from project progress towards milestones and the monitoring of costs and benefits.

The main issues highlighted from the Libra case study are:

a) Lack of accountability of sponsors;
b) Lack of control of contract developers;
c) Original specifications were considered 'unworkable', but this did not change the direction or scope of the project;
d) Project Boards should not initiate projects if there are serious doubts;
e) The problem of the early days of computing was that developers would assume they knew what the users wanted. They would go away for 6 months to develop a system and would be surprised when the system was rejected. This case study seems to have made the same mistake, but in reverse. The UK Government has assumed that the developers knew what was needed of a system and left them to get on with it. It is no surprise that this resulted in a less than acceptable system.

The Individual Learning Account was intended as one of the main thrusts of the Labour Government's offering for IT and other skills training. However, a lack of planning and badly drafted operational requirements resulted in abuse of the system and its eventual withdrawal. Computer weekly describes the issues in their article of 15/04/2003 by Bill Goodwin. Goodwin states that,

> "The government is to offer compensation to IT training companies that took part in its ill-fated Individual Learning Account programme, following a damning report by the Parliamentary Ombudsman. The report accuses the government of "serious maladministration" in creating and setting up the scheme, which aimed to help people to improve their IT and other work-related skills. The ILA scheme, one of the Labour Party's flagship election promises, was suspended by the government at the end of 2001 after running massively over budget amid allegations of fraud and abuse by unscrupulous firms. The sudden closure of the ILA scheme is believed to have forced

> hundreds of legitimate IT training companies out of business and led to thousands of job losses in the training sector."

The Ombudsman's investigation criticised the Department for Education and Skills and IT services company Capita for designing the ILA scheme around a website that lacked basic security measures.

There is a strange emphasis from UK Govt on getting the contract right. They should be getting the partnership right to ensure the success of the projects that they undertake. The push for contractual wording smacks of a cover-my-back and set-up someone to blame mentality and approach. And if this is the approach at the outset, then it does not bode well for the ability of the stakeholders to work as a genuine team for the combined success of the project. It is a worrying aspect that UK Government project managers should have an attitude that the contract is more important than the relationship between the sponsors, designers, developers and users.

There is now a ground-swell of thought that contracts should be drafted in very general terms, leaving the details of deliveries to be determined and agreed between the parties as more information is known. This approach will lead to more team-work and the sponsors will need to be more involved in the project.

The main issues highlighted from the Individual Learning Account case study are: -

a) UK Government consider contract wording to be the most important factor in their projects;
b) Security implications were overlooked, allowing accounts to be accessed by other than their rightful owners;
c) Project Managers failed to allocate responsibility for controlling security risks;
d) The DES failed to keep records of key government policy decisions, which had significant implications for the project.

Computer Weekly summarised a damning report from the Public and Commercial Services union in an article on 15/07/2003 by James Rogers. Rogers warned that the system, supplied by Texas outsourcing firm EDS, is beset by serious problems. It was designed to help implement the government's child support reforms, the system went live in 2003, nearly 12 months behind schedule. The delay allowed EDS to undertake

exhaustive testing but the PCS union, which represents the majority of CSA staff, said important glitches have still not been ironed out

The main issues highlighted from the Child Support Agency case study are:

a) Operational requirements have not met expected response times or throughput volume;
b) Interfaces with other Information Systems has not supported expected levels of throughput;
c) The design has not met Management Information requirements;
d) Access rights have not been designed or configured correctly.

A Computer Weekly report of 24/07/2003 by the Parliamentary Reporter suggests that the UK Government are urged to seek compensation from EDS. A committee of MPs has urged the government to demand compensation from its IT supplier, EDS, after hundreds of thousands of people did not receive their tax credits on time.

The main issues highlighted from the UK Inland Revenue Tax Credit System case study are:

a) Operational requirements have not met expected response times or throughput volume;
b) Project monitoring of quality and progress has been lacking;
c) Adequate contingency measures were not taken to cope with emergency payments in the event of the system failing;
d) The project was the biggest ever undertaken by the department and perhaps the expertise was lacking;
e) The timescale was too short for a project of this scale and complexity;
f) There was limited time available for live testing;
g) A large number of separate elements needing to come together in a short time for the payments system to go live by the deadline of April 2003.

3.3 UK Government IT Projects

A List of Problematic Projects includes:
Department of Work and Pensions
Passport Agency
Ministry of Defence
National Air Traffic System
Individual Learning Account
Inland Revenue Tax Credit System

A number of these problem projects have been dealt with under the previous section of high-profile failures. However, it is worthwhile giving some more detail into some other UK Government projects. It is also worthwhile giving a summary of the reversal of policy over Public Finance Initiatives (PFI's) for UK Government IT projects.

No organization likes to publicise project failure. That is why some degree of secrecy has been encountered. Project failures have been covered in the general media. The Computer press, such as Computer Weekly and On-Line media such as Silicon.Com have identified a large number of failed UK Government projects. However, the UK Government cannot hide its failed projects as the National Audit Office (NAO), the Public Accounts Committee (PAC) and the Office of Government Commerce (OGC) exist to provide transparency. Therefore, UK Government projects are better reported than some projects of private organizations, which remain hidden within consolidated balance sheets.

The 'Computer Bulletin (Sept 2004, p15)' refers to the report of the Select Committee on the Department of Works and Pensions. This article, 'MPs slam failing govt projects' says that the report reflects upon the whole of UK Government IT projects. Sir Archy Kirkwood said,

> "Government has produced mountains of guidance to encourage successful IT projects, but there's no way of knowing whether it's being followed until the IT fails and it's to late."

The article continues to describe other projects that will fail due to no clear business objectives when it states,

> "Customs and Excise has been slammed by the Public Accounts Committee for committing hundreds of millions of pounds to IT programmes with no clear idea of the benefits."

A Computer Weekly article on UK Government IT Projects on 17/02/2004 was contributed-to by a number of Computer Weekly reporters. This article reported that,

> "A House of Commons select committee is half way through one of the most fundamental reviews of government IT ever carried out. The MPs are examining the Department of Work and Pensions' management of its IT projects, and may seek to draw out lessons for the whole of Whitehall."

Computer Weekly has taken upon itself a role to monitor UK Government IT projects. The article reports on the review of the Department of Works and Pensions modernisation programme and the Child Support Agency. The Select Committee added that,

> "IT is central to the department's efforts to improve its quality of service and reduce fraud and error. The committee's investigation will take a close look at the Child Support Agency's IT overhaul and best practice in general."

The article continues,

> "Peter Gershon, chief executive of the Office of Government Commerce, told the committee that no major public sector organisation in the world had completely got to grips with IT project failure. But, we think we are among the leaders in cracking the problem."

Gershon added that,

> "Gateway reviews are uncovering weaknesses in the early stages of projects and helping to ensure that these are tackled."

The main issues highlighted from this case study are:

a) UK Government consider contract wording to be the most important factor in their projects;
b) Introduce peer reviews to reduce the problems of people checking their own work;
c) A senior responsible owner should act as a bridge between technology and the business world;
d) UK Government is trying not to roll-out 'big bang' projects;
e) Departments to avoid announcing 'go live' dates;

f) Ministers should conduct proper risk analysis before deciding on policies that rely on IT;
g) Post-contract changes to requirements must be managed carefully.

An On-Line article from Silicon.Com by Andy McCue (2003A) on 03/11/2003 reported that,

> "The Ministry of Defence (MoD) has overhauled project management procedures after writing off £118m on a ditched IT system. They have also overhauled project and risk management as a result of the problems encountered.

McCue continued, saying that,

> "The Defence Logistics Organisation (DLO) – the MoD's internal buying arm – canned a single common inventory project called Defence Stores Management Solution (DSMS), which would have enabled more accurate tailoring of stock holdings, after executives found the benefits did not outweigh the costs."

This is not necessarily an indication that the business justification was not assessed thoroughly enough. A simple cost/benefit analysis conducted before the start, can illustrate the viability of the project. However, when changes are made during the project, it is necessary to continually review the viability of the project.

A Computer Weekly report of 03/07/2003 by Tony Collins (2003B) 'Revenue flouted warning over "high risk" tax system' Computer Weekly Tuesday 3 June 2003. Collins reports that the Tax Credit shambles has cast doubts over Inland Revenue's project planning. Collins states that,

> "The Inland Revenue went live with a £150m system to pay new tax credits in April 2003, despite warnings from IT auditors that there had been too little time for live testing and the project was high risk. The department now faces accusations that the system's introduction was a shambles."

Late in 2003, the Office of Government Commerce conducted a gateway review where it said the project, the biggest ever undertaken by the department, was well run but high risk for a number of reasons. These included the limited time available for live testing and the problem of a large number of separate elements needing to come

together in a short time for the payments system to go live by April. Collins states that,

> "Despite these warnings the department went ahead with television advertising and was committed to the April deadline for the system to go fully live. Hundreds of thousands of claimants have not been paid on time, have not been paid at all or have received the wrong amount."

The article 'IT strike at Home Office' in Computer Weekly on 28/05/2003 by Mike Simons (2003) reported that,

> "Home Office payroll and pensions staff walked out and were set to strike further in a dispute over what they call 'an unworkable computer system'. The action, by 350 members of the Professional and Commercial Services Union in Bootle, is the section that handles the payment of salaries to 70,000 civil servants at the Home Office and its agencies, including prisons, immigration, passport offices and the Criminal Records Bureau."

The main issues highlighted from the case study of the Payroll system at the Home Office are: -

a) Operational requirements have not met expected response times or throughput volume;
b) Users of the system have not been 'bought-in' to the project as there is so much staff unrest;
c) Clerical workarounds are needed to plug gaps in the system functionality.

The article from Silicon.Com 'Government scraps PFI for IT projects' by Andy McCue (2003) on 16/07/2003 reported that,

> "The government has scrapped the use of controversial Private Finance Initiative deals for public sector IT contracts following a catalogue of costly high-profile projects."

The main issues highlighted from the article on Private Finance Initiative are:

a) Private and public partnerships have not had a good record in UK Government IT projects;
b) The Pathway project for benefit payments by smartcards and the Libra magistrates courts system were PFI projects.

The article from Silicon.Com 'Public-sector IT could learn from private-sector success' by Jo Best (2004) on 12/05/2004 reported that,

> "BuyIT, the IT best-practice network, has launched its framework for e-government to give the public sector a subtle hint on what it could learn from the private sector with technology."

They continue in the hope that,

> "Given Chancellor Gordon Brown's budgetary aim of saving £20bn in the latest budget and the government's history of less-than-glorious IT project successes, the network hopes its recommendations will be timely."

The National Audit Office reports are scathing on the Child Support Agency, Criminal Records Bureau and the Individual Learning Account. The report on the payment of Benefits by a new Card System for the Department of Social Security has particularly interesting conclusions as follows: -

> "There may be a temptation to think that the Payment Card project failed solely because it was large and complex or because it was a pioneer for the Private Finance route. This is not the case. Various factors contributed to the project.s failure and their effects are difficult to disentangle. Looking to the lessons that can be learned by Government, important reasons for the projects failure were:

- divided control. The project was run by two organisations, the Department and Post Office Counters Ltd, with different objectives
- inadequate time for specifying the requirement and piloting. To save time and money, insufficient work went into specifying the project and for demonstrations by bidders. The result of skimping at the start was vast delay and as it turned out, wasted money.
- a shared, open approach to risk management across the whole programme was not achieved.

The NAO report includes an executive summary, which concludes by saying,

> "Mistakes of this kind are made time and time again. A Report by the Committee of Public Accounts 'Improving the Delivery of Government IT

> Projects' published in January 2000, shows that government has found learning from and applying its previous experience in project management very difficult."

The executive summary continues,

> "In their report, the Committee of Public Accounts called for the training of more skilled project managers and a high degree of professionalism in the definition, negotiation and management of IT contracts to help address this. And a wider perspective must be maintained."

3.4 Risk Analysis & Management

The previous parts of this section have documented the problems with some high profile and expensive UK Government IS projects. Within the project management of these projects 'risk' should be considered a major factor that needs to be analyses and managed. Where IS projects have failed, it is likely that risks have not been identified, analysed and managed appropriately. One of the main propositions of this research is that 'risk' is poorly understood by the project management fraternity.

John Adams (1995, p9) suggests that risk is more of a social construct than an objectively agreed concrete item. Risk is a fuzzy issue, where one person considers that there is no risk, but another may consider the risk to exist and be too high to contemplate. The slide that children enjoy in icy weather, is not considered a risk to any youngster using it. But, icy pavements are a considerable hazard to older people. Risks may be considered along a graduated scale, at one end of which is no risk and at the other is extremely high risk. However, different people will place the same issue at different points along this scale. Adams (1995, p1) describes risk as such a general topic that everyone is an expert to some degree. He says even children as,

> "junior risk experts are performing a balancing act."

It is entirely appropriate to consider the assessment of risk and risk planning as a balancing act. It is the balancing of the protection of valuable assets against the probability of their loss, incapacity or destruction. There are a considerable number of 'unknowns' while risks are in the potential stage. And the most significant of these for this research is the ability to identify the risks associated with an IS project. Even after an event there may remain conflict regarding the severity of risks. For example, no planes dropped out of the sky on the first day of the year 2000. Consequently, it has been argued that the risks of the Y2K phenomenon were exaggerated.

However, perhaps the reason that no large-scale disasters occurred was due to the fact that exhaustive analysis and updates had been made in advance to remedy the Y2K faults. From my experience, significant projects were undertaken to ensure the year 2000 would arrive without surprise problems being encountered. I was actively involved in the correction of faults in preparation for Y2K for 18 months leading up to 2000. These projects were performed in conjunction between Software Houses and

their clients. I worked as a consultant with a number of Software Houses, who identified Y2K as a useful new marketing channel and revenue stream. The Software Houses worked in partnership with their clients and shared the costs of the Y2K corrections. Consequently, in my estimation, I regard the risk of Y2K to have been assessed in advance, with funding and resources arranged to initiate projects in time to make the corrections needed.

Boehm created the Spiral model of systems development (Appendix A). This is the first model that emphasises risk analysis as a central activity in each cycle of the spiral. However, there are very few detailed instructions on how to approach the risk analysis process. And perhaps this is the failing in many development methodologies; an assumption that risk is understood and easily identified by anyone. This assumption is patently unsound. Risk is seen differently by different people. The same issue may be seen as a risk to one group and not recognised as a risk by another. Icy pavements, for instance, are considered a menace for older citizens, whereas they are a source of wild entertainment to young children.

Boehm (2000) defines risk as follows,

> "***Risks*** are situations or possible events that can cause a project to fail to meet its goals. They range in impact from trivial to fatal and in likelihood from certain to improbable. A risk management plan enumerates the risks and prioritizes them in degree of importance, as measured by a combination of the impact and likelihood of each. For each risk the plan also states a mitigation strategy to deal with the risk. For instance, the risk that technology is unready may be mitigated by an appropriate prototype implementation in an early spiral cycle."(p3)

The work of Boehm was used as prime direction in this research on the manner in which risk fits into the systems development process.

Risks are 'fuzzy' issues. There is no simple manner in which to identify a substantive risk. The difficulty of identifying risks is partly due to their nature. There are a lot of 'soft issues' and risks are not always obvious to everyone. The organizations that had offices in one of the twin towers and their document storage and Disaster Recovery sites in the other tower only realised the extent of their risk exposure after the event.

Risks are not only things that have physically gone wrong; they are also things that are mere probabilities. It is also not straightforward to allocate costs to the risks. The paper by Kontio J, Getto G, Landes D (1998) illustrates a number of practical methods for identifying risks. This research will attempt to follow-on from these guidelines in locating risk within the new model. See Appendix B for a model of decision making for risk analysis (Kontio J). See also Appendix C for a Risk Analysis Model from Kontio.

Pfleeger (2003) refers to some of the basic principles of risk analysis and management. Pfleeger (2003, p507) also outlines Steps of Risk Analysis for security issues

1. Identify Assets (create an Asset Register)
2. Determine vulnerabilities
3. Estimate likelihood of exposure/exploitation
4. Compute expected annual loss
5. Survey applicable controls and their costs
6. Project annual savings of controls

These activities may also be adapted to apply to risk analysis for an IS project.

Yardley (2002, p144) suggests that risk management can provide a number of important benefits, including: -

- Visibility of business risks and technical risks for key stakeholders;
- The ability to concentrate resources into those areas where risks are high and to contain risks within reasonable limits;
- Management of risks in a consistent and quantifiable way.

Yardley maintains that the risk management process must be introduced at the start of the project for it to be of any practical use. It must also be performed continuously throughout the lifecycle of the project.

Yardley (2002, p144) states that,

> "Within an IS project, risk can be defined as any event that may jeopardise satisfying the objectives of the project."

Yardley (2002, p144) continues to assert that,

> "Ignoring the risk management process condemns the project team to managing risks passively and reacting when each occurs."

Yardley (2002, p145) describes the elements of the risk management process in the following diagram,

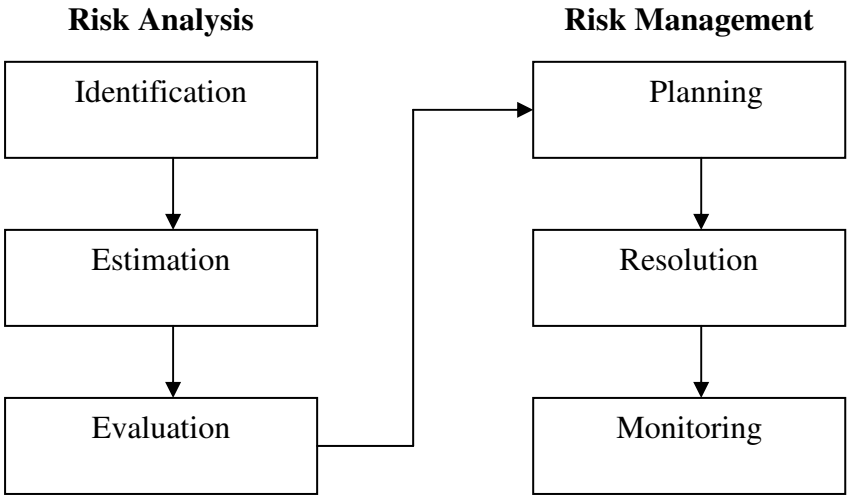


Figure illustrating the Risk Process (Yardley 2002, p145)

Yardley (2002, p147) lists business risks as: -

- Legislative activity;
- Actions of competitors;
- The validity and viability of the business case;
- Market forces;
- Whether or not the project supports the organization's business and IT strategy;
- Political factors (public opinion, government interference);
- The project delivering the stated requirements, but not fulfilling the customer's expectations.

Yardley (2002, p147) lists project management risks as: -

- People risks

  - Failure of supplier to deliver;
  - Business sector experience of supplier;
  - Inexperience of supplier development team;
  - Inexperience of project manager and project team;
  - Contractual risks;
  - Availability of resources;
  - Lack of skills;
  - Relationship between customer and supplier.
- Planning risks
  - Failure to specify all requirements;
  - Large project size;
  - Poor cost estimates;
  - Failure to specify accurate requirements;
  - Unrealistic or unachievable requirements;
  - Failure to test adequately;
  - Deliverables do not reach quality standards.
- Technical risks
  - Development of a highly technical or complex solution;
  - Lack of technical expertise within the team;
  - Geographically dispersed development;
  - Use of leading-edge technology.

The RiskIT Method & Models

Kontio has a number of models that are useful to show how risk management can connect with project management. I will use the models that Kontio has created as a foundation upon which to build my own models.

Jane Ferris describes a number of risk-related issues and illustrates some models for risk analysis in her paper ‘An investigation and analysis of risk models and the creation of a new framework for IT investment risks and model for risk management’.

Leslie Willcocks and Catherine Griffiths refer to a number of risk-related issues in their paper ‘Predicting Risk in Large-Scale Information Technology Projects’. The

paper contends that risk analysis in large-scale IT projects is a critical task. It sets the risk parameters as a foundation upon which subsequent management needs to take place. The paper reviews the risks that arose in a number of case studies and proposes a risk profiling tool that can be used to help predict risks in future projects.

Leslie Willcocks and Valerie Graeser (2004) also refer to risks in their article 'Delivering IT and E-business Value'.
They maintain that mitigating risks in the SDLC includes: -

- User involvement
- plans should be more flexible
- Strategic alignment with the business
- Shorter projects and more frequent deliveries
- Contingency planning

The contingency planning is an aspect of risk analysis and management that receives further significance within my model.

Roberto Meli describes the SAFE (**S**afe **A**ctivities **F**or **E**nhancement) method, which allows the Project Manager to gain the most complete awareness possible of the individual and meaningful causes of risk for a specific project by examining general and particular checklists, and by using creative group techniques and interaction."

In his paper 'Risks, requirements and estimation of a software project', Roberto Meli builds on his earlier work and continues to explore ways in which a project can be managed to better ensure success.

Leslie Willcocks and Catherine Griffiths highlight some case studies in their paper 'Predicting risk in large scale IT Projects'. The case studies include some of the most high-profile IT Failures worldwide and tries to extract ideas on how to avoid them. Willcocks suggests that Risk Analysis is undervalued and under-analysed. The paper sets out to investigate seven major IT projects,

- The Singapore TradeNet System;
- European Videotex - The French Minitel System;
- European Videotex - British Prestel System;

- European Videotex - German BTX System;
- The Indian CRISP Project;
- The UK DSS System;
- The UK Stock Exchange TAURUS System.

Willcocks (p20) states that,

> "The complex nature of risks in large IS projects is well exemplified in the DSS case, with the public sector setting also bringing distinctive outer and inner contextual factors to bear."

He notes a number of factors coming together in the DSS project, as follows: -

- Business Requirements were changed at very short notice. UK Government reforms to the methods of paying social security benefits were introduced within the first period of the project. The original design was no longer appropriate and a new design was needed;
- Due to concentration on the new payment requirements a number of smaller systems, designed to improve quality of service were dropped;
- A high proportion of consultants were used compared to permanent staff. This resulted in a lack of expertise of the DSS admin systems within the project team;
- The project was planned for 17 years. This is an exceptionally long period. Government changes and political reversals were virtually guaranteed to adversely affect this project.

Willcocks (p29) also cites the TAURUS system as one where lessons can be learned. He suggests the main business impetus was from the need of the London Stock Market to move to electronic share dealings from a paper-based system that could no longer cope with the volume of transactions. However, City interests, such as registrars feared for their livelihood if share certificates were abandoned. This created a strong group resisting the introduction of automation. As Willcocks (p30) states,

> "This presented a major dilemma for the Stock Exchange. "

And it was a dilemma that was to pull the project in too may different directions for a successful conclusion to ever be a possibility. Willcocks continues,

> "The main focus was lost and decisions regularly swung from developing a massively centralised computer system to the provision of an integrated network of computer databases, with the Stock Exchange acting as the 'hub'."

The TAURUS system is a prime example of an IS project that did not start off with a clear, overall business objective. The CONFIRM System also falls into this category, with American Airlines, Hilton & Marriott hotels and Budget car rentals all wanting different things from the system. In hindsight, it is simple to see that the mix of objectives was never able to be reconciled in a single system. However, the question must remain as to how the decision was taken to initiate these systems with such unclear and conflicting business objectives.

Willcocks summarises the typical problems encountered in IT-based projects as,

- Lack of strategic framework, or conflicts over strategy;
- Lack of organizational adaptation to complement technological change;
- IT supplier problems and general immaturity of the supply side;
- Poor management of change, with particular neglect for its implications for organizational and project structure, processes and culture;
- Too much faith in the 'technical fix';
- A love of technology for its own sake, or for its novelty value, with resulting inappropriate applications – too often IT has been solutions looking for problems, and there has not been a major demand for the resulting product/service;
- Lack of skills to support implementation; and lack of exploitation of a wide range of options, resulting in the exclusion of lower technology alternatives.

The Paper by Jane Ferris 'Investigation in Risk Analysis' is one of many that my research will follow because it,

> "…focuses on the published literature relating to IT investment risk frameworks and prescriptive management techniques currently available to develop practical management aids to reduce the occurrence of unsuccessful IT projects."

In his paper, 'Software Development Risk: Opportunity, Not Problem'. Roger L Van Scoy (1992) describes his goal to establish an effective risk management ethic as standard practice in the software engineering industry. He models the Risk Assessment Process shown below in his Figure 3,

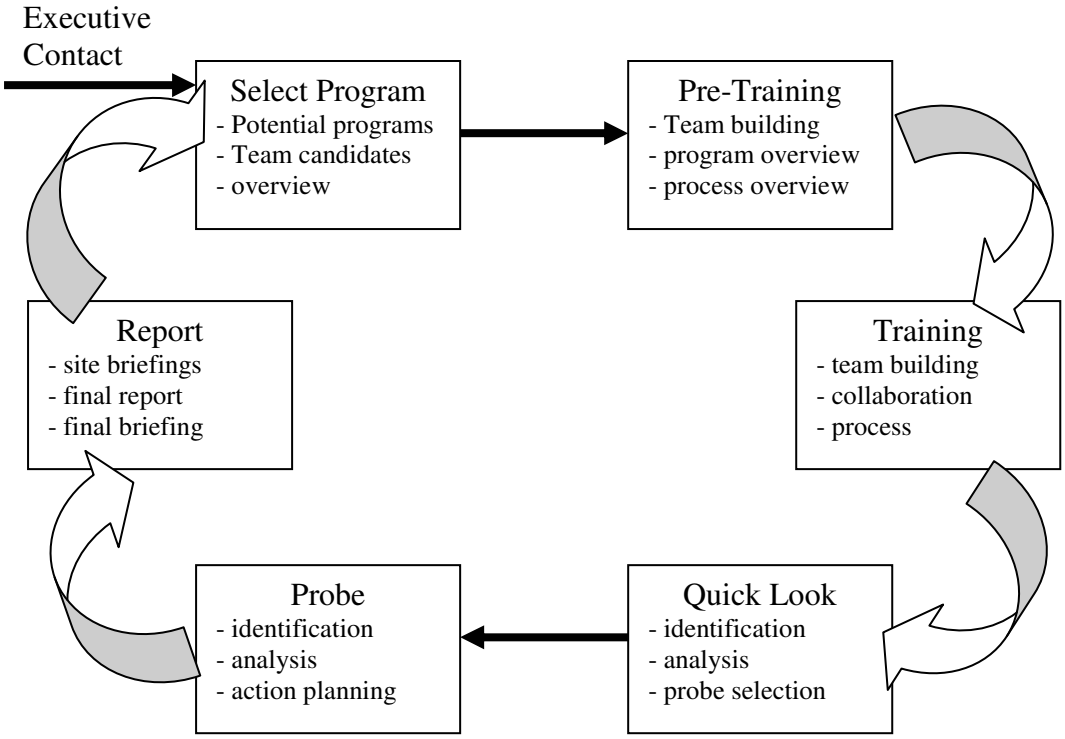


Fig 1 – Risk Assessment Diagram from (Van Scoy 1992)

Van Scoy also follows the 'Systems Thinking' approach when contends that,

> "Risk assessment provides a snapshot of the risk situation and is part of a viable risk management program. Although snapshots are valuable, effective risk management requires continuous vigilance and application of a risk ethic. A risk ethic involves everyone and is a continuous process of identifying, communicating, and resolving risks in an open and non-threatening environment. non-threatening environment. "

Van Scoy is recognising here that to understand the process properly, necessarily entails a recognition that things are not merely static, but dynamic. He proposes that risk management is a continual process throughout the life of the project.

Van Scoy concludes by saying,

> "Risk does not have to be negative. In fact, knowing our risks provides opportunities to manage and improve our chances of success."

The paper by Van Scoy supports my argument that risk management needs to be better understood in Systems Development and project management. He suggests that an 'ethic' is needed for the project team. I understand this to be similar to the 'customer service ethos' that should rule the approach of the IT Helpdesk. Instead of the IT Helpdesk operatives thinking that calls are an intrusion that they could do without. They should consider the callers as customers and actively attempt to satisfy their customer's needs.

This is the same with the project team. Their approach should be to engage with the risks, recognise them and handle them in an organised manner. However, there does not appear to be a great level of understanding of risk management within project teams. This is one of the reasons that a model for the risk management process is needed and to be created in this research.

3.5 Project Management

The art of Project Management has been developed over the last twenty years. Some ways of working have been found to be more effective than others and these have contributed to best practice. The evolution of software systems and the management of these projects have been influenced by uncertainty and risk. Innovations of tools, techniques and methods have helped to improve the systems developments and the project management processes. Unfortunately, fundamental problems continue to be encountered.

David Yardley (2002, p3) attempts to address two main questions:
"Why do IT projects continue to fail?"
"How can I ensure that future projects I am involved in are a success?"
Yardley (2002, p8) lists a number of factors that a 'perfect project' would include: -

- Strategic business planning indicates a clear need for a number of IS projects.
- A business program is established to co-ordinate all IS projects within the organization and establish standards and best practice across them.
- The project manager is selected on merit.
- The project manager is given a detailed and unambiguous requirements specification.
- The project manager is given time to produce a plan and the understanding that a budget will be provided and all the resources requested and the ones that had been forgotten.
- The entire organization knows how important the project is and give their full support and co-operation.
- The project manager is not infallible and the organization understands this. If mistakes are made in planning, there is a painless and straightforward process of change control.
- The project sponsor understands how last minute changes to the scope of the project can substantially increase the risk of failure and withholds additional functionality for the next release of the product.
- At the end of the project, the project manager is first to thank the project team, closely followed by the users. Both parties are happy as the system meets all expected requirements and significant business benefits will be gained as a

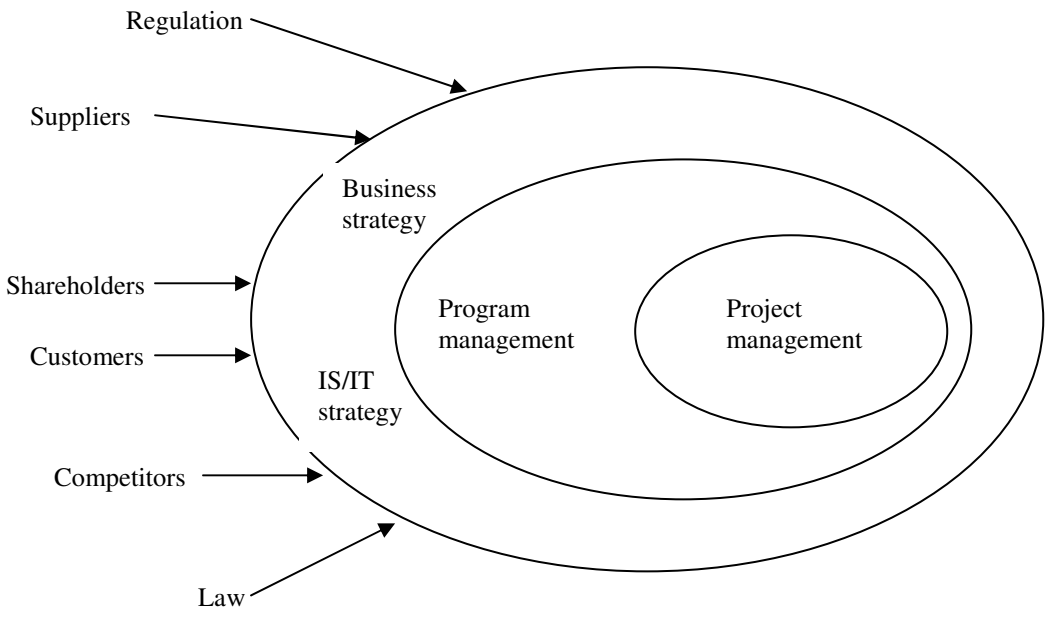
result. The project has implemented key components of the business strategy and the efforts of those involved are recognised through the activation of the organization's reward and remuneration process.

However, he misses the factor that the majority of analysts have suggested is the most important, that of user involvement.involvement. Yardley also list a number of IS Failures and gives details of success factors. However, Yardley's book is particularly important because it outlines a distinction between 'project failure' and 'project management failure'. Yardley suggests IS Failure is not merely exceeding budget, timescale or quality. These are the classic Project Management failingsfailings and are especially visible and a major factor in project failure. This is an important distinction and one that provides support to one the main themes of this dissertation; bad project management can almost guarantee project failure, but a good project manager can be instrumental in helping project success.

Yardley (2002, p11) suggests that,

> "…there should be a genuine concern over the role of project management within a project."

Yardley illustrates the scope of Project Management in the following diagram,



Yardley (2002, Fig 1.1 on p12) - External Factors influencing the success of an IS project.

Yardley (2002, p12) continues by saying,

> "What is becoming clear is that many factors that influence the success of the project lie outside the scope of project management."

I cannot agree with his ideas about project management scope. The Project Manager should cover the whole internal and external environment. Otherwise there will be no success. Success depends upon the Project Manager planning all aspects of the project before the start and then during the project, all external influences and any other eventualities must be monitored. It is obvious that it is not always possible to control the external influences. However, the Project Manager must attempt to set a framework in place at the outset by which all risks are communicated. The Project Manager must be aware of eventualities to be able to manage the project. Occasionally, the board may make a decision that is not communicated to the Project Manager. If this occurs, the Project Manager is not in a position to manage the project properly and the board should be aware that failure of the project is more likely.

Yardley is recognising that there are many changes that occur during the life of the project that may have an affect on the project. And it is often the case that the project manager has no control over these changes. For example, new Social Security Benefit Payment legislation was enacted that changed the whole direction of the UK DHSS system. Sometimes, the Project Manager will attempt to overcome this situation by controlling all aspects of the requirements. The Project Manager will attempt to ring-fence the project and stop any changes so that progress can be made. However, as has been detailed earlier, this merely keeps the project moving along an original direction that may be no longer appropriate due to changes in the environment. Therefore, the Project Manager cannot merely close the project to the external influences. This could mean that the final system delivered may no longer be fit for its purpose. However, this activity of the project manager, to continually monitor for changes, may be impossible if the board level decisions and actions are kept hidden from the Project Manager.

In his paper, Lamers (2002), highlights the distinction between work breakdown and the product break down. This paper is a response to a paper that attempts to suggest that project management is a combination of managing work, deliverables and resources. Lamers suggests that there is a blurring of the Project Management

deliverables and the project deliverables. But, he contends that it is all project management.

The paper 'Measuring Change Requests to support effective project management practices' by Roberto Meli is focused on an operational approach to the functional measurement of Change Requests and on the related expected impact on the amount of additional effort and duration needed to implement them.them. Meli gives guidelines on how to handle changes to the proect, which should be included in IT/IS best practice.

The PRINCE2 Methodology

UK Government projects use the PRINCE2 standards and methodology. However, they still suffer considerable failures. So, does UK Government adhere strictly to the PRINCE2 standards, or are there issues that PRINCE2 does not handle?

PRINCE (PRojects IN Controlled Environments) is a project management methodology that is recognised throughout the world. It was originally developed for UK Government IT projects. The history of Prince is described in the Wikepedia On-Line Encyclopedia as,

> "It was initially developed in 1989 by the Central Computer and Telecommunications Agency (CCTA) as a UK Government standard for IT project management; however, it soon became regularly applied outside the purely IT environment."

PRINCE2 was released in 1996 as a generic project management method. It has become increasingly popular and is now the standard for project management in the UK, The most current version was released in 2002.

A number of the high-level principles from PRINCE2 are worth noting at this point in the research.

a) PRINCE2 emphasises the delivery of products from the project. However, this may sometimes encourage the Project Manager to concentrate upon the achievement of a product by the deadline, rather than considering the quality of that product. For example, it is the responsibility of the Project Manager for the Business Requirement Specification to be produced by the end of the Business Analysis stage of a project. This should be produced by an agreed deadline. The Project Manager should not

merely concentrate upon the deliverable, but also the quality of the product. The responsibility of the Project Manager should also include ensuring that the product is of the required quality. If the business spec is produced on time, but has incomplete detail, or is incorrect, then it will set the whole project off on the wrong footing. However, it is not the responsibility of the Project Manager to draft the specification. In order to validate the document, the Project Manager should hold a workshop, where the experts can confirm the validity and give their sign-off.

b) The PRINCE2 project must be approved by the 'project board'. The project board then manages by exception. Progress reports are discussed at project board meetings, but the PM is expected to manage the day-to-day activities of the project.

Wikepedia describes some of PRINCE2's strengths:

- It produces highly standardised projects, which share a common approach, vocabulary and format of documents. Consequently, it is a transferable skill and anyone familiar with the method will recognise the stages and documents of any other project;
- It is a method that has been built from the experience of project managers and includes the best practice in project management;
- It uses a principle of management by exception. This allows the project manager to perform their role without interference from the project board.

The PRINCE2 Introduction by Fiona Spence of CC Consulting Ltd gives the following examples of bad project management practice:

- Poor estimation of costs
- Lack of planning
- Inadequate criteria for what is required
- Poor managerial support
- Poor communication
- Unclear roles and responsibilities

Spence contends that following PRINCE2 standards can help to avoid these problems.

Colin Bentley (2002, p2) discusses some of the typical problems that users described from their projects,

- The end product was not what was originally requested
- The system and project changed direction without anyone being made aware of it
- The costs escalated without anyone realising it until it was too late
- Users were advised of delays too late to add any additional resource
- Users were kept in the dark during development and not given enough training to make the system work for their benefit
- System was unreliable and needed costly maintenance.

These user experiences show that there is a general lack of user involvement, lack of planning and co-ordination, lack of communication and lack of quality control. These are all issues that Bentley suggests that PRINCE2 can overcome.

Wikepedia describes some of PRINCE2's weaknesses:

- A number of organizations use PRINCE in name only. They over-indulge the flexibility and cherry-pick from parts of the methodology. Thereby they fail to adhere to its key principles;
- The PRINCE2 documents sometimes become the ends in themselves and the actual project falters;
- PRINCE2 stresses the need for good communication and regular meetings between stakeholders. Some organizations take this to extremes and the meetings get in the way of the work;
- PRINCE2 can be too much of a sledgehammer to crack the nut of smaller projects;
- PRINCE2 does not dictate the treatment of requirements gathering. It is a project management methodology, not a systems development methodology. Sometimes the functions and responsibilities become blurred in IS projects.

PRINCE2 may also be subject to a number of issues that Wikepedia does not mention, as follows:

- Having standards allows PRINCE2 to be a transferable skill. However, this does not mean that it is a simple method. It takes years of experience to become

proficient in its practice. Therefore, the experienced project manager will be far more effective than one straight off a training course;

- In using a principle of management by exception the project board may be inclined to leave everything to the project manager;
- Because the project manager is working to the PRINCE2 system, he or she appears to be extra efficient and able to handle anything. This may sometimes encourage the project board to expect the project manager to perform the work of the business analyst. The project manager will gain an understanding of the business functions during the course of the IS project. This does not mean that they are the business expert and should not be expected to be responsible for specifications.

These weaknesses are not merely confined to PRINCE2, they are apparent in all project management methodologies to a greater or lesser degree.

The PRINCE2 activities all appear well-founded. However, more instructions on the processes would be useful. For example, it would be beneficial if the manner in which reports were given to the Project Board and the method of authorisation to proceed was outlined. These are issues that are addressed in the new model, later in the work.

PRINCE defines 'risk' as "the chance of exposure to the adverse consequences of future events." Prince subdivides these into Business risks and Project risks.

There are also a number of the high-level principles from ISO9000 that illustrate the reflective process that is expected from the Project Manager while monitoring the performance and progress of the project.

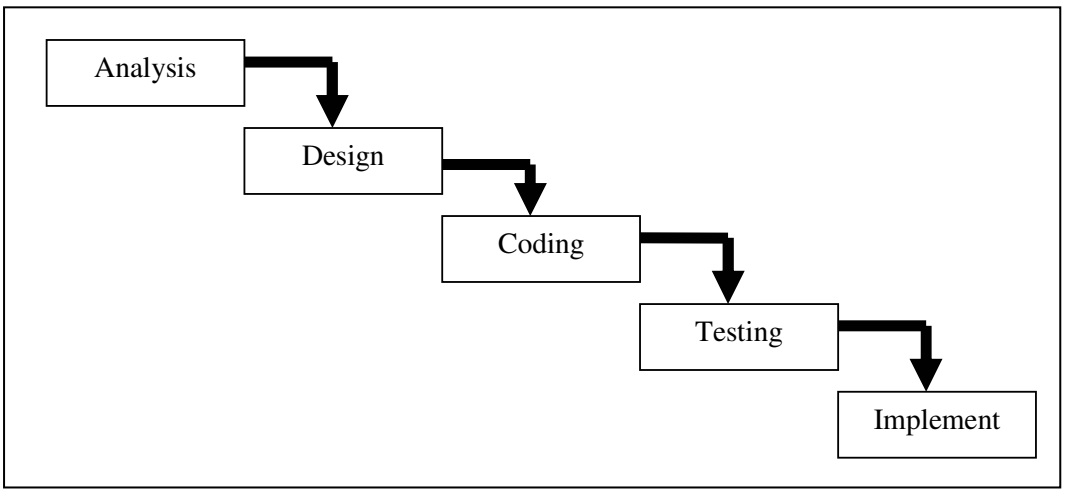
- Perform management reviews of the Quality Management Process
- Plan remedial processes (this is risk assessment and resolution as far as I can tell)
- Monitor and measure internal quality by means of peer reviews and internal audits
- Use quality audits to generate improvements to the quality process

(from the Systemic Requirements document of the ISO 9000 standards)

3.6 Systems Development Methodologies

Systems development is no longer a mystic art. Standards and methods have been created to act as guidelines for the developer and to identify development phases and milestones to aid project management. However, Systems Development is a complex process. It requires the coordination of a number of standard processes, such as analysis, development, testing and implementation.

The Waterfall Model

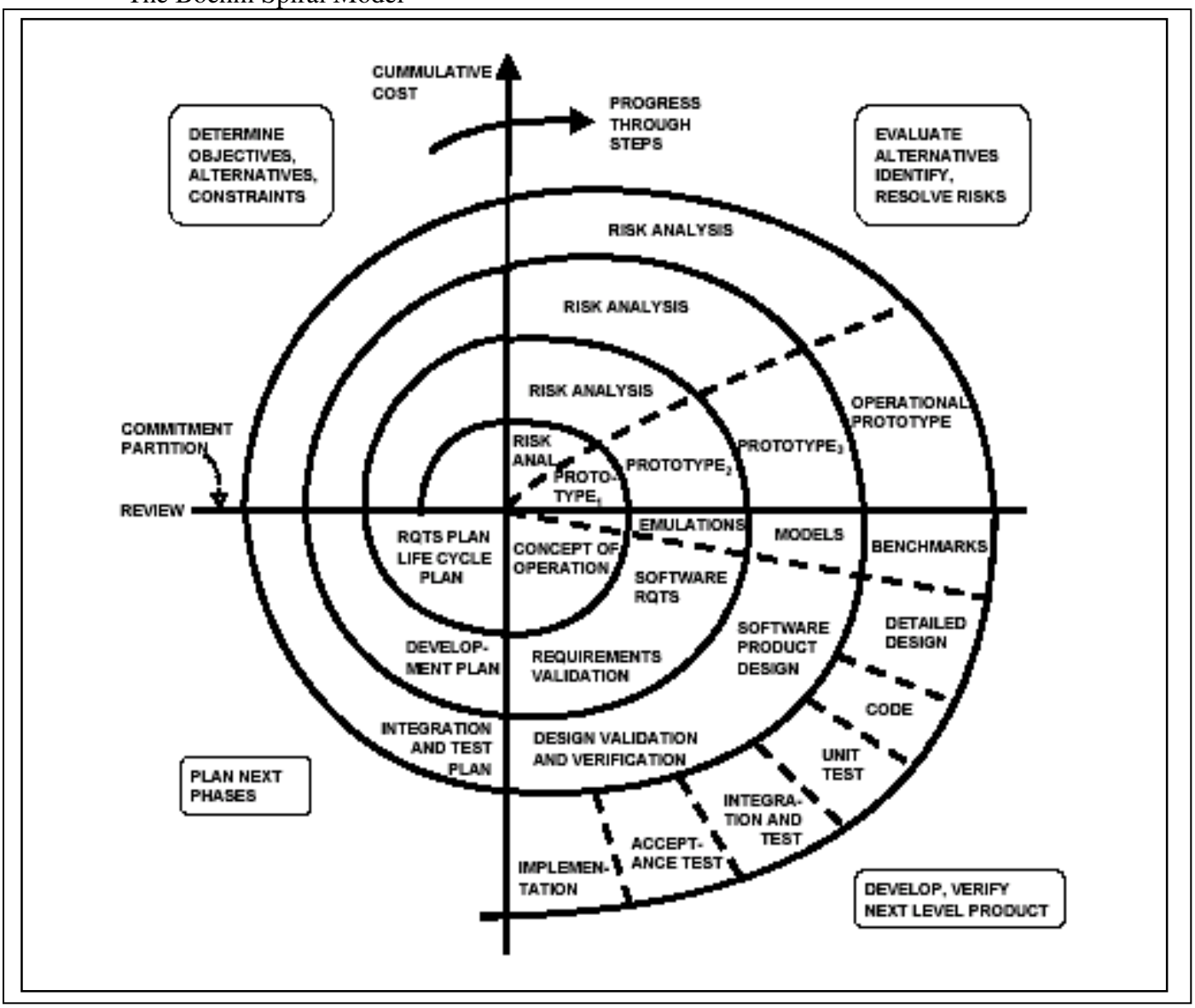


The waterfall model shows the cascade of one stage into the next in the SDLC, illustrating the progress through a system development project in logical steps. A number of criticisms have been raised with the waterfall model, including: -

- Sometimes problems with the design are not discovered until testing;
- Requirements must be determined before the system is designed and it may be unfair to expect the users to produce the definitive set of requirements at such an early stage;
- Design and coding may uncover inconsistencies in the requirements.

The Spiral Model works through the same stages as the waterfall, starting with rough system ideas and designs, becoming more refined with each cycle.

The Boehm Spiral Model



http://www.sei.cmu.edu/cbs/spiral2000/february2000/BoehmSR.html [Accessed 28/11/2003]

Boehm (2000) describes one of the commonly held misconceptions when he states that some think,

> "that the spiral is just a sequence of waterfall increments"

He continues to suggest that the spiral model need not be visited in the order indicated. It is also possible to backtrack to revisit previous decisions. He suggests that it is far more flexible than some have realised.

Boehm (2000, p3) defines his Spiral Model as,

> "…a risk-driven process model generator, in which different risk patterns can lead to choosing incremental, waterfall, evolutionary prototyping, or other subsets of the process elements in the spiral model diagram."

The Spiral Model is important because it is the first IS development model that included 'risk' as an integral part of the process.

There are other models, including: -

- Evolutionary Prototyping. This is where a rough prototype is developed quickly and the user refines the requirements by reviewing the prototype, which is revised and gradually becomes the desired system;
- Staged Delivery. This is where all of the stages in the SDLC are followed, but for a part of the functionality. This allows quicker deliveries and smaller parcels of work, which are easier to manage.

Prototyping helps both of the above methods. It is useful to keep the users of a system aware of the shape and structure of the system, without waiting for the final completion of the whole system. There will be expectations in the sub-consciousness of the organization. These expectations may not be articulated, but will be assumed to be in the system that will be developed. It is unfair to expect these assumptions to be expressed. The users often do not understand what systems are capable of. However, the developers will not understand about the underlying assumptions of requirements for the system. Therefore the sooner the system can be shown to the user, the more likely it is to catch anything that is missing.

A prototype will be available to view at an early stage. This will allow users to confirm that the system is acceptable, or whether the system needs to be changed in some way. It is important that this review is achieved at an early stage. Systems are no longer developed by bearded hippies in sandals, hidden away from everyone in a dark room. In the early days of IT, the requirements would be gathered and the programmers would go away and work for months, then return with a finished product that would not always be what the users were expecting. Systems cannot be built in isolation anymore. That was a recipe for systems failure. A prototype, to show users can be developed quickly by a number of different methods, as follows: -

- The User Interface screens can be developed without any functionality behind them. This would give the user an impression of screen design and the flow from one function to another;
- A set of functions could be built for a single product, or subset of data. This would be a slice through the functionality, which would not entail the time to develop the whole system. But, it would give the user a good idea of the functionality that the full system will have.

The prototype can be developed in a matter of days or weeks, whereas the full system may take months or years. The users can no longer be kept waiting until the full system has been developed.

Systems Development Life Cycle

The models and methodologies have grown from years of experience. The order in which a system development should be addressed has evolved from best practice over those years. Lessons have been learned from difficult situations and bad experiences. The initial approach was that the systems expert 'knew' what the user wanted. This had to change when systems were produced that didn't meet expectations. It was soon realised that users needed to be involved in order to define the required functionality.

It was also slowly admitted that users should be involved to ensure their acceptance of the finished product. A more gradual realisation came about that the system was not the end goal in itself. Information Systems offer terrific power to support a business and should only be introduced to fulfil a business need. Therefore, it has now become accepted that IS needs to fit within the organizational long-term strategic plans. Consequently, IS projects are now considered to be of a much higher level of sophistication than was originally thought.

A number of methodologies take the various factors into account within the Systems Development Life Cycle. Structured Systems Analysis and Design Methodology (SSADM) by NCC provides general guidelines and the description of standard phases that may help the success of a development project. Soft Systems Methodology (SSM) by Peter Checkland provides similar guidelines, but pays more attention to

people issues and stakeholder perspectives. DSDM (Dynamic Systems Development Method) is more accepted now for Rapid Application Development (RAD).

Yardley (2002, P89) describes the DSDM IS development methodology and notes a number of the Key Benefits, including: -

- Involves users at the outset
- Aims to deliver the highest priority requirements first
- Seeks to deliver small amounts of functionality on a regular basis
- Assumes requirements can change
- Better to be roughly right than precisely wrong

Boehm (1996) suggests that the Software Processes needs anchoring in his paper '*Anchoring the Software Process*, IEEE Software, July 1996
He promotes 3 anchor points that should provide the stability to ensure a successful project. They are: -

- Life Cycle Objectives (LCO)
- Life Cycle Architecture (LCA)
- Initial Operational Capability (IOC)

He considers these 3 milestones to be success-critical, particularly for large software projects. Boehm states that the LCA phase needs,

> "…to have all of the system's major risks resolved, or at least covered by an element of the system's risk management plan."

Boehm describes some of the stakeholder concerns in the following table (P16),

Stakeholder	Concerns/Evaluation Criteria
Customer	➢ Schedule and budget estimation ➢ Feasibility and risk assessment ➢ Requirements traceability ➢ Progress tracking ➢ Product Line compatibility
User	➢ Consistency with requirements and usage scenarios ➢ Future requirement growth accommodation ➢ Performance, reliability, interoperability, other quality attributes
Architect and System Engineer	➢ Product line compatibility ➢ Requirements traceability ➢ Support of tradeoff analyses ➢ Completeness, consistency of architecture
Developer	➢ Sufficient detail for design and development ➢ Framework for selecting/assembling components ➢ Resolution of development risks ➢ Product line compatibility
Interoperator	➢ Definition of interfaces with interoperator's system
Maintainer	➢ Guidance on software modification ➢ Guidance on architecture evolution ➢ Definition of interoperability with existing system

Table describing stakeholder concerns (Boehm 1996, P16)

3.7 Critical Success Factors

J. Rodney Turner (2004) considers there are 'Five necessary conditions for project success'. Turner summarised the work of two of his PhD students in this paper.

Although the title states that there are 5 necessary conditions, there are only 4 described in the paper. Turner actually states that there are four conditions, one discovered by Wateridge and three more discovered by Muller.

Turner summarises the four necessary conditions for project success as: -

1. The success criteria should be agreed with the stakeholders before the start of the project, and repeatedly at configuration review points throughout the project.
2. A collaborative working relationship should be maintained between the project owner and project manager, with both viewing the project as a partnership.
3. The project manager should be empowered, with the owner giving guidance as to how they think the project should be best achieved, but allowing the project manager flexibility to deal with unforeseen circumstances as they see best.
4. The owner should take an interest in the performance of the project.

Research by Belout and Gauvreau (2004) states one of its objectives,

> ".. was to further investigate the impact of the life cycle stage, type and structure of a project on the relationship between the critical factors and project success (dependent variable)." (P2)

The authors suggest that there has been a mechanistic approach to project management. They continue to suggest that IS Projects should be managed as 'behavioural systems' rather than technical systems. They contend that this would tend to lead to project success. In 1987, Pinto and Slevin developed a project model and identified 10 factors. Pinto and Prescott refined these success factors in 1988. These are detailed in a copy of their Table 1 below.

There is a question regarding the critical success factors being applicable during the different phases of a project. It seems that realistically, different factors will be more important in different phases. Pinto, Slevin and Prescott considered this theme of research when they asked the question,

> ‘‘Are project implementation critical success factors of equal and stable importance over the life of a project, or does their relative importance (weighting) change as the project moves through different stages of completion?’’ (P2)

The Critical Success Factors Table 1 (P3), illustrating the critical areas of the project and the detailed requirement for the project team.

Project mission	Initial clarity of objectives and general directions
Project Schedule	A detailed specification of the individual action steps required for project implementation
Client Consultation	Communication and consultation listening to all parties involved
Technical Tasks	Availability of the required technology and expertise to accomplish the specific technical action steps
Client Acceptance	The act of ‘‘selling’’ the final projects to their ultimate intended users
Monitoring and feed back	Timely provision of comprehensive control information at each stage in the implementation process
Communication	The provision of an appropriate network and necessary data to all key actors
Trouble-shooting	Ability to handle unexpected crises and deviations from plan
Management Support	Willingness of top management to provide the necessary resources and authority/power for project success
Team Development	Recruitment, selection and training of the necessary personnel for the team

The Critical Success Factors (Pinto and Prescott 1988, Table 1, P3)

In his review of the book 'Patterns of Software Systems Failure and Success' by Capers Jones, Ed Yourdon (1996) notes the 12 essential attributes that must be present in successful projects as,

"1. Effective project planning, 2. effective project cost estimation, 3 effective project measurements, 4. effective project milestone tracking, 5. effective project quality control, 6. effective project change management, 7. effective development processes, 8. effective communications, 9. capable project managers, 10. capable technical personnel, 11. significant use of specialists, 12. substantial volumes of reusable material."

This seems to be a massive 'sledgehammer' to crack the 'nut' of project success. But, it may be necessary. However, it may be possible that a really good Project Manager can accomplish all these tasks, bringing all these attributes and ensuring project success.

Yourdon says that Jones considers these 12 attributes to be 'necessary and sufficient' to ensure project success. He continues to ask how organizations would know if they were carrying out these tasks successfully. That would require the organizations to be recording project metrics. And how many orgs do record project metrics? In my experience, there are no organizations that have any project metrics records. We know that figures show only 16.2% of projects are completed on time and to budget. Therefore, over 80% of projects can be considered to have partially failed to a greater or lesser degree. Yourdon is referring to the figures in the Standish Group report below.

Therefore, the results of the project do not quite conform to the original objectives. And as the natural manner of assessing success is to compare the end result with the original stated objectives; where the original objectives are no longer appropriate, it is obviously difficult to consider taking measurements on shifting ground. Perhaps this difficulty of recording project metrics is an important area for further.research. This illustrates the need to update objectives in the light of events that affect the project outcome.

Yourdon (1996, p2) continues to review Jones' book when he states,

> "Some of the numbers, and some of the discussion, will confirm your 'gut feeling' and your common sense about the best way to develop software. And some of it will take you by surprise, and may lead to some controversial arguments; in his discussion of the impact of ISO 9000-9004 standards, for example, Jones notes that there are only a few years of empirical data. However, to date ISO certification does not appear to affect the failure or success patterns of software projects, or even to benefit software quality in a tangible way."

The book review promotes 'best practice', which has been an aim of the ICT profession for many years, when Yourdon (1996, p2) states,

> "The emphasis that Jones places on successful projects and successful companies is important, for it complements and supports the 'best practices' movement taking place in many organizations."

However, this, yet again, may serve to encourage the idea that by religiously following a set of standards, this will ensure project success. The standards are vital, but they are not sufficient; they are not the whole story.

The Standish Group (1994) Chaos report starts by referring to Alfred Spector's comparison of building bridges to software development. It contends that,

> ".. there is a big difference between software failures and bridge failures, besides 3,000 years of experience. When a bridge falls down, it is investigated and a report is written on the cause of the failure. This is not so in the computer industry where failures are covered up, ignored and/or rationalized. As a result, we keep making the same mistakes over and over again."

It continues,

> "Consequently, the focus of this latest research project at The Standish Group has been to identify:
>
> - The scope of software failures
> - The major factors that cause software projects to fail
> - The key ingredients that can reduce project failures"

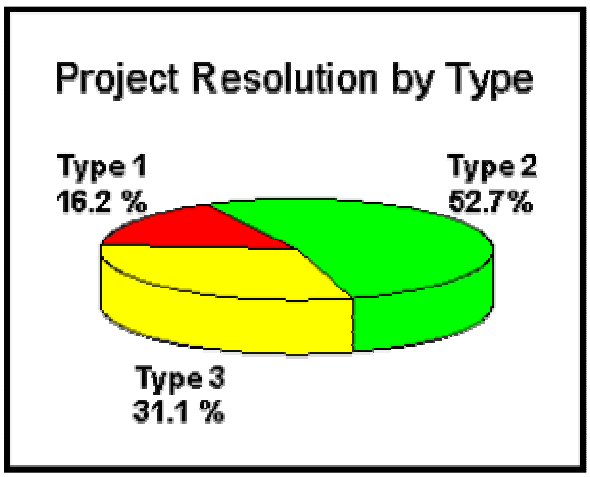
The statistics in the report make depressing reading. It analyses the sample of project results into 3 categories.

Type 1 - Success – the project is completed on-time and to budget, with all features and functions as initially specified. (16.2%)

Type 2 - Challenged – the project is completed, or operational, but over-budget, over time estimate, and with fewer features and functions than originally specified. (52.7%)

Type 3 - Impaired – the project is cancelled at some point during the development cycle. (31.1%).

The following diagram illustrates the proportions of each type of project result,



Pie chart showing the 3 categories of Project (Standish 1994)

Some other statistics that the report contains are: -

- Cost overruns "The average across all companies is 189% of the original estimate."
- Time Overruns "The average overrun is 222% of the original time estimation."
- Content Deficiencies "On average, only 61% of originally specified features and functions were available on these projects."

The report states that,

> "Currently, the 365 companies have a combined 3,682 applications under development. Only 431 or 12% of these projects are on-time and on-budget."

The report attempts to identify the factors that contribute toward project failure when it states,

> "The most important aspect of the research is discovering why projects fail. To do this, The Standish Group surveyed IT executive managers for their opinions about why project succeed. The three major reasons that a project will succeed are user involvement, executive management support, and a clear statement of requirements. There are other success criteria, but with these three elements in place, the chances of success are much greater. Without them, chance of failure increases dramatically."

The following table appears on p5 of the report and contains the factors on which success is dependant. These factors were advised to the Standish Group by the participants in the survey.

Project Success Factors	% of Responses
1. User Involvement	15.9%
2. Executive Management Support	13.9%
3. Clear Statement of Requirements	13.0%
4. Proper Planning	9.6%
5. Realistic Expectations	8.2%
6. Smaller Project Milestones	7.7%
7. Competent Staff	7.2%
8. Ownership	5.3%
9. Clear Vision & Objectives	2.9%
10. Hard-Working, Focused Staff	2.4%
Other	13.9%

Table of Success Factors (Standish 1994, p5)

The report also states that,

> "The survey participants were also asked about the factors that cause projects to be challenged."

Project Challenged Factors	% of Responses
1. Lack of User Input	12.8%
2. Incomplete Requirements & Specifications	12.3%
3. Changing Requirements & Specifications	11.8%
4. Lack of Executive Support	7.5%
5. Technology Incompetence	7.0%
6. Lack of Resources	6.4%
7. Unrealistic Expectations	5.9%
8. Unclear Objectives	5.3%
9. Unrealistic Time Frames	4.3%
10. New Technology	3.7%
Other	23.0%

Table of 'Challenged' Factors (Standish 1994, p5)

The report also contains factors that were advised on cancelled projects, illustrated in the following table,

Project Impaired Factors	% of Responses
1. Incomplete Requirements	13.1%
2. Lack of User Involvement	12.4%
3. Lack of Resources	10.6%
4. Unrealistic Expectations	9.9%
5. Lack of Executive Support	9.3%
6. Changing Requirements & Specifications	8.7%
7. Lack of Planning	8.1%
8. Didn't Need It Any Longer	7.5%
9. Lack of IT Management	6.2%
10. Technology Illiteracy	4.3%
Other	9.9%

Table of 'Impaired' Factors (Standish 1994, p6)

The report continues,

> 'The comment most indicative of the chaos in project development came from Sid, a project manager at an insurance company. "The project was two years late and three years in development," he said. "We had thirty people on the project. We delivered an application the user didn't need. They had stopped selling the product over a year before."

The report covers the following case studies,

The California Department of Motor Vehicles (DMV) embarked on a major project in 1987 to update the drivers license and registration application process. However, 6 years later, after spending $45 million dollars, the project was cancelled. The report states,

> "The DMV project was not rocket science. There are much harder applications than driver licenses and registrations. But because of internal state politics, unclear objectives, and poor planning, the project was doomed from the start."

The report also details the case of American Airlines, who in 1994, settled their lawsuit with Budget Rent-A-Car, Marriott Corp. and Hilton Hotels after the $165 million CONFIRM car rental and hotel reservation system project collapsed.

The report contrasts the failure of the two previous cases when it states,

> "While Marriott and Hilton Hotels were checking out of their failed reservation system, Hyatt was checking in. Hyatt had all the right ingredients for success: user involvement, executive management support, a clear statement of requirements, proper planning, and small project milestones."

The research participants were asked about grading the factors for success and The Standish Group developed the following table from the results.

Success Criteria	Points	DMV	CONFIRM	HYATT
1. User Involvement	19	NO (0)	NO (0)	YES (19)
2. Executive Management Support	16	NO (0)	YES (16)	YES (16)
3. Clear Statement of Requirements	15	NO (0)	NO (0)	YES (15)
4. Proper Planning	11	NO (0)	NO (0)	YES (11)
5. Realistic Expectations	10	YES (10)	YES (10)	YES (10)
6. Smaller Project Milestones	9	NO (0)	NO (0)	YES (9)
7. Competent Staff	8	NO (0)	NO (0)	YES (8)
8. Ownership	6	NO (0)	NO (0)	YES (6)
9. Clear Vision & Objectives	3	NO (0)	NO (0)	YES (3)
10. Hard-Working, Focused Staff	3	NO (0)	YES (3)	YES (3)
TOTAL	100	10	29	100

Table of Case Study Conclusions (Standish 1994, p9)

This illustrates that giving points to the 'Critical Success Factors provides a method by which project confidence can be assessed. The Standish Group have suggested that the 3 case studies can be measured in terms of predicting project success (or otherwise). From their gradings it is obvious that the DMV would not be successful. The Confirm System is less straightforward to predict, but a score of 29 out of 100, is more likely to result in a project failure than a success.

The Hyatt grading is 100 out of 100 – a project success. The only problem with using these factors to predict a project outcome, is that the project must be underway before it is known that user involvement is not forthcoming. Therefore, it once again falls to the Project Manager to monitor these factors closely. If any one, or group of factors appear to be in decline, then it is the responsibility of the Project Manager to raise this as an issue. It should then be communicated to the Project Board, or Steering Group in the strongest possible terms that there is a growing likelihood of project failure.

The latest Standish Group offering on project successes dates from 2001. In the 7 years of the Chaos reports, the Standish Group identify vast improvements in project

management success. However, they maintain that there is still a considerable room for improvement. They highlight better tools to monitor project progress and better trained project managers and management processes as the main reasons for the improvements. They state that,

> "The fact that there are processes is significant in itself."

They also suggest that the average size of a project has been approximately halved. This supports the hypothesis that the larger the project, the more likely it is that the project will have difficulty in coming to a successful conclusion.

The spreadsheet model to check the risk of failure, designed as part of this research, is based upon the criteria and weighting that The Standish Group have assigned in the last table. This model is described more fully in Chapter 5 The Models.

3.8 Summary of Literature Review

The research material analysed in this chapter has covered a broad spectrum of themes. Examples have been documented that illustrate high profile and UK Government IS Project failures. The importance of Risk to the Project Management process has been explained. Project management methodologies and Systems Development methodologies have been shown to be vital in providing a framework in which projects are more likely to succeed. Critical Success Factors have also been identified. The majority of UK Government IS projects are run according to strict standards and PRINCE2 project management methodology. Yet there are still failing projects.

Lessons must be learned from these examples of IS project failures. Standish (2001) suggests that within the 7 years since their previous research, project sizes have reduced and this is an important factor in the greater likelihood of successful IS projects. These themes will be further analysed and brought together in the following chapter.

CHAPTER 4. ANALYSIS OF FINDINGS

From the Literature Review in the previous chapter, it is obvious that there are many factors that come into play to affect the outcome of a project. The project will be doomed from the outset if the business objectives are not realistic, or unclear or contradictory. If proper planning with small milestones and deliverables have not been achieved, then, the project is also likely to fail. A number of research papers, books and articles have identified what they consider to be the Critical Success Factors. This chapter will attempt to bring together the various factors and develop a single list from those common to all the research. There will also be an exploration of the findings of the other research to provide an underlying rationale to the hypothesis that project success does not merely depend upon those factors as a 'checklist', but it is also vital to understand the 'processes'.

In this section I will attempt to examine the body of research material and stress the need for greater understanding of 'risk' within projects. This work then concludes with methods and process models that guide the project manager through the process of including 'risk' within their project in order to increase the likelihood of success. The next section addresses the high-level questions:

a) What are the problems that cause project failure?
b) Can we learn lessons from the previous experiences?
c) What are the resolutions of the problems?

Directly, the first question poses an obstacle. There are multiple problems, not merely a single problem. Consequently, part of the problem is to hold all these in mind at once. However, they are not always concrete issues, such as the technology. They are more often related with people, or processes. These are 'soft' issues and more difficult to understand exactly how they interact with other factors to affect the outcome of a project.

IS projects also entail the management of the development team and the coordination with the people who are sponsoring and funding the system and those who will be using the system. This combination of hard and soft issues requires very careful handling. The manner in which a systems development is approached is vital for the

success of the undertaking. If the users are not involved at a very early stage and throughout the project, then this will invariably lead to problems with acceptance of the system. It may even be that the implementation of the system is refused.

The methodology chosen for any system development must balance all of these competing factors in its attempt to provide a successful conclusion to the project. The management of the changes is one of the main factors involved in the failure of systems projects. Therefore, Change Management must be included in the development planning.

It is worthwhile detailing these issues in the form of the themes that have been addressed within this research. These themes will be covered in detail in the later sections of this chapter. A summary of the main themes of the research are given below: -

- Learning the lessons from IT/IS Project Failures. There are critical success factors that have been identified, which need to be analysed and used in planning for the success of future projects;
- The 'what' and the 'how' of Project Management. Do Project Management Methodologies & the standard SDLC give checklists of 'what' is needed, but they neglect to give descriptions of the process of 'how' the deliverables should be produced;
- The 'soft' nature of Systems Development and Project Management. These are activities that necessarily involve people. The 'hard' issues, such as the technology, is more straightforward to manage. However, human beings are notoriously difficult. These 'soft', people issues are determined by ambitions, emotions, feelings, the social attitudes and team dynamics. To handle all of these 'soft' issues, the Project Manager needs special skills and years of experience;
- Managing projects in a changing world. Project Objectives need continual review and revision throughout the duration of the project;
- 'Systems Thinking' is an attitude of mind that it is important for the project manager to learn. Organizations are dynamic systems and the requirements for an Information System cannot be simply represented as a Static Snapshot. The project manager must always consider that the project is unfolding within an ever-

changing environment. 'Systems Thinking' should also lead the project manager to view the whole picture and not merely a sub-set. The IS should fit within a framework of other systems and procedures that are already in place within the organization. The project manager who embraces 'Systems Thinking' should also embrace changes, not isolate the project from them. They should use discretion regarding which changes to include. The decision of including or excluding changes needs to be taken by the project and business teams. This needs a good project manager, a project team working as a team, sharing responsibility and being realistic. This highlights a major contradiction in the responsibilities of a Project Manager. That contradiction is the need to ring-fence the requirements to enable the development team to have something clear and definitive to work on, as opposed to the need to take account of changes that may affect the project objectives. This is one of the main thrusts of this research and further expansion and explanation is provided later in this section of the paper;

- Risk Analysis/Assessment & Risk Management. This research paper proposes that risk management is an activity that the Project Manager should undertake continually throughout the life cycle of the project. The risk analysis and risk management processes are not fully understood by project teams. The models in chapter 5 are a major contribution of this research, which give guidance on handling risk within the project management process.

4.1 The Need for IS Projects

Today, Information Systems (IS) are the major factor in supporting organizations in their quest to remain viable and to optimise their profits. Organizations are always looking for opportunities to improve business performance and gain competitive advantage. In fact, Stafford Beer (1985) suggests that if organizations are not to fail and are to remain 'viable', they must be continually updating their processes. The external environment and the market place will always change. Therefore, organizations must continue to evolve to keep-up with those changes. These days the speed of that change is such that only by using Information Systems is it possible for an organization to keep pace.

In the early days of computing, the automation of routine, clerical tasks was the maximum that could be achieved with Information Systems. Bulk data keying onto paper tape, or punched cards and batch data processing were the ideal of the future-thinking organization of the 1960s. These Office Automation systems allowed faster turn-around times and greater throughput, which led to the improvement of business performance and increase of service quality. This also led to staff savings and increased capacity, enabling the handling of a greater volume of orders and selling to more customers. This, in turn, led to reducing threats from opposition in the same industrial sector and the gaining of competitive advantage. To a large extent, with the advent of computers, the business was led by the technology.

In modern times, IS not only provides the opportunity to automate processes, but also open new marketing channels, create alliances with suppliers and pass labour-intensive processes to the customer. It also allows the creation of the virtual organization. Just as in early times, there are still occasions when technology leads the business. If an organization has no presence on the Web, they are now considered stuck in their ways and old fashioned. It will lose stature among its competitors and consequently lose custom. However, there are significant advantages to be gained from being on the Web, as well as combating the negative issues. The Web opens new marketing channels and provides a vast potential customer base. It also allows certain processes to be passed to the customer. So, instead of a clerk mistyping the address of a customer, the customer completes his or her own ordering details, together with the

delivery address. This process ensures that the delivery is made to the correct address. This improves customer service, reduces complaints and reduces workload for staff.

However, the IS Project must provide a functional system, within a reasonable time and budget to acceptable quality standards. Therefore, the management of IS projects has become the focus of attention for this research.

This work continues the line of research to address the issues of risk analysis and project management in the pursuit of preventing IS project failures and act as a guide to project success.

Hardly a day goes by without another article appearing in the national and computer press, highlighting the failure of yet another UK Government IT Project. A considerable amount of research has been conducted on the best practice for software development projects. There are methodologies that provide the guidelines to help practitioners approach projects in the right way. However, projects continue to fail.

4.2 Lesson Learned from Project Failures

The following sections of this chapter summarise the research material analysed in the earlier chapters. Lessons must be learned from the case studies and this research emphasises the significance of risk analysis and management in ensuring project success. The themes of this research are expanded below and my analysis and conclusions are documented.

A number of issues leading to project failure are apparent from the case studies in the previous chapters. The project failures tend to have a number of these factors in common.

4.2.1 Lack of User Involvement

If users are not involved, then the project is more likely to fail. If users are involved, but not at an early stage, then the project is likely to fail. If users are involved, but not for the whole duration of the project, then the project is likely to fail. The management of stakeholders is a vital issue. It is the central point upon which project success hinges. If stakeholders are not managed, then the project may be pulled in different directions, which will inevitably lead to failure. Therefore, the dilemma for the Project Manager is to involve users, but also manage them to guide the project in the direction towards a successful conclusion.

The primary stakeholders may be full of enthusiasm at the start of the project. However, that enthusiasm can fade before the project has completed. Other projects may come along and take the focus of the organization. However, the Project Manager needs to continue the reporting of progress and holding project review meetings. In this manner, the stakeholders may remain involved and be able to give the support that is needed.

4.2.2 Magnitude and Complexity

Large projects are more likely to fail than small projects. More complex projects are more likely to fail than simple projects. Projects that attempt to utilise pioneering technology are more likely to fail than those projects that use technology that is tried

and tested. UK Government should take a leading role in setting standards for successful management of projects. They also have a role in driving technology forward and providing the best practice example for the other sectors of business. Typically UK Government projects are large projects.

The large, complex projects require staff of a high required level of skill and expertise. These staff are highly paid and may be difficult to manage. It has also been reported that Project Managers are more likely to lose focus when they are involved in large, complex projects.

Large, complex projects may involve integrating multiple systems. These must be managed very carefully as attempting to connect untested sub-systems can lead to system compatibility problems and ultimately project failure.

4.2.3 Sound Business Justification and Clear Objectives

A project should be founded on valid business objectives. A project should not be undertaken for the sole purpose of trying-out new technology. However, there are some technological advances that organizations must try to adopt in order to remain competitive. For example, at this point in time it is important for an organization to have a presence on the Web. It is a significant extra marketing and promotional channel. It makes good business sense to keep-up with the competition. It also allows the general public to have access to the range of products that can be kept more up-to-date than printed catalogues. Consequently, it is a valid business reason for an organization to develop a Web presence. This is not to say that a website should be developed whatever. It should be profit tested and targets for projected sales over the web and benefits of web marketing should be balanced against the costs for development and maintenance.

Shareholders should be holding companies to account over their IT investments at annual general meetings and ensuring that projects have valid business justification. It is also important that projects are reviewed to ensure that the original business objectives remain valid throughout the life of the project. Changes to plans, a poor initial brief and a lack of progress reporting are factors that lead to project failure.

A project that has a mixture of objectives from separate stakeholders is not likely to have a single coherent direction. This was clearly illustrated in the Confirm case study. The TAURUS system is another prime example of an IS project that did not start off with a clear, overall business objective. The case study of the Payment of Benefits by a new Card System for the Department of Social Security is also an example of conflicting and unclear objectives. It was a large and complex project and one funded by the Private Finance Initiative route (PFI). However, there was divided control with the project being run by two organizations, the DSS and Post Office Counters Ltd, with both having different objectives.

The recent national programme for IT in the National Health Service will need to be mindful of falling into the same trap. The objectives for the Centralised Patient Database has been prescribed from the top and does not derive from a requirement from each individual regional trust. However, the data will need to be populated by the regional stakeholders and it will need to be maintained by the regions. It seems that the central NHS management see that the benefits for the Centralised Patient Database are worth putting-in the effort. However, the benefits may not be obvious to the regional stakeholders and they are required to expend all the effort too. Therefore, the full commitment of the stakeholders may be lacking and consequently may result in the failure of the whole project.

A simple cost/benefit analysis conducted before the project start, can illustrate the viability of the project. However, the cost/benefit analysis cannot illustrate the complication for who wants a benefit to be achieved with the efforts of others.

4.2.4 Communication

Roles and Responsibilities must be communicated and agreed at the very outset of the project. Everyone needs to know what part they play in the overall scheme and who is relying upon them and who they are depending upon to complete their tasks.

Project Teams that do not have regular updates cannot ensure that there is no duplication of tasks. It is also possible that tasks are ‘forgotten’ as assumptions are made that they are someone else’s responsibility.

Without regular progress reports and meetings it would be impossible for the project board to monitor deadlines and hence identify the need to cancel a failing project. It has been reported that UK firms waste £Millions a year by not cancelling failing IT projects.

Communication is also vital between third party suppliers and customers. Working with internal development teams is difficult enough to ensure a system that functions in the way that users expect. It is far more difficult for a third party Software House, working on a different site. Therefore, the methods of communication have to be designed and agreed at an early stage in order that the system does not move along a direction that the user would not accept.

4.2.5 Lack of accountability of sponsors

This also relates to the valid business justification.

The decision-making over what projects to initiate must be made by those who will be held accountable for the success or failure of the project. If the sponsors are not accountable, then this may result in project failure at the very first hurdle as illustrated by the Libra Magistrates Courts System case study. The issue of accountability has been illustrated in many of the UK Government project case studies. Accountability is an issue that is necessary in the Private Sector. However, a culture change seems to be needed before the UK Government project have the same sort of commitment and professionalism as shown in the Private Sector. If your career and reputation is on the line for the success of a project, then it is obvious that there will be a great deal of commitment and drive towards making the project a success.

The original specifications of the Libra System were considered ‘unworkable’, but this did not change the direction or scope of the project. The objectives and technical design for the Criminal Records Bureau (CRB) System was challenged. But, constructive criticism was ignored. Warnings were given to beware the cheapest bid. But, the project still went ahead. It was also reported that effective consultation with potential users came very late in the project. Project Boards should not initiate projects if there are serious doubts, as was reported by the National Audit Office in the cases of the CRB and the Libra Systems.

4.2.6 Change Management

Almost everyone reacts against change. IS Developments necessarily involve change. There are changes to procedures, changes to environments, changes to methods of working, changes to what we have come to rely upon as familiar. The IS Project Manager must embrace change and must also persuade others to see change as positive. Change is a fact of life. For an organization to remain in a stable position with respect to its competitors, it must change on a daily basis.

Contingencies may be planned for dealing with change. They include plans for changing project objectives and processes. These must be considered if the project is to deliver some of the main objectives (the business benefits) in a changing environment. The contingencies may also include changing personnel in the project team. Further training may be possible to overcome some staff issues. And training is often necessary for the users of a new Information System. Training can help to allay fears of the new and equip staff better for playing their part in the changed organization. It may also be necessary to review the development methods and tools. They may become inappropriate with the advent of modern breakthroughs in technology. For example, many projects take advantage of the Web nowadays. However, this opportunity was not available a few years ago.

A number of studies raise issues related to change management, including some IT Projects suffering from a lack of strategic framework, or conflicts over strategy. The lack of organizational adaptation to complement technological change is also a source of difficulty with projects. The management of change should particularly focus on the implications for the organizational structure, processes and culture. The DSS project was planned for 17 years, which is an exceptionally long period. The UK Government changed a number of times within this period. There is no way that a project could be managed over such a long period, with so many changes to objectives.

4.2.7 Contract Wording

UK Government seem to consider contract wording to be the most important factor in their projects. They have not been very successful in penalising the suppliers for timescale overruns and project deliveries, which lack functionality. The Individual

Learning Account case study illustrated that the design did not include vital Security implications. Access rights have not been designed or configured correctly. This omission allowed accounts to be accessed by other than their rightful owners. Project Managers failed to control the quality of the functionality. The DES failed to keep records of key government policy decisions, which had significant implications for the project. The Child Support Agency case study also shows a lack of functionality in the design, where operational requirements have not met expected response times or throughput volume. Interfaces with other Information Systems has not supported expected levels of throughput and Management Information requirements have not been met. The UK Inland Revenue Tax Credit System case study is also another example where functional requirements were not met in the design and implemented system.

The UK Government need to reconsider their approach to projects. The contract wording is obviously important. But, the case studies cited in this work indicate that the business functionality was specified, but not included in the system design. This is an issue of project management and quality control rather than 'contract wording'.

The contract is important in laying the framework for the project between the prime stakeholders and a third party supplier. However, the project needs to be started before functional requirements have been specified in detail. Indeed the first phase of any project is to gather the functional requirements. Therefore, it is impossible for the contract to contain wording that will guarantee all functions.

Perhaps the UK Government is hoping that penalties can be written into the contract that guarantees some recompense in the eventuality of objectives not being met. This is a very difficult area. The project team should be acting as a team. And full cooperation should be the aim, even with third party suppliers. The successful project will be one where the relationship between internal stakeholders and third party suppliers is managed in an environment of mutual respect. The suppliers do not set-out to provide faulty systems. However, there are numerous case studies that show the functional requirements have not been met. It should be part of the project manager's role to ensure that functionality is achieved in the proposed design. Measures may be applied to check the design and review prototypes. If this is not ensured then the project manager is not performing his role satisfactorily.

Therefore, 'contract wording' is not the answer. Failing in Relationship Management is one of the main reasons for the problems encountered in the case studies. Project

Management should include managing all stakeholders and third party suppliers. Another reason for failings is that requirements are not accurately specified, or they are not correctly translated into an appropriate design. This issue is considered more fully in the next section.

4.2.8 Incomplete Requirements & Specifications

Willcocks L and Griffiths C, (undated) contend that projects are often not allowed adequate time for specifying the requirement and conducting Pilot Exercises. He suggests that in an attempt to save time and money, insufficient work went into specifying the requirements and for demonstrations by bidders. The result of this skimping at the start then obviously resulted in vast delays later in the project and wasted money.

The DSS case study, yet again illustrates the result when objectives or requirements are altered. The DSS Business Requirements were changed at very short notice. UK Government passed legislation which reformed the methods of paying social security benefits within the first period of the project. These changes in law meant that the original design was no longer appropriate and a new design was needed. The functional scope was also badly affected when these legal changes forced a focus upon the new method of payment. This concentration on the payment requirements resulted in a number of smaller systems being dropped. These smaller systems were designed to improve quality of service. Thus the legal changes actually resulted in an extension to the project timescale & budget and also a reduction in the functionality from the original intentions.

4.2.9 Definition of 'failure'

Project Failure does not always mean that nothing is achieved. Often there is a system that is developed and delivered, but some element, or elements of the objectives are not realized.

The Standish Group defines three separate categories of project failure. The successful project is completed on-time and to budget, with all features and functions as initially specified. However, they report that only 16.2% of projects fall into this category.

The Challenged project – the project is completed, or operational, but over-budget, over time estimate, and with fewer features and functions than originally specified. The vast proportion (52.7%) of projects fall into this category. This type of project has completed, but not delivered full functionality, or met deadlines.
The Impaired project is cancelled at some point during the development cycle. And a shocking 31.1% of reported projects fall into this category.

4.2.10 Poor Project Management

This will often result in poor estimation of costs, lack of planning, poor communication and unclear roles and responsibilities.
These problems manifest themselves as costs escalating beyond the budget without anyone realising it until it was too late, stakeholders not being advised of delays until too late to add any additional resource and a tasks being addressed by two separate resource pools, or worse, no-one at all. It has been suggested that PRINCE2 can overcome these problems.

4.2.11 Project Failure Factors

The factors that make project failure more likely include: -

- Lack of User Input
- Incomplete Requirements & Specifications
- Changing Requirements & Specifications
- Sound Business Justification
- Lack of Executive Support
- Lack of Risk Analysis and Management
- Technology Incompetence
- Lack of Resources
- Unrealistic Expectations
- Unclear Objectives
- Unrealistic Time Frames
- New Technology
- Lack of Planning

- Poor communication
- Poor Change Management
- Contract Wording
- Lack of Accountability of sponsors

4.3 Risks

Understanding risks and how to deal with them is a vital part of the project manager's role. One of the main propositions of this research is that risk is poorly understood by project managers. The following section explains the background to risks generally and proposes some processes and methods that the project manager should follow.

Undertaking an exhaustive risk analysis exercise may be time consuming. However, the time spent on it should be considered as an investment in the project. The time and effort should be a very small proportion of the total project. A more thorough Risk Analysis will probably provide a considerable return on investment in terms of minimised problems. It will also provide the plans to tackle issues if they arise during the project.

It is better to have anticipated the issues and designed contingency and mitigation plans, instead of being caught by surprise by them. If issues arise that catch the project team by surprise, decisions will be made in times of stress. If the risk has been identified at the start of the project and contingency plans have been designed, then the decisions are about initiating a contingency plan and not trying to design one on the hoof.
Some risk-taking is inevitable in undertaking a project. This risk must be managed by taking action that prevents or minimises the exposure to the risk in a cost-effective way.

Risk Analysis involves a cycle of activities, including: -

- Risk Identification – this can be a difficult task, but can be aided by using previous risk registers;
- Evaluation – to assess the probability of the risk and potential impact in terms of time quality and resources;

- Response Assessment – to determine plans to prevent, reduce or mitigate the risk should it occur.

The Risk Management then involves monitoring the environment and the project progress to determine if the contingency plans need to be initiated.

The Project Management function includes Risk Analysis and Risk Management. It should also be seen that following the development of the project plan (or Gantt Chart), the role of the project manager is to monitor and guide the project to achieve the milestones in the agreed project plan. This necessarily involves the identification of any risks and issues that may arise and act to ensure they do not lead to the failure of the project. During projects a risk register should be developed and maintained. This can be used in subsequent projects, where the risks are still relevant. It is also necessary for the Project Manager to maintain a 'Lessons Learned' document. These documents should be used in 'post-project reviews'. And they should also be used as guidelines in subsequent projects.

If no risks become a reality and no issues arise, then the Project Manager merely needs to monitor the project towards its milestones and deadlines. However, projects always have issues and the Project Manager must ensure these are handled correctly. The best way to handle them is to identify them in the first phases of the project and to develop plans of action to address them.

4.3.1 Standard Risk Register

Some risks are specific to the Project under question. However, there are certain risks that are common for a proportion of IS Projects. And there are methods of preventing these risks or contingency plans that may be established. If there is a single important lesson that we should have learned in the field of Information Systems it is that we should wherever possible not re-invent the wheel. We should learn lessons from our previous projects and apply those lessons to the subsequent projects. The following table has been used by the researcher for a number of years and a variety of projects as a starting point for the risk register of a new project. It contains risks and responses that have been found to apply to a broad range of circumstances.

Risk Analysis and Preventing Information Systems Project Failure

Risk	Response – Contingency or Mitigation
Vital, expert resource not available at the appropriate time	Gain commitment from ALL Stakeholders to their role and responsibilities
	Plan tasks with the agreement of resources
	Plan for substitutes for any resource whose removal would jeopardise a task on the critical path
	Communicate the plan and remind the project team regularly of when they are needed
Business Requirements incorrect or incomplete	Ensure Business Requirements are documented and agreed by ALL relevant Stakeholders
	Ensure that the Project Team can be flexible to act if changes to the Business Requirements come at a late stage. Perhaps prototyping will be useful to allow users to gauge whether they have missed anything. Be prepared to help users in any way to clarify their requirements and avoid misunderstandings.
	Anticipate changes to Business Requirements. Plan for the monitoring tasks that can identify the need to react for changes. The Business Requirements should be reviewed at least at the progress from each stage of the project.
	Arrange for overtime payments from the Project Board at the initial stage of the project for a 'Special Team'. This team will be called into action if a quick response is needed to an unexpected eventuality.
	Raise the issue of allowing change with the Project Team and ensure that everyone understands that some requirements may only become clear part way through the project.
External Influences having an impact on the project	Assess the Project Objectives on a regular basis. Check the relevance against the new situation.
	Ensure that the Project Team can be flexible to act if changes to the external environment cause changes to be needed to the initial project objectives.
	Be prepared to change the objectives to match the Changed environment.
	Be prepared to cancel the project if the environment changes and removes the initial reasons for the project. If the project is no longer viable, then it should be cancelled.
Data Migration or data feeds from other Information Systems does not go smoothly	Recognise that the format on a specification may not materialise exactly when a test file is received. The data fields are likely to be different in some significant ways. So, plan for differences. Request early test files. Plan for early practical data imports to 'prove' data formats.

Risk	Response – Contingency or Mitigation
	Anticipate differences between test files and the actual production file. Sometimes the developer will be helpful and mock-up a test file using a data editor. This is likely to be different from a test file from the actual system itself.
	Anticipate errors and plan to test them at an early stage in the project. Do not wait until the exporting system is complete and the importing system is complete to discover that the data interface is not in the same format as specified.
Misunderstandings of specifications leading to badly designed systems	Perform walkthroughs between developers and users. Meet regularly and conduct reviews. Develop prototypes to ensure the user has an idea of the 'look and feel ' of the system at an early stage.
	Encourage developers to ask if there are points of confusion regarding the Business Spec. Never make any assumptions.
	Never allow the developers to go away to build a system for any period of time. Always arrange at least weekly reviews. There is nothing worse than the development team being allowed a 3 month build period, then after this time they deliver something that does not come close to what was expected by the user.

Table: Example Risk Register with responses

4.4 Critical Success Factors

The list of factors identified in the case studies of failed or impaired projects will often have a reflection as a factor that is critical to the success of a project. Therefore, the factors from the failed list will look very similar to the Critical Success Factors. For example, if a lack of user involvement will increase the likelihood of project failure, then involvement of users will help towards the success of a project.

The list of factors that help towards a successful project outcome include: -

- User Involvement
- Executive Management Support
- Clear Statement of Requirements
- Proper Planning
- Realistic Expectations

- Smaller Project Milestones
- Competent Staff
- Ownership
- Clear Vision & Objectives
- Hard-Working, Focused Staff
- Agreed Success Criteria at the start of the project
- Valid business justification
- Management of the project as a behavioural system, not a technical system
- Communication of the project management methodology to the project team
- Seek to deliver small parcels of functionality within short timescales

The project manager must take note of these factors within the project plans as they will help guide the project to success and help steer away from failure.

4.5 Measurable Objectives

The PRINCE2 standards encourage the delivery of products from the project stages. These actual products and their delivery can then be compared against the original deadlines and quality. In this manner, the project can be measured and an assessment made as to whether it has been a success, or otherwise.

Weaver and Brickman (1974) were among the first to argue that individuals implicitly make summary comparative judgements apart from and as an input to their feelings of satisfaction.

This can be seen in the expectation-disconfirmation paradigm, which is the most widely recognised of the discrepancy theories (Oliver, 1977).

This paradigm is part of marketing theory and holds that judgements on satisfaction are influenced by the consumer's perception and expectations of performance.

Oliver (1980) stated,

> "…expectations are thought to create a frame of reference about which one makes a comparative judgement. "

Teade Punter (1996) draws attention to the ability to measure objectives in his paper 'Requirements for checklists to evaluate software product quality'. This paper uses

checklists as an instrument to evaluate software product quality. So, the main theme is not relevant for my research. However, it is interesting that it continues to refer to an underlying assumption that is inherent in the thinking of the Project Manager, but often not voiced when he states,

"First step is defining what can be measured."

This requirement that evaluation is centred upon what is measurable, requires the research to identify the objectives of a project in a manner which enables them to be measured. This measurement of the success of a project is usually achieved by comparison of the end results with the initial objectives. This evaluation should be formalized in the post implementation review. However, there is often a tendency for the post-implementation review to be overlooked, or perceived as inappropriate. This may be due to the final outputs from the project being different from the initial objectives.

Consequently, this could engender a feeling of project failure. However, it may be that the original objectives are no longer appropriate. The project may need to meet a new set of objectives that have grown out of revised needs of a changing marketplace, or advances in technology. The original objectives may not have been changed accordingly and will remain in the mind of the sponsors. Therefore, it would not be fair to compare the end results with the initial objectives. However, it would have been appropriate to change the objectives to align with the changed circumstances and consequently validate the revised direction of the project. PRINCE2 requires the Project Board to review the Business Case upon which the project was initiated at the boundary of each stage of the project. This review is important to recognise that objectives have changed to meet a new market, or organization structure. It is also vital in authorising the continuation of the project under its newly revised objectives. If all projects followed this PRINCE2 principle, then the post-project review would be more appropriate as it would be comparing the end results with relevant objectives.

4.6 Systems Thinking

Systems Theory has led to Systems Thinking, which is used to investigate business organizations in the modern world. However, systems thinking cannot advise directly how to resolve business problems. It can provide tools, techniques and frameworks with which the analyst may unravel and make sense of problem situations. Systems Theory developed from the study of biological organisms and now helps the understanding of complex business organizations. Systems Theory is the process of comparing a subject of study with a 'system' of components all working together towards a common purpose.

Systems Theory has led to a particular way of thinking; Systems Thinking. It is normal to undertake a process of reducing any complex subject to its constituent parts to allow understanding. Sometimes, subjects are so complex that no-one can understand the whole without this reductionist activity. However, Systems Thinking takes the tendency to deconstruct any subject under scrutiny and enlarges it by bringing the focus back to bear on the whole together with the component parts. Therefore, Systems Thinking encourages the view of the 'holon', reminding that components of systems will always affect other components and changes in one system will affect another system down the line (the Law of Conceptualization, Checkland (1999, p. 237). It teaches that the focus should be on the whole system and highlights the 'emergent properties' of a system, which may be described as the whole is greater than the sum of the parts. Stafford Beer in his 70th birthday lecture at Liverpool Business School referred to the emergent properties of a radio. After the radio is assembled the sound emerges as a property of the whole system, but cannot be anticipated from reviewing the individual parts.

It also requires the dynamic properties of the organisation to be borne in mind at all times. Some descriptions of organizations can give an accurate snapshot of the problem situation. However, the 'snapshot' is static and an organization is a dynamic system. It is a complex system, made more complex by its inclusion of people. People are not merely other parts within the system, they have emotions and intentions and

feelings. This means that any system to be introduced must be planned to include the wishes of the people who will be involved with it (the stakeholders).

Systems Thinking is the important feature of modern business analysis. It introduces the 'holon', which emphasises the whole system over the parts.

Business Analysis was traditionally based upon the reductionist approach of breaking a process down into its component parts to better understand the complexity of the interrelationships. Reductionist theory is where a complex arrangement is considered as a set of smaller parts. Sometimes this is the only way in which a complex organization may be understood. However, this systematic taking apart of systems has been found to miss some vital elements of organizations. The accepted manner in which business or systems analysis is performed is by a process of reduction of the whole into parts that are more easily understandable. This is reasonable as most organizations and human activity systems are not able to be understood in their entirety. Consequently, for the sake of progressing through a process of understanding the analyst reviews the sub-sections that comprise the whole. Unfortunately, the reductionist analysis could suffer from 'sub-optimisation', where the interconnections and inter-relationships of the individual parts are ignored. If reductionist analysis were to be conducted on Stafford Beer's radio, then no sound would be discovered. Consequently, Systems Thinking reminds the analyst to continue to the synthesis stage of their work. The analyst should build-up from the parts back to the whole, while also considering the larger system and the environment in which the system operates.

It is also necessary to consider the wider environment in which the organisation operates. As Senge (1990) contends,

> "Systems Thinking is a discipline for seeing wholes. It is a framework for seeing interrelationships rather than things, for seeing patterns of change rather than static 'snapshots'." (p68)

Therefore, Systems Thinking emphasises the systemic (dynamic) approach rather than the systematic (static snapshot).

The Law of Conceptualization

Birgitta Bergvall-Kåreborn (1999) gives the definition when she notes,

> "Checkland's law of conceptualisation states that a system which serves another cannot be defined and modelled until a definition and a model of the system served are available (Checkland 1981, p. 37)"

The reference in the paper must have a printing error. This definition actually appears on p237.

Since it was first developed in 1981, this law has been enhanced to include making changes to systems. So, we are now more familiar with the law of conceptualization recommending that changes should not be made to one system without considering other interconnected systems. This is aligned with systems thinking. When one falls foul of the law of conceptualization, it is due to concentrating upon one part of the system or organization and losing sight of the whole.

This may also be seen from another perspective. That is, during the project, eventualities may arise that cause changes to original objectives. These changes must be considered over the whole project, and revisions should not be made that affect only a single part of the project.

CHAPTER 5. THE MODELS

This chapter documents the models developed during this research. It has involved reviewing project management and risk management processes and re-engineering them. These re-engineered processes are then provided in straightforward diagrams that should be easy to understand and follow. The chapter also includes a spreadsheet, which provides a risk monitor, giving an indication of the project team's confidence in the successful outcome of the project.

The chapter connects all the lessons learned from the research into project failures, together with the success factors that have been identified in other research. The previous research has been good in providing lists of factors, but there have not been too many models of the processes involved in managing these factors to make a successful project more likely. In this chapter an attempt will be made to diagram the Project Management Process to include Risk Analysis and Risk Management. These processes should enable the Project Manager to conduct a process of Risk Management throughout the life of the project and increase the likelihood of a successful project outcome.

The previous chapters in this dissertation have highlighted the factors that combine to result in project failures. It has reviewed the considerable volume of cases where a project has not been successful. It has also highlighted themes, such as the SDLC, methodologies and 'Systems Thinking' that will all have an impact on the success of the project management process. There has also been an examination of the factors that work towards a successful project.

The models within this chapter have been developed from PRINCE2, other models of risk analysis and management and my own experience in mapping these processes.

5.1 The Project Management Model

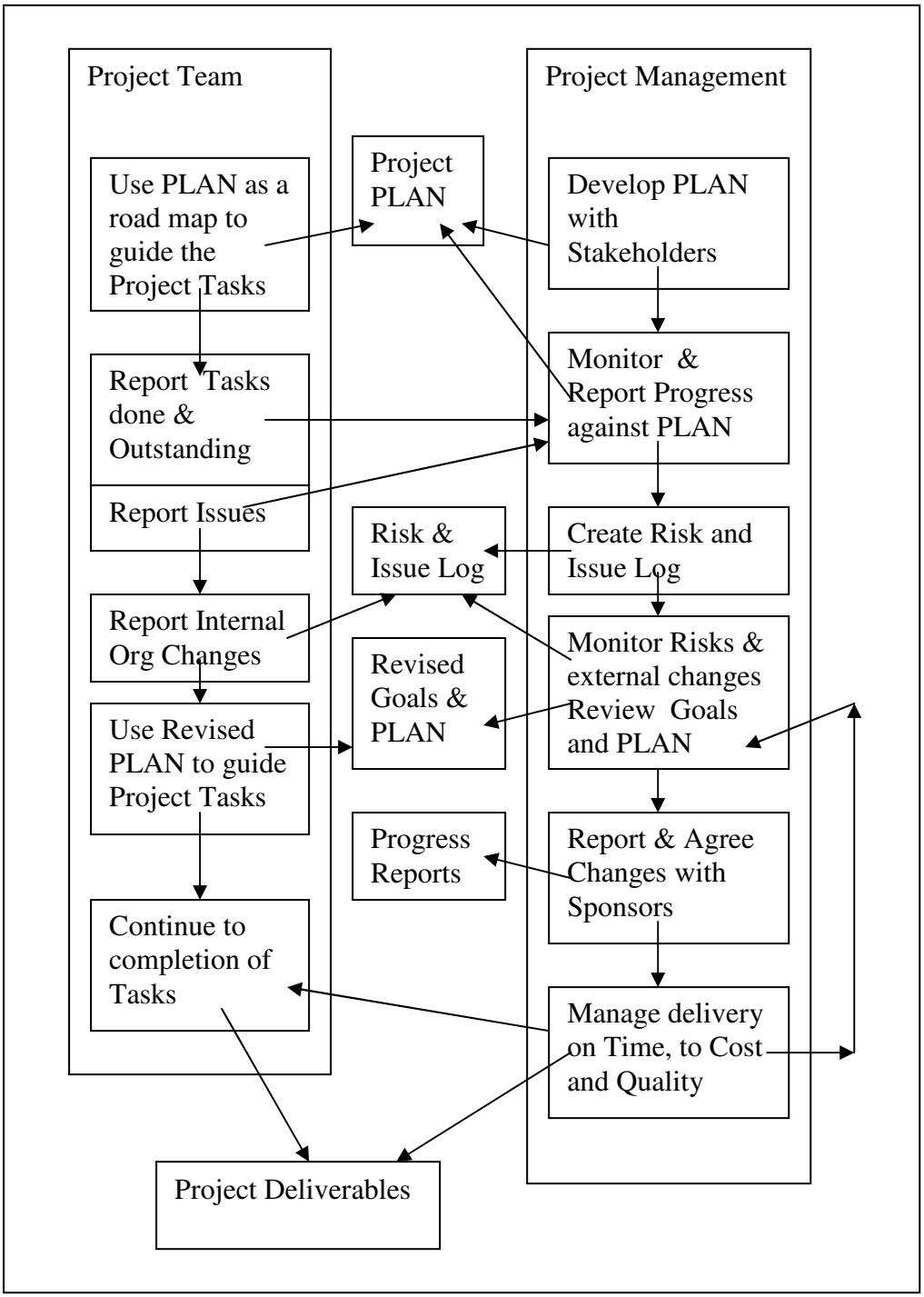


Diagram illustrating the Project Management process

The Project Manager should be concerned with the management of team members and resources towards achieving the tasks as scheduled on the Project PLAN. The

team members are responsible for completing the tasks towards delivering the objectives of the project.

Some Project Managers can become confused over roles and responsibilities. It is worth making a significant point of this confusion over responsibilities at the outset. The roles and responsibilities should be stated at the start of the project. This would remind everyone, including the Project Manager of the boundary of responsibilities. Sometimes the Project Manager also assumes responsibility for some of the analysis. In these cases, the Project Manager must take care not to confuse the project deliverables and objectives with the project management reports/products that must be developed for the project management purposes.

Some Project Initiation Documents (PIDs) contain notes of expected deliverables from the project of Risk Register, Issue Log, Project Plan, etc… These are not 'project deliverables'. They are the deliverables of the project management process. This distinction should be borne very clearly in mind by the Project Manager. In PRINCE2, there are 'specialist products', which are the project products and there are 'management products', which are the project management products. It is easy to get wrapped-up in the project management process and become blinded to the 'business' goals. For example, business Objectives could include: -

- Address the concerns of the FSA regarding selling of Endowment Products
- Review the new 'Treating Customers Fairly' regulations and ensure the Compliance Department can monitor the sales of new policies and sales training for the future;
- Development of training plans to meet regulatory requirements for the selling of any Insurance Products in the future;
- Development of a method of reviewing and compensating policy-holders where previous selling has not been compliant with FSA Regulations, etc…

Whereas, the project management deliverables would include: -

- A project plan to coordinate the activities towards achieving the business goals and objectives;
- A method of communicating progress from team to sponsor;
- Risk and Issue logs, etc...

It cannot be emphasised strongly enough how important it is for the Project Manager to keep this distinction in mind throughout the project. If this does not happen, then the project may start-off with unclear and confused objectives. The business goals will be confused with the management goals. But, no-one would want a perfectly documented risk register and not achieve the business goal of the project. Yet the project manager is in danger of doing exactly this, by taking their eye off the ball.

The business deliverables should be distinguished from the project management deliverables in any project documentation. It is straightforward to define the responsibilities, but sometimes the project documentation is a standard format. Therefore, the Project Manager should review the documentation for the section on project deliverables. The documents should have two separate sections as follows: -

- Business Objectives and Business Deliverables;
- Project Management Deliverables.

If the documents do not currently have the two separate sections, then the Project Manager should amend the documentation and the templates. This will ensure that future project will also distinguish between the two separate types of objective and deliverable by merely completing the separate sections in the documents.

5.2 The Project Management Cycle

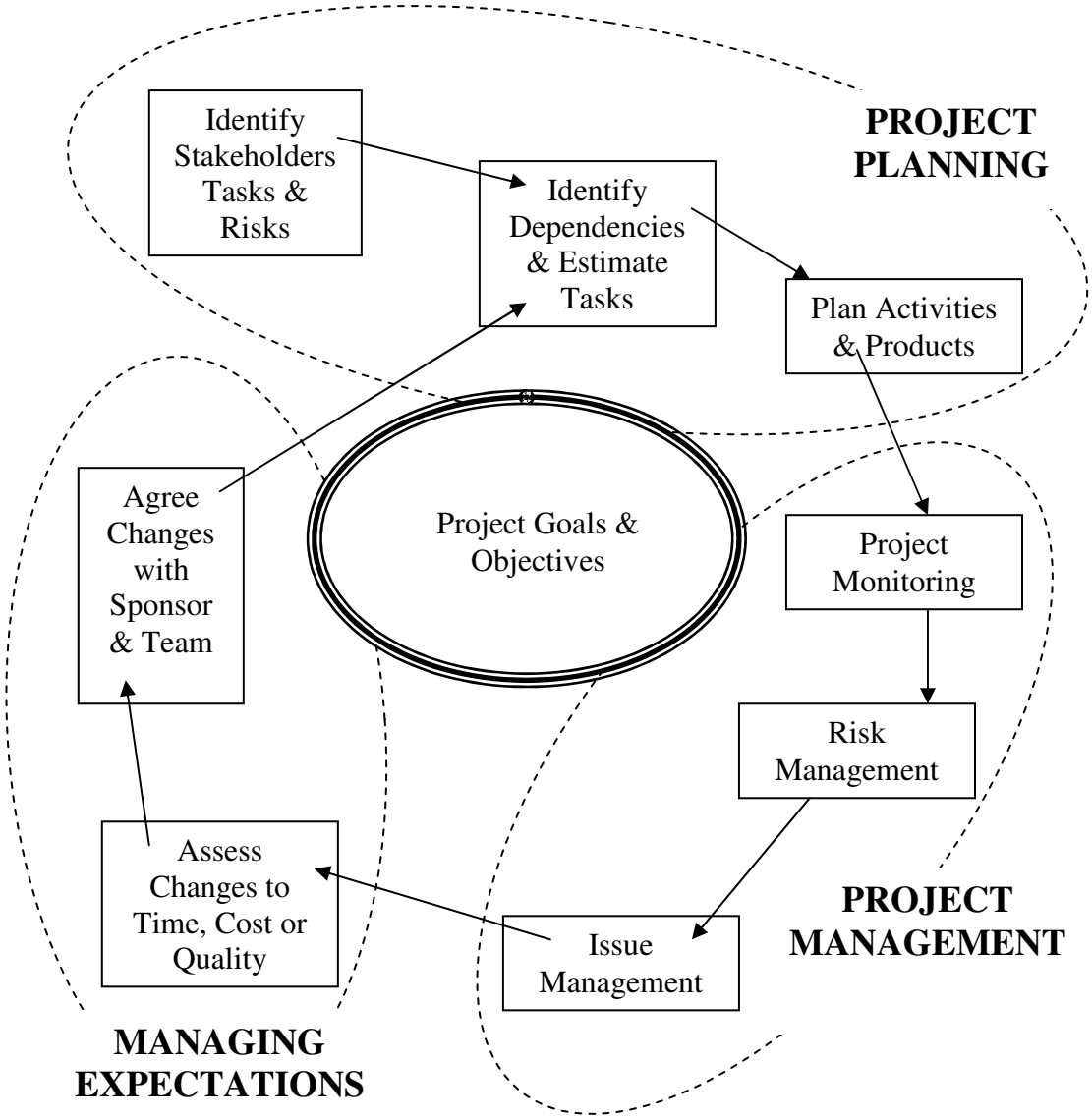


Diagram illustrating the Cycle of the Project Management process

Projects generally fit into this model of Planning, Monitoring and then Managing expectations. The processes and products are often described differently in different methodologies. This is an iterative process.

5.3 The PRINCE2 Model

This model is shown in the PRINCE2 Manual (p12). The processes as described by PRINCE2 are illustrated in the following diagram,

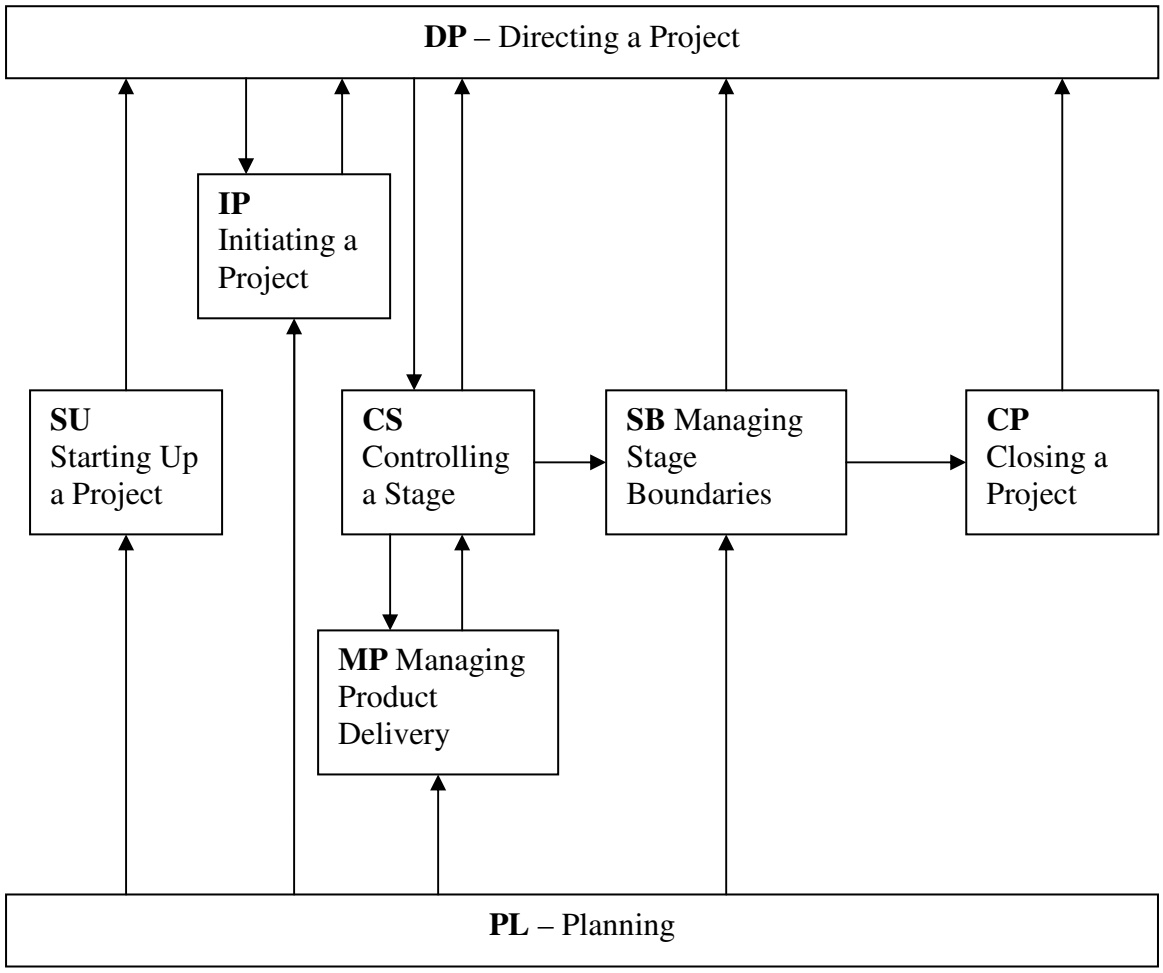


Diagram illustrating the major process in PRINCE2 Project Management

The Project Board performs the Directing a Project function. The Project Manager performs the Start-Up, Initiation, Controlling and Managing a Stage and Closing the Project. Team Managers perform the Managing Product Delivery, which is the area in which the actual project products are developed and created.

An important lesson to learn from PRINCE2 is the significance of 'products'. Products are emphasised in PRINCE2. They are the reason for any activity within the project plan. They are also the reason for the whole project, it should produce a

substantive product. Therefore, it is important that the Project Manager should always bear this in mind when drafting any project plans. If there is an activity on the plan, then there should also be a product resulting from that activity. If there is no product, then the Project Manager must ask the question, 'why is the activity being performed?' The project products are described as 'specialist products'. They are typically a new installed Information Systems, or a re-engineered business process. The project management products, such as the Project Plan and the Risk Log, are referred to as 'management products'.

PRINCE2 focuses very firmly on the Project Management Processes. Its whole emphasis on Project Management may be seen in the proportion of the references to producing the end product of the project. There are 8 Major Processes within the PRINCE2 model. It is only in one of these processes that the specialist products are addressed; that is the Managing Product Delivery (MP). Furthermore, it is only in one of the 3 sub-process of Managing Product Delivery (MP) that the specialist products are addressed. This emphasis is unbalanced. It seems intuitively rational that the projects products should figure in any project management model in a greater proportion than the project management products. PRINCE2 is an extremely comprehensive project management model and it is difficult to see how it could be any bigger. However, it also seems reasonable to propose that there is something more to project management than PRINCE2 is describing. This is a concentration upon the project management, when it seems that perhaps there is something more to managing actual projects. This is drawing attention to the difference between 'project management' and 'managing projects'.

However, there are many valuable lessons to learn and guidelines that PRINCE2 provides. It applies a controlled start, controlled middle and controlled end approach to the project life cycle. At any of these points the project may be changed, or even cancelled if the Business justification has altered in any way. This is a valuable lesson for those projects that run away under their own momentum, while the business justification no longer applies.

The framework which PRINCE2 applies, with its emphasis on reviewing the Business Case at each Stage Boundary, is a very good discipline. The Project Manager who

only learns this lesson will not go too far wrong in his or her career. Therefore the Stage Boundary is an important principle, which should be built into any Project Plan for good practice.

PRINCE2 prides itself on having a Project Board that manages by exception. However, the Project Board needs to be confident that progress is being made according to agreed plans. Therefore, it sets 'Stages' in the plans and uses these as convenient points at which to assess the progress of the project. The Stages may not coincide with project phases, or even with project deliverables. But, sometimes the stage may end with a deliverable product. The Project Board may decide that they want to assess the project after a three month period. Consequently, they will set the first Stage to be three months. The initial business requirements document may have been created and a prototype system may be partially complete after three months. But, the Stage will end whether these products are complete or not. PRINCE2 uses Stages as a management tool, ensuring that the project does not run for longer than a set period defined by the Project Board without being assessed in a formal manner.

5.4 PRINCE2 Stage Boundary Model

This model is the process required of the Project Manager as he or she manages the progress from one stage of the project to the next. This is described in PRINCE2 as SB Managing Stage Boundaries.

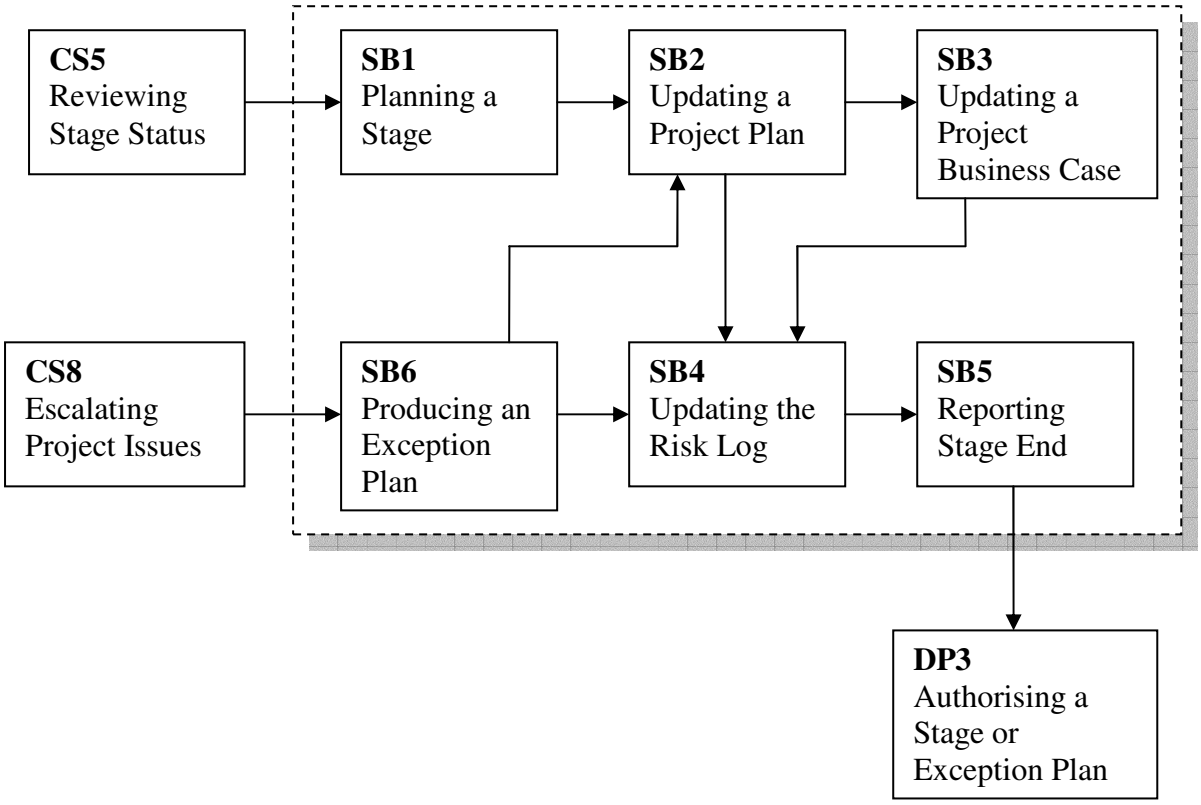


Diagram illustrating the sub-processes in PRINCE2 Managing a Project Stage Boundary

This is where the formal reporting to the Project Board happens. The Project Manager produces the Stage End Report, which assures the Project Board that the Stage has been completed to agreed time cost and quality. This process prepares plans for the next Stage in the project and reviews and updates the Risk Log. A premature end of a stage may occur if an important issue arises, which results in an 'exception plan'. The exception process may result in remedial action, or the close-down of the project.

The final task within this process is that the Project Board determines whether the project still remains viable. If the Business Case is still appropriate, then the Project Board authorises the next Stage to begin. However, if the project is no longer viable, then it will be closed-down.

5.5 Risk Analysis

Pfleeger (2003, p506) describes a risk as a potential problem, which has 3 main characteristics: -

1. A loss associated with an event (the loss is called the risk impact)
2. Likelihood that the event will occur (the probability of 0 = impossible, 1 = certain, then it is a problem)
3. The degree to which the outcome may be changed (risk control)

PRINCE2 encourages the approach of planning for everything in advance and reporting only when exceptions are encountered. Therefore, it emphasises risk analysis and risk management as central to the project management process. It expects risks to be identified at an early point in the project. At the Start-Up process a blank Risk Log is created. But the Risk Log could include any risks that may have been identified in the Project Mandate. These will typically relate to business competition, or organizational changes that are known will happen in the future. According to PRINCE2, Risk Analysis should be conducted at the start of the project. The end of each stage is also a point at which to reassess risks and issues.

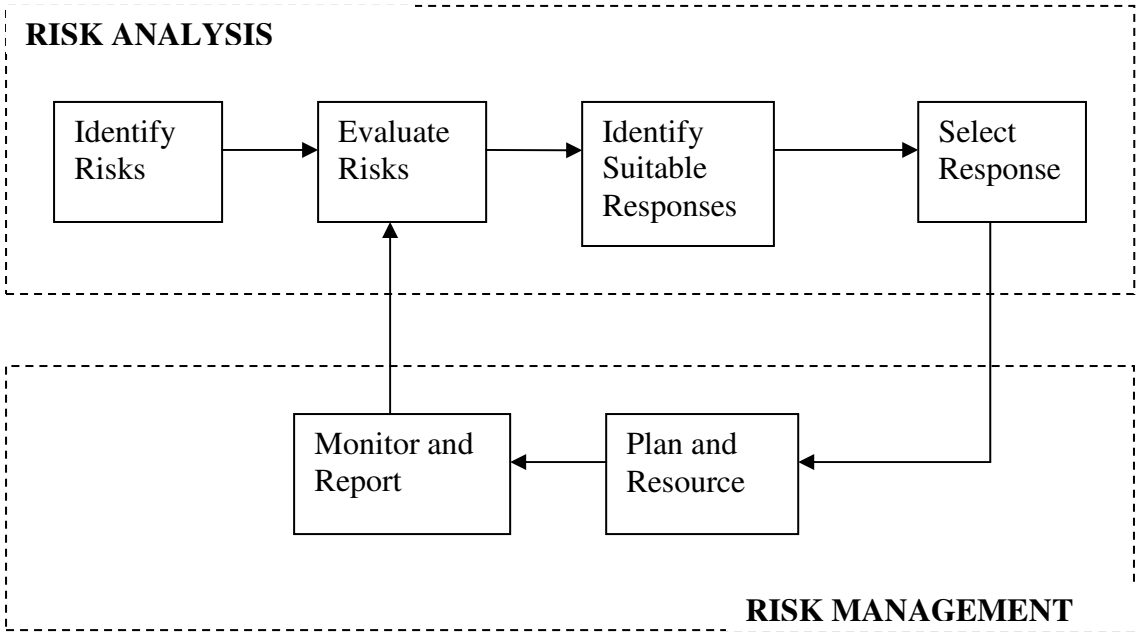


Diagram illustrating the generic Risk Model

Risk Identification is typically performed in a 'brain-storming' workshop. When Risks are being identified it is important not to stifle any ideas. It is also important that no evaluation of the risks is attempted at this stage. Therefore, the risks should merely be noted as they are raised by the participants in the workshop.

Risk Evaluation should cover an assessment of the probability, the potential impact and the proximity. The probability can be rated as High, Medium or Low.

The Impact should be assessed in terms of its effect on Timescales, Quality, Benefits and Resources & People. The risk may have a result of extending the timescale of the project, or may affect the scope of the functionality expected from an Information System. The risk may also mean that the benefit of the organization move ahead of its competitors may not be realised, or may result in more resources or budget allocated to the project. The four elements of Impact should also be rated as High, Medium or Low.

The Proximity should give an indication of when the risk would affect the project, or how many weeks until the risk may arise. For example, it may be a risk that only affects the start of the project, such as not being able to gain skilled planning resource. When the planning phase is over, this will no longer be a risk. The Proximity for this example is 'soon', or within two weeks of the Project Start.

Identifying a Suitable Response should be based upon 5 separate factors; prevention, reduction, transference, acceptance and contingency. Often the only entries on a Risk Log are the Risk description and a Contingency plan. This indicates that risk analysis has not been conducted properly. Indeed, it may indicate that risk analysis is not properly understood.

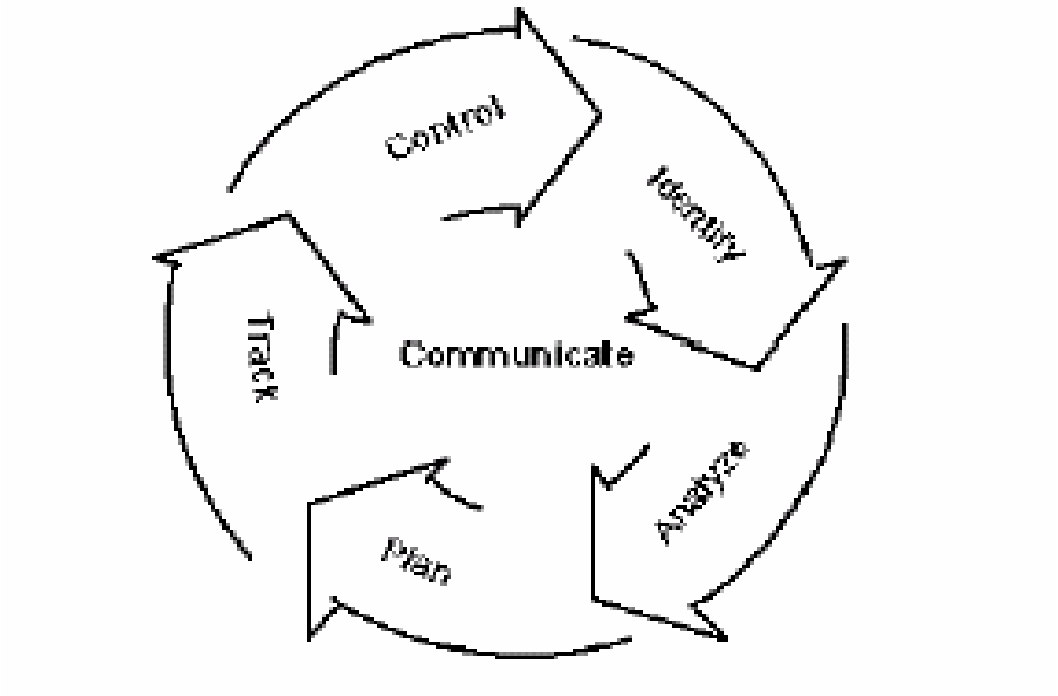
At the end of a stage, some risks may have passed and need to be written-up as complete. Some new risks may be identified that may apply to the later Stages of the project, which need to be assessed and added to the Risk Log.

Pfleeger (2003, p503) describes an Incident Response Plan, which tells the staff how to deal with a security incident. The Plan includes: -

a) Definition of what constitutes an incident;
b) Naming staff member who takes charge of the situation (leader);
c) The Plan of Action, (to reduce the chaos and panic) including:
    - Call leader on discovery of incident;
    - Leader determines if it is a false alarm or a real incident;
    - Establish the facts of the incident and record as much as possible;
    - Invoke the Response Team;
    - The 'director' decides on what actions are necessary and makes the decision when to halt the response activity;
    - Lead technician will take response actions, record evidence and document activity;
    - Advisor to help with Legal, HR, communications and PR issues;
d) Train everyone on their responsibilities as a response team;
e) Ensure that lessons are learned and a post-incident-review is conducted;

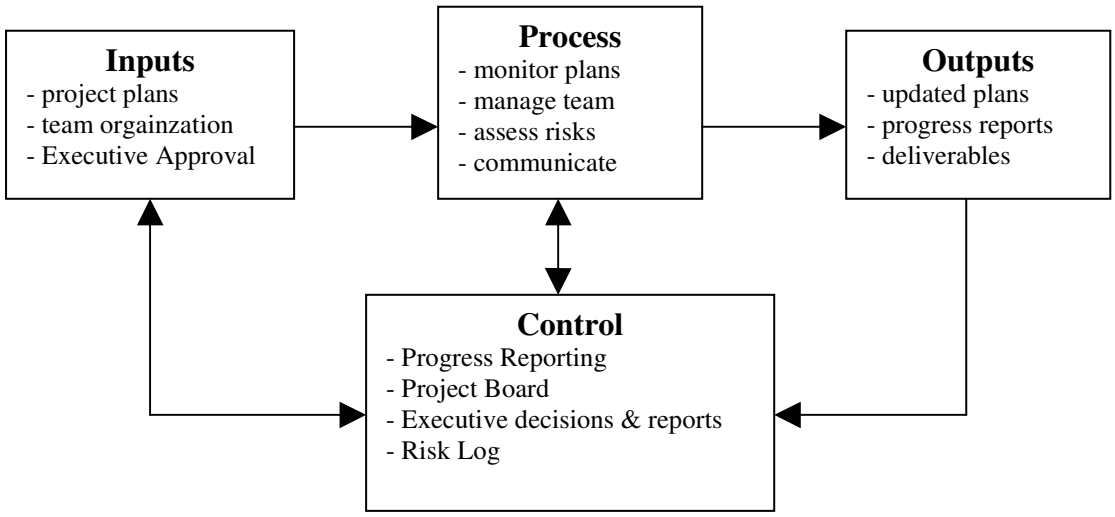
This plan illustrates some of the activities that may also be applied to an IS project to safeguard against identified risks. There would be benefits to be gained if each IS project could develop 'response strategies' along similar lines as Pfleeger describes above to add to the risk management plan.

5.6 The Risk Management Models



The Risk Management Paradigm (Van Scoy 1992, p9)

Van Scoy's model, yet again emphasises the generic Risk Model activities, Identification, Evaluation, plan for a Suitable response, Track/Monitor and Control.



HIPO Diagram of the Project Process

A Hierarchical Input Process Output (HIPO) diagram showing how risk fits into Project Management. This diagram does not include internal Corporate Programme Direction or external market forces.

The Risk Analysis process is as described in the generic Risk Model on page 107 above. However, it may be useful to expand on the Risk Analysis process as it is not well-understood among project management practitioners. The following is a diagram based upon the RiskIT Risk Analysis model by Kontio.

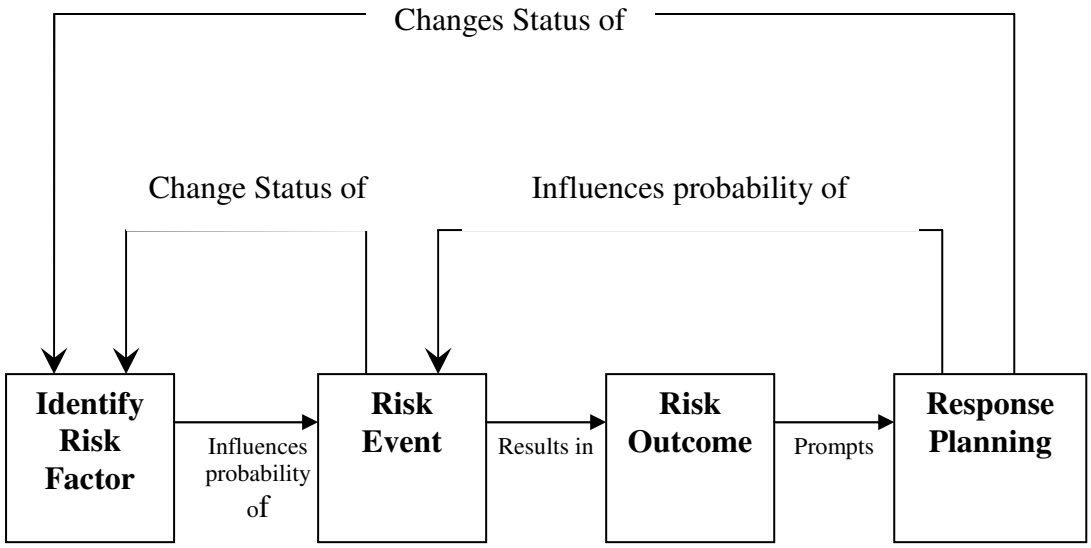


Diagram illustrating the iterative risk process (based on Kontio see App C)

Analysing risk is an iterative process as can be seen from the above diagram. As the risk event is considered, this can affect the risk factor itself. Therefore, the analysis may need to consider a new risk; a variation on the original. The response planning may in turn affect the risk event and a reconsideration of the original risk may again be needed. Finally, the outcome resulting from the Response Planning activity is a single response that will be applied for the specific risk. This response may immediately reduce the risk to an acceptable level. Or the response may be a contingency plan to be activated if and when the risk becomes a reality. Therefore, the contingency plan must be resourced and documented ready for its need.

5.7 The Risk Checklist

There should be a standard checklist of questions that the PM should ask through the course of the project. This activity should be considered an integral part of the risk analysis and identification process. Pfleeger (2003, p511) continues to suggest that we need to consider the risk specific to each organization, adding,

> "Alas, there is no simple checklist or easy procedure to list all vulnerabilities."

Whilst this is true, there are some standard risks to which every project may be subject. These risks include: -

a) Not meeting its deliverable deadlines;
b) Not meeting its business requirements;
c) The IS project failing to meet its business objectives.

The questions that a Project Manager should be asking at the time when risks are monitored and rechecked should also include:

a) Checking the 'Internal Governing Variables'. The Project Manager must continually ask Managers if any internal strategic plans have changed to affect the direction of the project? PRINCE2 expects the Project Board to perform this role. However, there is a danger that if the Project Manager does not perform this task, then it will not be done at all.
b) Checking the 'External Governing Variables'. The Project Manager must continually ask Managers if there have been any alterations in external market conditions, legislation or the political framework to affect the direction of the project? These changes may be threats or opportunities. But, in either case, they may require changes to the project.
c) Is everyone involved in the project aware of what is needed of them in the next stage? Has the plan been communicated? Have all team members been given enough notice for them to provide what is expected of them?
d) How can we ensure that the users will accept the completed system?
e) How can we ensure that the system is acceptable to both Users and Sponsors?
f) Is there a need to activate the contingency plans for any circumstances?
g) Has an unforeseen eventuality arisen for which there is no response plan?

The risks identified will require different responses for each different project. However, knowing some of the generic risks and documenting them on the risk log is the first step to managing risks properly. The brainstorming sessions may be held to identify responses and create the plans that may be needed if the risks become actual issues.

Communication is also a vital issue. It is necessary to remind the project team of the main goals of the project. This requires a review of the project objectives at regular intervals to make everyone aware of the main direction in which the project should be heading. It also gives everyone an understanding of their role and everyone else's role. This sometimes uncovers a duplication of effort.

This is not an exhaustive list, but hopefully it is illustrative of the risk analysis activity that needs to be conducted at the outset of any IS project. There are also some other risks that are not completely under the control of the project manager, including: -

a) The IS business objectives changing part-way through the project;
b) A change of sponsor and a lack of ownership and support for the current project;
c) Market changes mean that the IS project is no longer needed.

These risks may be outlined in the initial project brief and a 'contract' may be agreed by a senior executive for a plan of action in these circumstances. These risks will also be highlighted by their specific 'impact', as follows: -

a) The potential degradation of an existing business capacity;
b) The potential degradation of competitive advantage;
c) A potential increase in operating costs.

However, these eventualities will only be identifiable after the project is complete and the system has been implemented. Therefore, these issues occur too late in the life of the project to be useful to this research. This is exactly the reason that Risk Analysis and Management should be taken seriously; no-one wants the project to fail and only know about it after it has happened.

5.8 The New Models

These are variations and combinations of the PRINCE2 SB Model, the Van Scoy model and the Kontio Risk Model. The following model describes a process to follow when reviewing the end of a stage in the project.

5.8.1 End of Stage Process

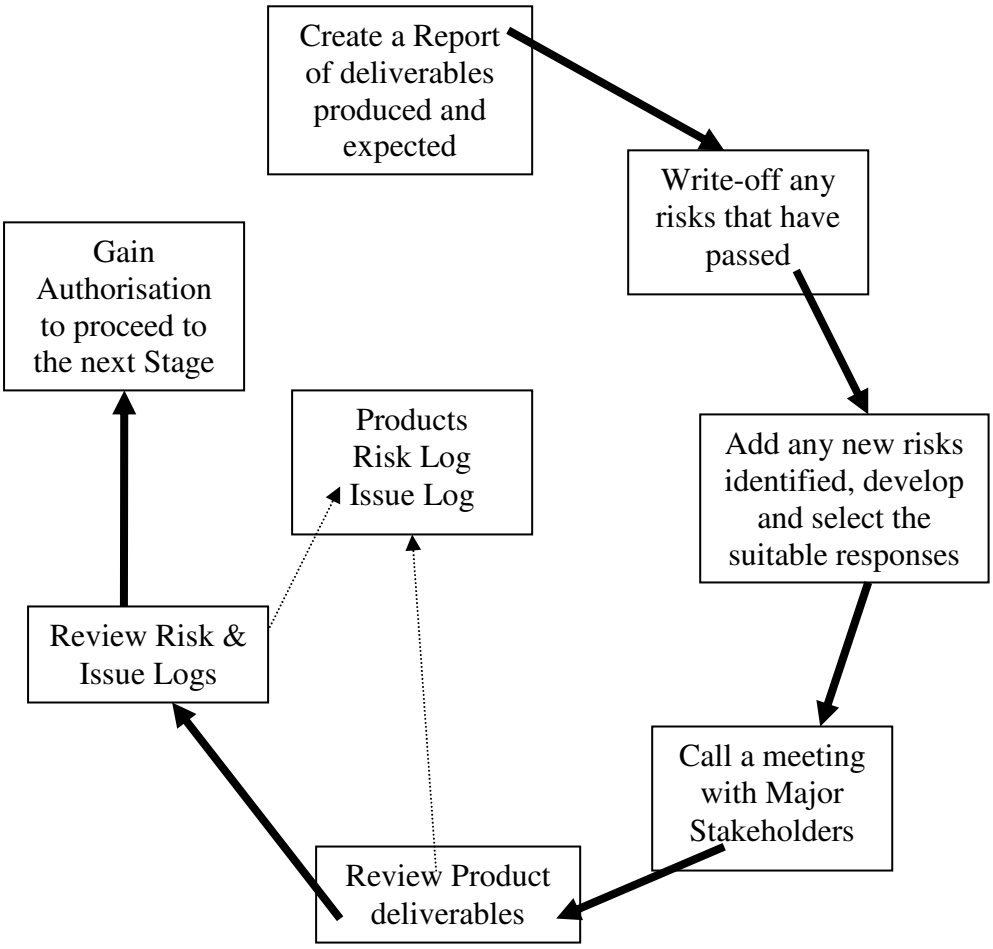


Diagram: A straightforward illustration of the end of Stage process

The process diagram could be easily continued to produce a report of expected products from the next Stage. However, that is what the Project Plan will do. The reviews of the Risk and Issue Logs are to ensure that the Risk Analysis exercise was performed correctly and identified resolutions for all potential risks.

The box in the diagram describing adding new risks and developing responses for those risks is the Risk Analysis process. This is illustrated in the diagram below.

5.8.2 The Risk Analysis Process

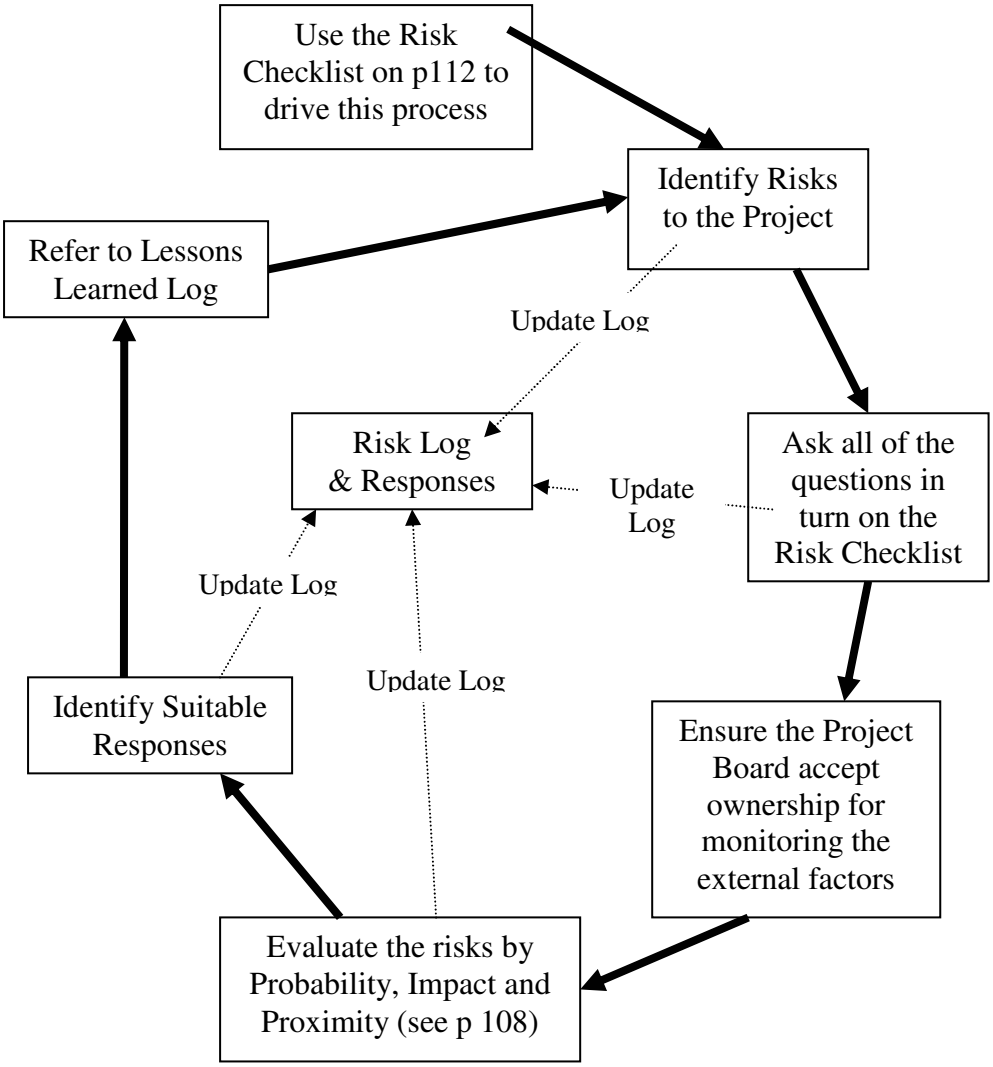


Diagram: A straightforward illustration of the Risk Analysis process

Asking the questions on the Risk Checklist will help to identify the Risks at the outset of the project. As the exercise continues, more risks will be identified by the team for that specific project. But, as it is sometimes difficult to start, the Risk Checklist will allow a simple introduction to the Risk Analysis process.

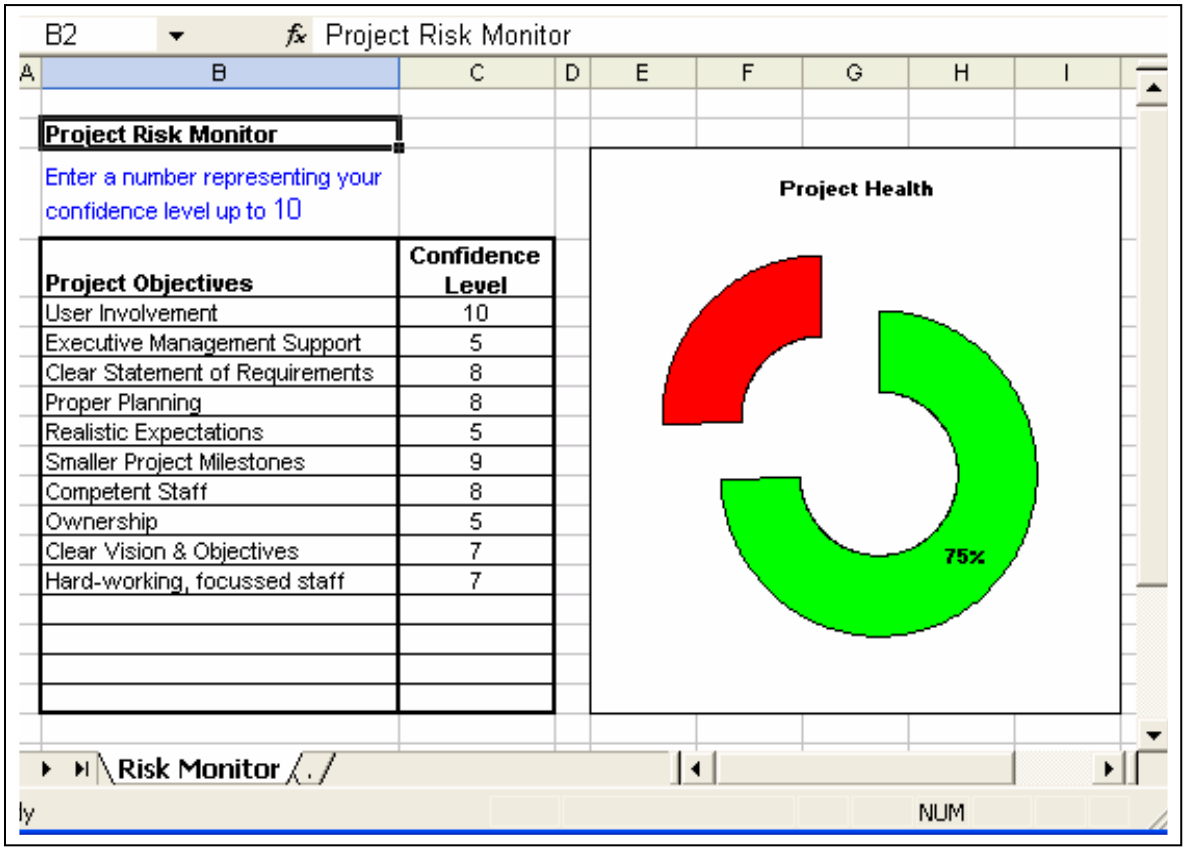
Identifying a Suitable Response involves analysing the risk for 5 separate factors; prevention, reduction, transference, acceptance and contingency. For example if the risk was 'not having skilled resource', it may be possible to: -

a) Prevent the risk by assigning more resource at the outset;

b) Reduce the risk by allowing more time for the work and training more people in the skills required;
c) Transfer the risk by contracting an external organization to perform the work;
d) Accept the risk by doing nothing. The 'Do Nothing' option should always be considered. If nothing else it focuses the mind on why the risk is important enough to motivate a response against it occurring;
e) Develop a Contingency plan that if the skilled resources are not available at the time, then more resources will be assigned from another project as a short-term measure.

However, at the end of the analysis, the decision must be taken to adopt one of the responses as the most suitable. This analysis must be conducted for every risk and the response must be documented, together with the resourcing and the plan for its action.

5.8.3 The Risk Monitor Model

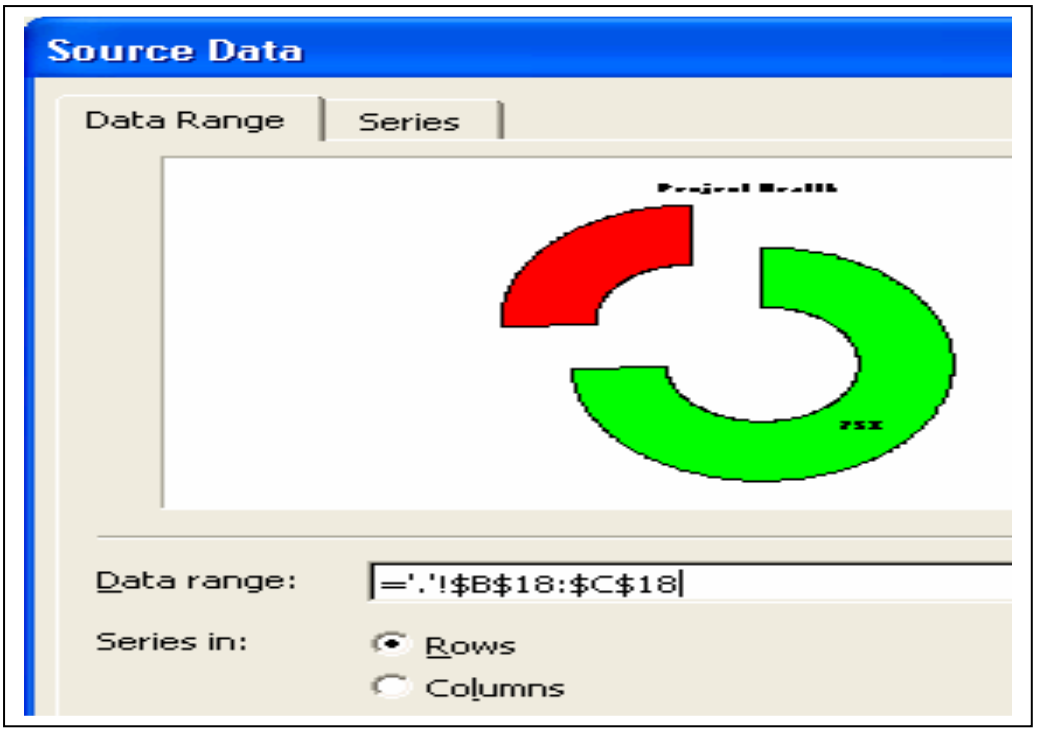


Screenshot of Risk Monitor Model (enhanced from original model by *Vyom Bhuta* at http://www.gantthead.com/deliverable.cfm?ID=191411 accessed 23/06/2004)

This Excel spreadsheet has been developed to help test the confidence of project team members in the successful outcome of the project. It has the factors identified in the Standish Report, together with the weighting that Standish have attributed to each of the factors (see page 73 of this work).

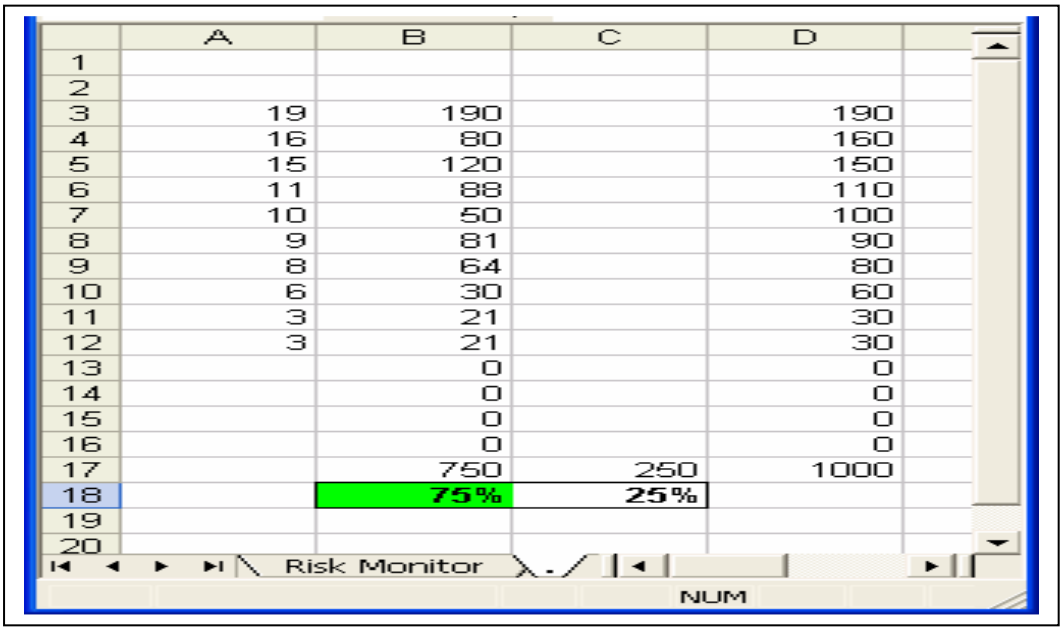
The user inputs a confidence level for each of the factors under the Project Objectives heading. They assign a factor between 0 to 10. The model then displays a graph in the form of a doughnut chart, giving a pictorial representation of the confidence factor. In the example above the confidence factor is 75%. This is calculated from the factors input by the user under the heading 'Confidence Level'. In this example, the user has keyed 10 for User Involvement, which indicates that they are confident that the user is fully involved in the project. They have input 5 for 'Executive Management Support', indicating that they consider this level of support may not be fully achieved.

5.8.4 The Risk Monitor Spreadsheet



Screenshot illustrating the data range on worksheet '.'

The data for the green part of the doughnut is in cell B18 on worksheet '.'. The data for the red part is in cell C18 on worksheet '.'.



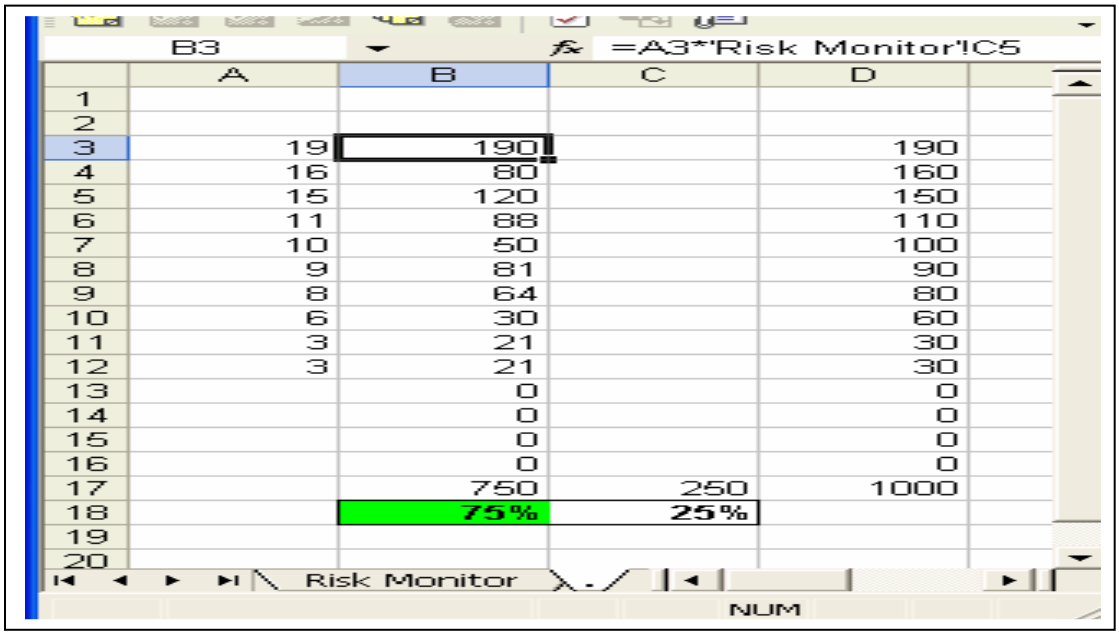
	A	B	C	D
1				
2				
3	19	190		190
4	16	80		160
5	15	120		150
6	11	88		110
7	10	50		100
8	9	81		90
9	8	64		80
10	6	30		60
11	3	21		30
12	3	21		30
13		0		0
14		0		0
15		0		0
16		0		0
17		750	250	1000
18		75%	25%	
19				
20				

Risk Monitor . NUM

Screenshot illustrating the datasheet on worksheet '.'

Cell B17 is the accumulation of the entries above in column B. B18 is the figure in B17 expressed as a percentage of the potential full total of points (1,000).

The data is calculated from the 'set ratings' in Column A, identified by Standish and a factor from 1 to 10 given by the person assessing the project. The following Screenshot illustrates the formula for 'User Involvement'. The calculation is to multiply the contents of A3 (the rating) with the content of C5 on the Risk Monitor Worksheet as shown in the formula in cell B3 below. Cell C5 on the Risk Monitor worksheet has been updated by the user with their confidence level between 0 and 10. Subsequently, the user updates their confidence level for all of the categories detailed on the Risk Monitor worksheet (contained in C5 to C14).



	A	B	C	D
1				
2				
3	19	190		190
4	16	80		160
5	15	120		150
6	11	88		110
7	10	50		100
8	9	81		90
9	8	64		80
10	6	30		60
11	3	21		30
12	3	21		30
13		0		0
14		0		0
15		0		0
16		0		0
17		750	250	1000
18		75%	25%	
19				
20				

Screenshot illustrating the formula for cell B3

This formula is then replicated for all relevant rows in column B and totalled in B17.

The model may be used within the Project Support Office of any organization. It may also be amended to incorporate the factors that are considered more appropriate to the specific organization. These other factors may have been arrived at from lessons learned from previous projects. However, if the factors are changed, then the Standish 'ratings' will no longer be appropriate. Therefore, the ratings should also be changed to reflect the importance of the new factors.

This is a straightforward Spreadsheet that can be used as it is, or changed to suit the specific organization. I trust that the description above is sufficient for anyone to recreate this model with any spreadsheet package.

5. 9 Validation of the models

In the period of this research the models have been used by the researcher in his role as IS/Business Consultant. The process diagrams are also used as part of the material for training staff new to project management. They show the major processes in project management and emphasise the integral position of risk analysis. Other models and diagrams are used to give an understanding to the stakeholders in the projects of the part that risk plays and how to conduct risk analysis exercises.

It is hoped that the Risk Monitor model will help to illustrate to Executive Management a realistic confidence level of the project in question. A picture has an immediate effect and can make a significant impression with people who have little time to read through a multi-page report. It has been used on a number of occasions when making presentations on the high-level principles on which a new project will be based. The model serves the purpose of illustrating the significance of the involvement of Executive support. The process diagrams serve the purpose of showing the manner in which the project manager and the project team interact.

The models and process diagrams could be useful in both areas of training for novice project managers and as guides for how the project management activities should be performed.

CHAPTER 6. CONCLUSION

This research work attempts to address a number of themes affecting the outcome of an IS Project including, connecting the risk analysis process and the systems development and project planning processes. It also proposes that the connection between the risk management process and the project management process is not well-understood. The project management process is reviewed and re-engineered in order to formalise the risk management activity as an integral and vital part of project management to ensure project success and safeguard against failure.

6.1 The Limitations of this Research

It would have been beneficial to have access to the individuals involved in some of the project failures.

A longer-term project would be required to test the theories in this research. These tests would have involved working with the PRINCE2 custodians. And work on a large-scale project would be required, such as the UK Government projects that have recently started, including the NHS Programme for IT.

6.2 The Internal contradictions of some Methodologies

During this research a number of contradictions have been illustrated including,

- Checklists against processes (The what against the how);
- The Project Manager ring-fencing the scope against needing to allow for changing requirements;
- The straightforward management of technological issues as opposed to the complexity of the management of the people involved;
- The PRINCE2 methodology being product-delivery oriented, but it also has a process-based approach;
- PRINCE2 emphasises 'products', but less than 10% of its methodology refers to the 'project products', whilst the vast majority are project management products;
- Standards and methodologies provide a guiding framework to increase the likelihood of success. But, they also encourage an attitude of 'invulnerability', which may lead to complacency;

Flowers (1996 p 21) suggests that there is a tendency for this blind confidence. He recalls the anecdotal report of the captain of the Titanic,

> "I cannot imagine any condition which could cause this ship to flounder."

Flowers describes this as the "The Titanic Effect", which he defines as,

> "The severity with which a system fails is directly proportional to the intensity of the designer's belief that it cannot." (p21 footnote 5)

6.3 Indicators of Problems in a Project

A number of symptoms have been identified as indicators that a project is going out of control and moving toward failure. However, by the time that these symptoms manifest themselves, the project may already be heading for disaster. Yardley (2002, p10) refers to IS project failures being characterised by the following events: -

- the degradation of an existing business capacity;
- the degradation of competitive advantage;
- an increase in operating costs;
- failure to meet critical business requirements;
- poor levels of user satisfaction;
- loss of control over requirements management;
- loss of control over planning.

The risk management process should focus on the indicators as follows:

- Unclear direction
- Over-worked, or under-worked staff
- People or equipment not being available when needed
- Examples of rework or wasted effort
- The final tasks being rushed
- A high volume of bugs in testing illustrates poor quality work
- Project delays and over-spends
- Small problems having large impacts

6.4 Future Research

A number of suggestions for future research spring from this work.

One future project could be to work with the Association of Project Managers to review the understanding of 'risk' within the field of project management. This research proposes that risk is not clearly understood by project managers. The future research could explore the concepts of locating risk in a central role within project management for practitioners out in the field. It could provide material for use in training future project managers in the part that risk plays in project management and how to conduct risk analyses.

A future project could use and prove the models and process diagrams from this research within a substantial project. A long-term, project would be ideal to test the theories and models in this research. A trainee project manager could shadow an experienced project manager. The trainee could use the techniques and processes within this research to cross-check the project. This would allow training on the job and would also provide objective overseeing of the project.

Another future project could involve liaising with the PRINCE2 custodians while working on a practical project. This work would be able to assess the issues raised by this research and feedback to improve the PRINCE2 methods. The PRINCE2 methodology adds a significant framework to act as a guide towards a successful project. The future project could assess the perceived inconsistencies of the focus of PRINCE2 on products, but less than 10% of the documentation relates to 'project products'. The focus of PRINCE2 is very firmly on the Project Management products. This is similar to stating that the objectives of the project are to produce a project plan and risk log and regular progress reports. These are all important products that aide the project manager in guiding the team towards a successful conclusion. However, if the project should be developing a Customer Relationship Management System, then the fully tested and approved Information System is the final product of the project.

A final suggestion for a future research project would be to participate in one of the current UK Govt projects being in early stages and follow it through its life cycle. The intention would be to map the processes and document any issues that may lead to a failed project outcome. The project manager should be able to perform this task,. But, perhaps they are too close to the action. Two current projects would be ideal as they are only in the planning stages at the moment. They are the National Programme for IT in the NHS (NPfIT) and the National Identity Card projects. They are both multi-billion pound projects and all measures should be taken to ensure that this public money is not wasted. This future research work could document the activities of the project and record those decisions and activities that were instrumental in moving the direction toward success or failure. This could create a lessons learned document that would be of value for all project managers in the future.

6.5 Suggestions and Recommendations

Lessons must be learned from the earlier list of the 'commonly accepted' critical success factors and the factors leading to a failed project.

If there are changes in the environment, then the project objectives should be revised. Otherwise the factors on which the project is being measured may no longer be appropriate. This mentality is often apparent in the attitude of project sponsors who react to expanding the scope of a project by also strictly adhering to the original deadline.

The Project Manager should always bear in mind that if there is an activity on the plan, then there should also be a product resulting from that activity. If there is no product, then the Project Manager must ask the question, 'why is the activity being performed?'

The factors that almost guarantee project failure are listed earlier in the work including: -

- Lack of User Input;
- Incomplete Requirements & Specifications;
- Changing Requirements & Specifications;
- Sound Business Justification;
- Lack of Executive Support;
- Lack of Risk Analysis and Management;
- Technology Incompetence.

A list has been included of the 'common' risks that should be considered by a Project Manager. These should be used throughout the duration of the project as a yardstick by which to measure changes internally within the organization and in the external environment, which will determine the need for revisions to the project and the project's original objectives.

The research has attempted to define such terms as project, problem, objective, and risk: concepts that are often assumed but are frequently misunderstood. Their

explanation suggests ways to better understand the risk associated with specific situations, and to be able to face these risks with better hopes for success. Risk management is then presented and described as an iterative organizational process to be performed at special times and whenever necessary, within the project's life cycle.

An attempt has been made to associate the risks with a standard Systems Development Life Cycle (SDLC). Each phase should repeat the analysis of risks. The overriding risk for which the PM should continually monitor is that the project will not achieve its goals.

UK Government IT/IS Projects have an overriding risk – that is public money will be wasted if the project is not successful!

There are also a number of incidental risks that result from the failure of UK Govt Projects. The most important is that if money and resources are spent on a failed project that will result in another project not being able to have been commissioned. For example, in the NHS, if the National Patient Database fails, this will result in Millions of pounds being wasted. This will mean that money is not available for modernisation of radiotherapy units. Therefore, the community will be disadvantaged two-fold by a failed project.

A final recommendation that the information distilled in this work be used for two main purposes: -

1. To help the Project Manager identify risks and design suitable responses for them throughout the project;
2. To identify actions that the Project Manager should take (and the 'Systems Thinking' mindset that the Project Manager should employ) to ensure that the project objectives are measured against any changes in the environment and revisions are made to them where appropriate.

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Appendix A - The Boehm Spiral model of systems development

From: http://www.sei.cmu.edu/cbs/spiral2000/february2000/BoehmSR.html

[Accessed 28/11/2003]

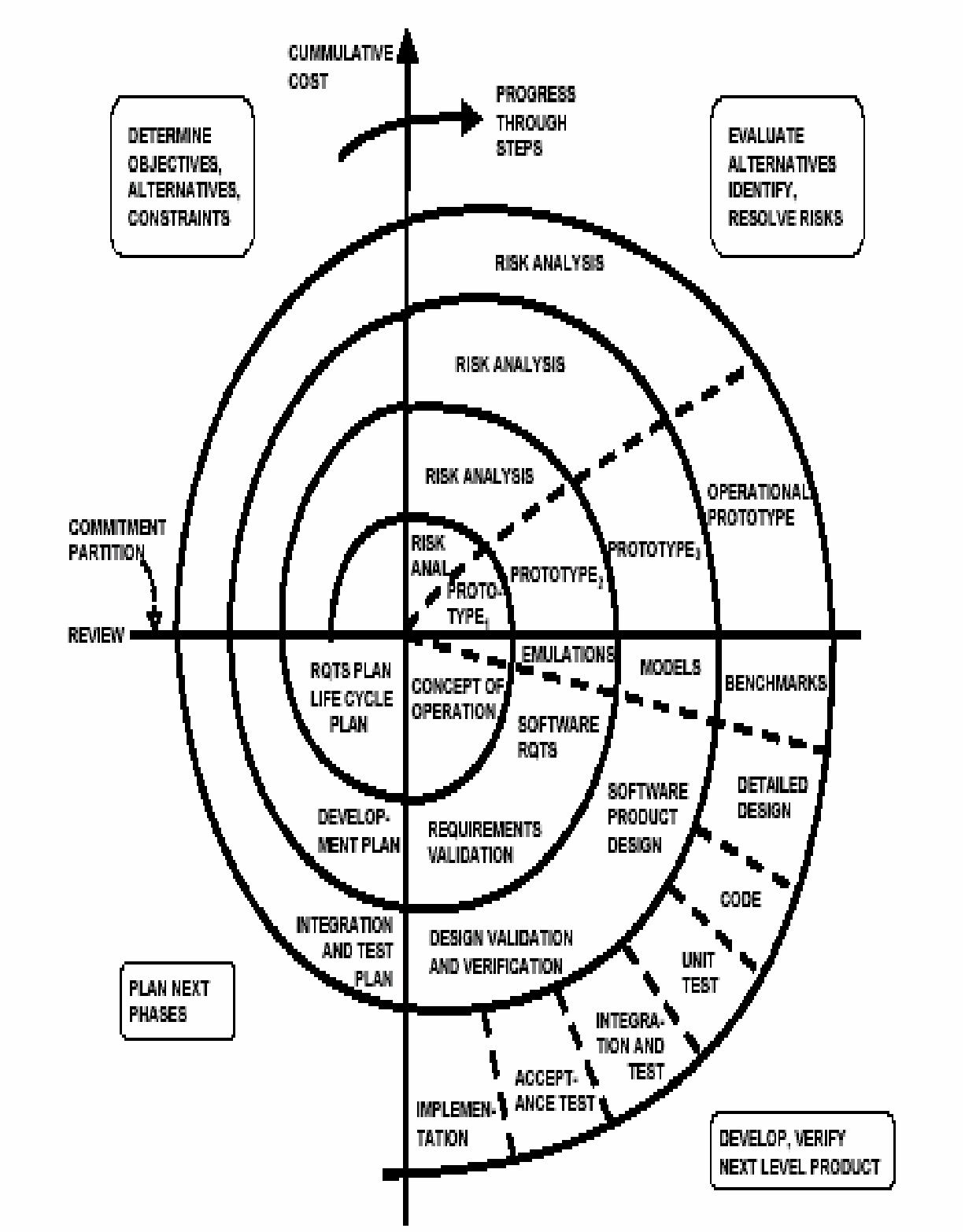
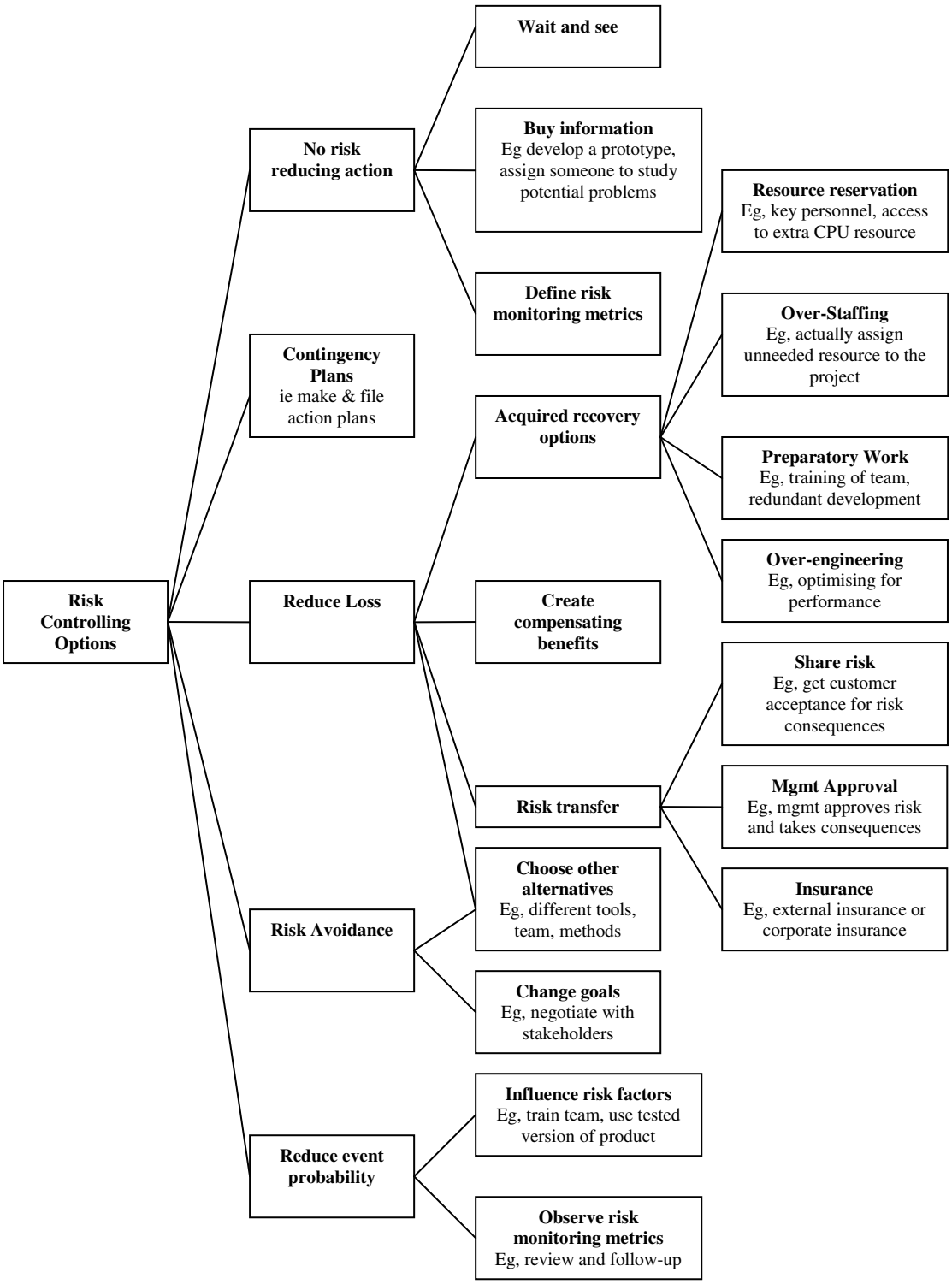


Figure 1: Original Diagram of Spiral Development (on p2 of the paper)

Appendix B – A model for risk management decision making

Jyrki Konti, The Riskit Method for Software Risk Management, version 1.00

Figure 11: Options for risk management decision making (p35)



Appendix C – The RiskIT Risk Analysis Model

Jyrki Konti, (p9), The RiskIT Method for Software Risk Management, version 1.00

Figure 2: A conceptual view of the elements in the Riskit analysis graph