CRANFIELD UNIVERSITY

SCHOOL OF MECHANICAL ENGINEERING
R&D MANAGEMENT CENTRE

Ph.D. THESIS

Academic Year 1995-1996

ALI QASSIM JAWAD

Factors for success in acquiring Information Technology

Supervisor: Dr. Richard Reeves

December 1995

This thesis is submitted in partial fulfillment of the requirements for the degree of Doctorate of Philosophy

ACKNOWLEDGMENTS

This work was funded by the Government of the Sultanate of Oman. I am grateful to my country who opened the way for me by sponsoring my studies and I hope that their investment in this work will have great value for money.

I am most grateful to Dr. Richard Reeves, my supervisor, whose direction was invariably patient, considered and enlightening, and whom during the course of my studies became a good friend on whom I knew I could always rely.

I am indebted for assistance and support to the following. David Robinson for assistance with the surveys without whom they would have been much longer and more difficult, and for being effectively supportive whenever needed. Andrew Bytheway of Cranfield School of Management for introducing me to the concepts of Information Systems within Management school of thought, and for his invaluable comments on research methodology. Dr. Andrew Racey of British Gas for valuable introductions to those who were able to positively share with me their industrial experiences, and for perceptive and constructive comments on the thesis. Dr. Yasar Yesilcay of Sultan Qaboos University for guidance and advice in the application of statistics to my research. Dr. Rodney Gale for expert guidance in the use of Content Analysis technique. Terry Dwan of Price Waterhouse for introducing me to the practical applications of Information Systems. Karen Dawson of Price Waterhouse for practical assistance in the statistical aspects of the research. John Ross of Infologistix for sharing with me his practical IT experience. The Review Panel Prof. Philip Hutchinson, Prof. Michael Sanderson and Prof. Peter Allen for constructive advice in monitoring the progress and direction of the research. Petroleum Development Oman (PDO), the Oman national oil company for the considerable extent of their participation in the survey.

I would like to thank all those who participated in my surveys for their time and efforts. I also would like to thank the members of the "Expert Panel" for their active participation.

I am indebted to Mushtaq Abdullah Al Saleh, my uncle, who had a vision about my education from day one of my University life and who supported and encouraged me continuously to fulfill that vision. This work is an end-product of his vision.

Finally, but not of course least important, I am deeply indebted to the unselfish support of my family, particularly my mother, wife and daughter, on whom heavy burdens fell during my prolonged absence.

ABSTRACT

The acquisition of new IT systems is expensive and risky. Systems often fail to provide the expected services, or may commit an organisation to a particular long-term solution to its information management needs which can be very costly to change. The purpose of this research was to help organisations to manage the IT acquisition process with greater chances of success. In this research 'Acquisition of IT' means the whole process of initiating, implementing and then using an information technology system.

The approach taken was to identify success factors for IT acquisition. A large number of actual acquisition cases were examined, and a list was compiled of factors reported by people involved in these cases to affect their success or otherwise. The relative importances of these factors were then measured quantitatively by correlating the degree to which each factor was present in the cases, with the degree of success of the cases.

This work has produced: a comprehensive list of factors to be considered; a method of defining what is meant by success for a given project; a description of the acquisition project lifecycle; and an identification of the different roles played by different people within an organisation.

It is shown how to integrate these considerations into a structured approach to managing IT acquisitions. This integrated approach is called the *Success Map*.

Three mini case studies were included, and one of these was analysed in the light of the findings.

In a supplementary section, fifteen guiding principles for people involved in an IT acquisition are presented.

CONTENTS

Note: References and appendices are at the end of each chapter. A diagrammatic plan of the research is shown in Table 1 on page 11.

CHAPTER 1

INTRODUCTION

The acquisition of a new information system is often very expensive and risky. Systems may fail entirely to provide the expected services, or they may commit an organisation to a particular long-term solution to its information management needs which if it proves to be inappropriate can be very costly to change. This research examines the factors associated with success or failure in IT acquisition and presents a series of guidelines to assist organisations planning to acquire new Information Technology systems.

The research is based on a study of a large number of different Information Technology acquisitions made by government bodies in the Sultanate of Oman. This chapter defines terminology, provides background information , and explains the stages of the research plan.

It is believed that the results of this research would apply not just in Oman, but would be applicable with suitable modifications to any country or organisation acquiring IT.

1.1 General background

1.1.1 Information Technology definition and background

The term "Information Technology" (IT), as referred to in this research, embraces the broad range of electronic means involved in information processing and handling, such as computer hardware, software, communications and office automation.
As recently as thirty years ago, the bulk of information used by most organisations was handled manually. The rapid development of computer technology has led to an enormous change in the routines of information handling, and in the volume of

transactions made electronically. An example most widely apparent to the greatest number of people world-wide, is the volume of daily business now handled in finance and banking.

An OECD report classifies Information Technology as one of the most important new technologies of the 1990's (OECD 1988)[1]. The Information Technology industry is also one of the fastest growing industries. "World wide sales continue to exceed $250bn annually. This trend is expected to continue and sales are expected to reach $900bn by the year 2000" (Madu 1991, p. 105).

These rapid technological advances have had significant social consequences. The adverse employment effects of transferring manual processes to machines are believed by some to have been more than counterbalanced by the development of a wide-ranging new profession of "information technologists". These professions range from low level technical and clerical staff up to senior managers specializing in Information Technology strategy. A recent unpublished US government report showed that 60% of all jobs are now information related with eight out of ten new jobs occurring in information intensive sectors of the economy.

With the mass production and distribution of microcomputers, and the enormous strides made in the development of off-the-shelf software, the cost of computer systems has been reduced to a point where nearly all organizations, no matter how small, can afford IT for their administrative needs. The introduction of these technologies has become a matter of a strategic concern for many commercial enterprises and governments (Abdul-Rahman, 1992). It is therefore essential for senior managers and policy makers in such organisations to understand the impact of information technology on their organisations and the process of acquiring it.

[1] References are presented at the end of each chapter in this thesis

1.1.2 The Sultanate of Oman

(a) Introduction to Oman

The Sultanate of Oman is the second largest country in the Arabian Peninsula, occupying an area of some 300,000 Km^2. It is located at the eastern part of the peninsula. It has an estimated population of 2 million and a GNP per head of $4850. The sultanate of Oman has a history which can be traced back over 2000 years. The Omani people have traditionally been noted sea-farers, traveling as far as China in the ninth century AD, acting as navigators for the Portuguese in their explorations around the Indian ocean in the sixteenth century, and being the first Arab country to send an ambassador - in an Omani ship - to America in 1844. Through trade, and its colonization of the spice island of Zanzibar, Oman became a prosperous nation, retaining its independence throughout Turkish and British domination of other parts of the peninsula.

In the twentieth century, Oman fell into a state of general decline until, in 1970, Sultan Qaboos took over the rule of the Country from his father. He immediately began to utilise the modest oil-wealth of the country in an unprecedented phase of development. The inherent spirit of independence and adventure of the Omani people played a significant role. Additionally, many well-educated expatriate Omanis returned to their homeland and, within ten years, the Sultanate had a complete infrastructure of public administration, an extensive network of modern roads, and an enviable education system leading from primary school to university.

The Sultanate now has a comprehensive system of public administration, centered on 23 ministries and 20 other government bodies, with a total staff of some 100,000, to serve a population of just over 2,000,000 spread widely over 212,000 Km^2. The policy of the government is to promote, encourage and support private enterprise and to balance adequate and responsible control with a minimum of bureaucracy. To this end, considerable emphasis is placed on industrial development and increasingly successful diversification from dependence on an oil-producing economy. Further major

developments have taken place in the exploitation of other mineral resources, agriculture and fishing, and the development of industry.

(b) Development of IT in Oman

The development of the nation only really began in 1970, and the application of information technology has played an important role in the overall process. At present, the application of information technology in both the government and private sectors is equal to that of some of the most advanced states, whereas, prior to accession of His Majesty Sultan Qaboos in 1970, information for government and commercial purposes was recorded by hand in ledgers and documents.

As the country embarked on a rapid programme of development, the volume of associated information expanded rapidly. Information technology, which 25 years ago was still in a relatively primitive state in Oman, was gradually introduced to begin the process of automating records.

The first computer system in Oman was introduced by a government department in 1972 and was shortly followed by some other departments. This represented the first phase of computerisation. Although the success rate of such acquisitions was somewhat mixed (as indicated later in this thesis), the overall trend was one of significant achievement in the application of information technology to meet the demands of rapid development.

It was, however, the mixed experiences encountered in the acquisition and use of information technology in Oman which led to the selection of IT acquisition as a topic worthy of more detailed research for this thesis.

1.1.3 Importance of the research

In recent years a large number of IT systems have been acquired by different government organisations in Oman though until now no research related to the IT acquisition had been undertaken in Oman and very little has been taken elsewhere. The

application of improved knowledge to future IT acquisitions could result in significant financial savings. This is particularly critical to Oman where the government recently embarked on a major project aimed at shaping a long-term national information infrastructure under the title Vision 2020. An action plan for IT acquisition is a specific proposal in the Vision 2020. Such a plan should enable improved success rates to be achieved by those acquiring IT. This research therefore investigates a timely issue and the results of this study will be immediately applicable to the researcher's sponsor, the Oman government, as well as more widely.

1.2 Acquisition and purchase

The exploratory study conducted in Oman (Chapter 2) demonstrates that acquisition through purchasing is the most common mechanism for introducing new IT systems to organisations. Hardware or software purchased was sometimes installed and brought into use by the Omani purchasers whilst at other times partial or full implementation was undertaken by contractors.

During this study it was realised that it is important to distinguish between *acquisition* and *purchase*. When an IT system is required, attention is usually concentrated on its purchases. The act of purchasing the actual hardware and software in a given case will however normally lead on to the expenditure of time and effort by the new owner which is worth in many cases much more money than the purchase price. When the system is finally working (or not), the positive or negative impact on the purchaser's business may be worth a great deal more again. It is the whole acquisition process which must be successfully managed.

In this research the acquisition of IT is defined as the total process which includes the adoption, implementation and use of information technology. This research covers not just how a country like Oman can successfully purchase IT but how it can be successfully manage the whole process of IT acquisition.

1.3 The research method

1.3.1 The problem

One often hears of unfortunate experiences of costly waste in the purchase of Information Technology (IT) in both hardware and software. For example, in one of the three mini-cases discussed hereinafter, a new computer system purchased to automate an important records system turned out to be an obsolescent model and it was soon found to be impossible to work with its old programming language. However, one can also meet failure by adopting IT that is too new. In another case a system was needed to transfer data stored on a large number of old magnetic tapes to a more up-to-date format. A newly introduced digital system was proposed by a supplier. The top management liked the system and IT staff technically approved it and therefore was adopted. Within only six months, the supplier announced that their pioneering model was being discontinued and would be replaced by a second generation using more standard tapes.

Such unfortunate experiences are not restricted to developing countries such as Oman, where rapid infrastructure development is taking place. Similar disasters also occur in countries like the UK on a variety of scales. The attempted computerisation of the London Ambulance Service and of the London Stock Exchange were well-publicised examples of very costly failures.

From the cases above we get the warning that a widely adopted software package may quickly become redundant as more efficient or more flexible packages become available. Also the initial highly successful entry of particular hardware may be completely eclipsed by the introduction of new cheaper or more capable models.

Although from the above we could deduce the rule "Do not buy IT that is too new or too old", initial exploration of the problem indicated that a great variety of other considerations could also be suggested as important. It was thought necessary to find

a way of systematically gathering a large body of such anecdotal evidences, and then weighting it to find if some factors are more significant than others.

1.3.2 The success factor approach

It was decided to use the success factor approach pioneered in project SAPPHO (SPRU 1972). SAPPHO, stands for Scientific Activity Predictor from Patterns with Heuristic Origins, and was a classical study carried out in the 1960's into how to conduct R & D projects more successfully.

Project SAPPHO involved examining large numbers of company R&D projects and asking those involved what factors, such as government financial support, or market research into the need for the new products, were present in each case. The factors present were then correlated with the success of the different projects in order to identify which factors predict success or failure and which are unimportant. For example, government funding was found to be unimportant whilst relying on another technology not yet developed was a strong predictor of failure. Figure 1.1 shows one form of presentation of the output of the SAPPHO research.

SAPPHO's methodology has been adopted by many researchers including Cooper (1993) who investigated what makes a new product a winner by using a success factor approach. Cooper identified 40 different factors, and used a database of 200 R&D projects to correlate the factors with success. His results have been used as the basis of a consultancy service for the management of R&D projects in companies. A questionnaire given to managers involved in the R&D is used to measure the presence of the different factors in these projects. Then a computer program is used to predict the degree of success of each. Cooper's service is quite widely used, and it was felt that a similar approach might be fruitful in the case of finding how to acquire IT successfully.

1.3.3 Research objectives

The main objectives of this research thus became:

A) To identify a list of factors which might influence the outcome of IT acquisition projects in the government sector in Oman.

B) To use a large number of projects in order to identify by correlation the most important factors.

While identifying factors for success, it became apparent that the definition of "success" is a major topic in IT acquisition. A third objective was therefore added and defined as

C) To develop means of measuring success in IT acquisitions.

In order to achieve the above objectives, two surveys were undertaken which will be referred to as the qualitative survey and the quantitative survey.

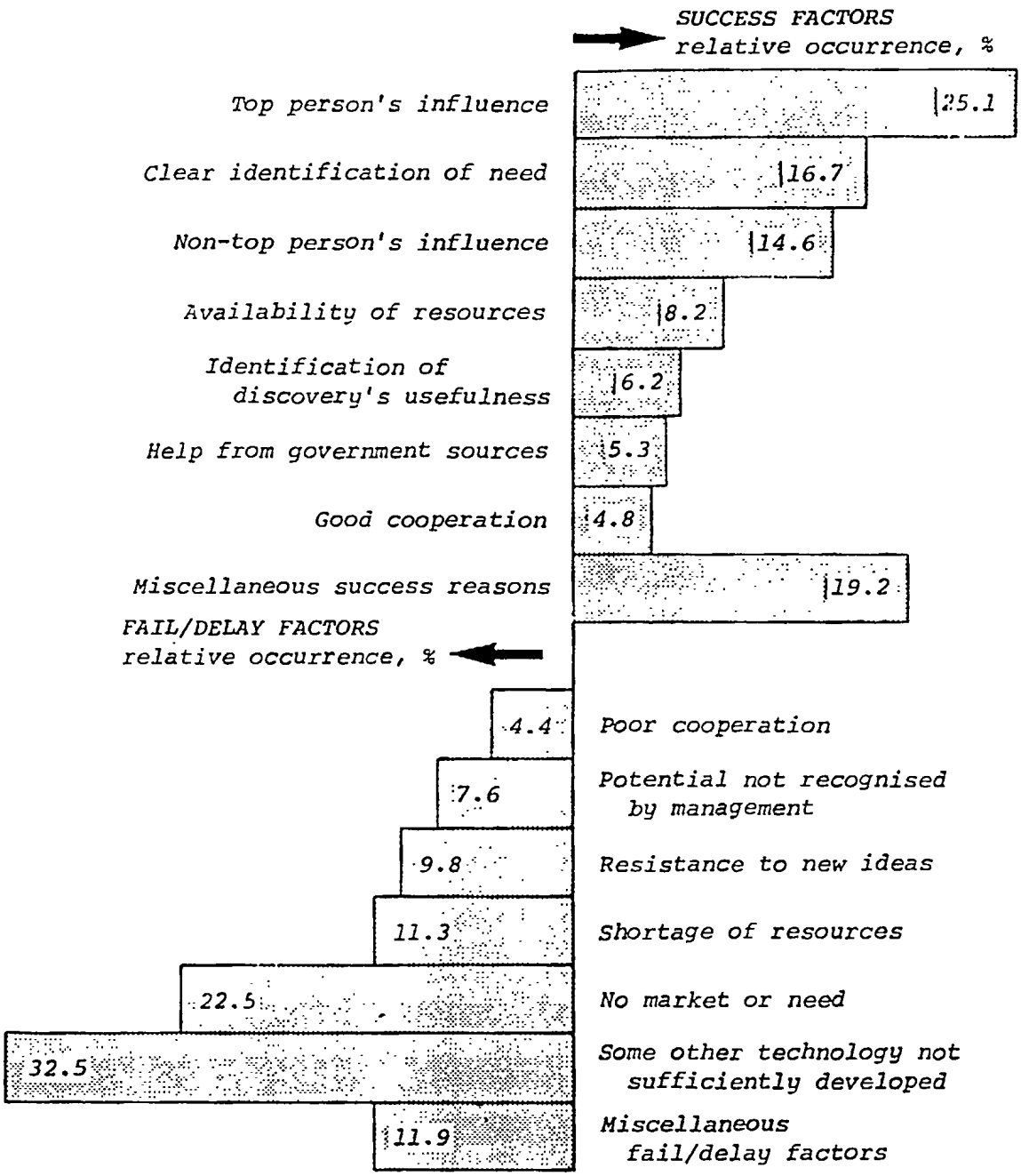

Figure 1.1 Output of project SAPPHO- a list of success factors for R&D projects

1.3.4 Research techniques used

Research techniques used in Management were thoroughly reviewed and appropriate ones were adopted for this research. A bibliography on research techniques is presented after the references at the end of this chapter.

The methodology used in this work included mainly interviews and questionnaires as means of data gathering. Data was collected from a wide variety of organisations and individuals. Content analysis and statistical analysis were used as data analysis techniques. Three specific acquisition cases were examined in a little more detail and are referred to as mini-case studies. One of these cases was used at the end of the thesis as an illustration for the application of the research findings. More detailed definitions of the various techniques employed are given at the appropriate points in this thesis.

1.4 The research plan and milestones

1.4.1 The research plan

The research plan comprised 12 stages in 4 phases, as shown in Table 1. The terms used in the table are explained in the appropriate chapters.

1.4.3 Research management (milestones)

The progress of the research was assessed three times during the period of study by the researcher's Review Panel and the following milestone plan was requested by them at an early stage of the research. The plan proved to be extremely helpful for managing the research and meeting all the 5 milestones on time as shown in Figure 1.2.

PHASES	STAGES	OUTCOME	CHAPTER(s)
1. Project definition	1. Literature review 2. Exploratory study in Oman	1. Definition of research objectives 2. Research methodology 3. Research plan	Two
2. Qualitative survey (Interview)	3. Semi-structured interviews 4. Content analysis 5. Reliability tests a. Inter-rater test b. Expert opinion 6. Mini-case studies	4. Candidate success factors 5. Measurements of success 6. Phases of IT acquisition 7. Project players	Three
3. Quantitative survey (Questionnaire)	7. Questionnaire design 8. Pilot survey 9. Main survey 10. Statistical analysis	8. Super and Subordinate factors	Four and Five
4. Discussion and Synthesis	11. Discussion and interpretation of the results 12. Application of the results	9. The Success Map 10. The Success Table 11. Guidelines for acquiring IT	Six and Seven

Table 1 The research plan. See later chapters for explanations of terms.

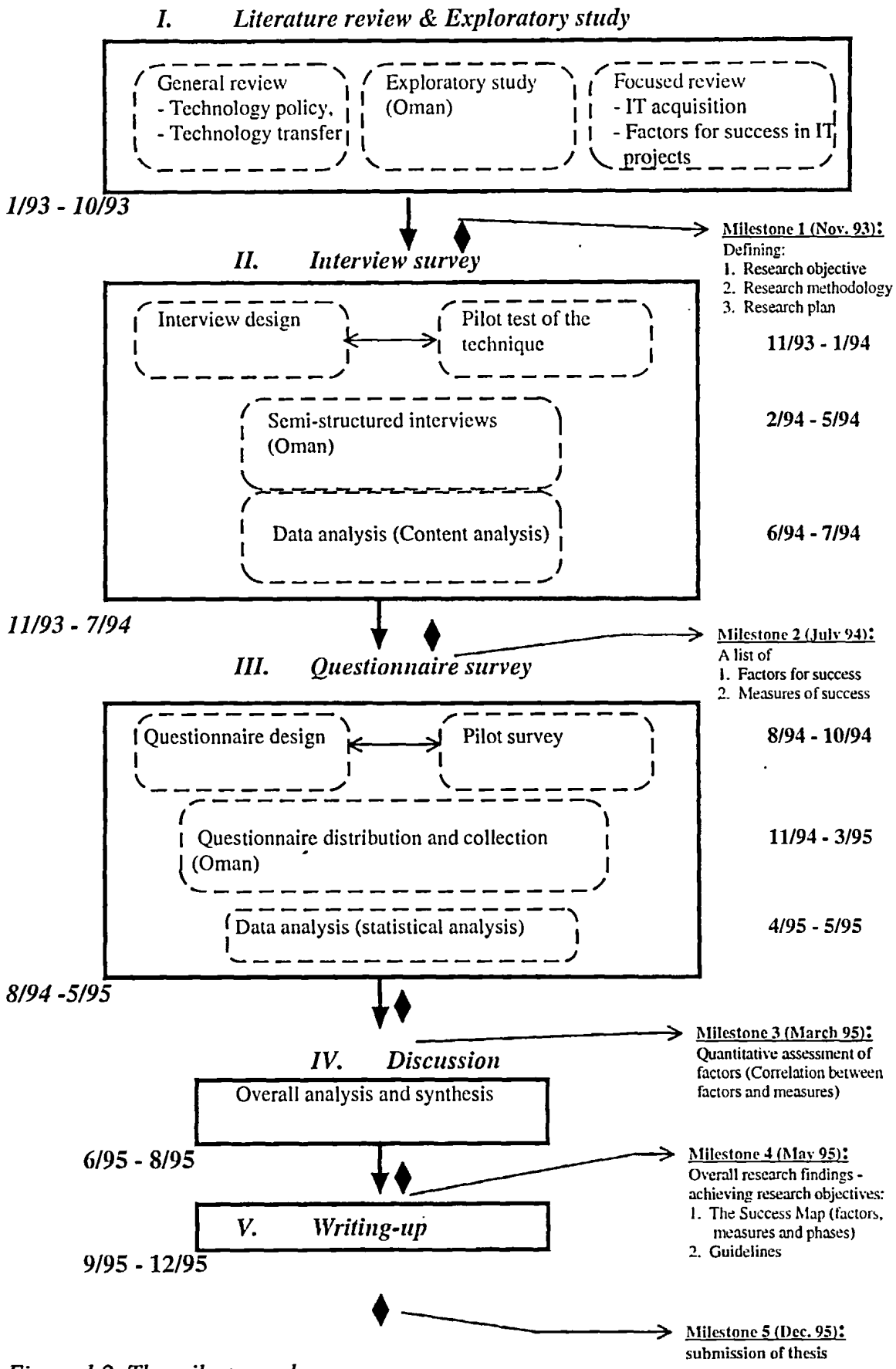

Figure 1.2 The milestone plan

References

Note:

The Turabian method of referencing is adopted in this thesis, where the title of a paper is in **bold** and the name of the journal is in *italic*. In the case of a report, the title of the report is in *italic*. For a book, the title of the book is underlined.

References are in alphabetical order.

Abdel-Rahman, Abdalla M. *Appropriate Industrial Technology in the Developing Countries: Oman Case Study*. Sultan Qaboos University, Department of Education, working paper, 1992.

Cooper, Robert G. Winning at New Products. 2nd ed. Reading: Addison-Wesley, 1993.

Madu, Christian N.; Kuei, Chu-Hua; and Madu, Assumpta N. **Setting Priorities for the IT industry in Taiwan- A Delphi study**. *Long Range Planning*, 24(5), 1991, 105-118.

McGrath, J.E. **Theory of method for research in organizations:** R.T. Mowday and R.M. Steers (eds.), Research in Organizations: Issues and Controversies, 4-21, 1979, Goodyear Publishing Company, Inc.

OECD. New technologies in the 1990s: A Socio-Economic Strategy, OECD report, France (1988).

Science Policy Research Unit. *Success and failure in industrial innovation.* University of Sussex, report on project SAPPHO, 1972.

Bibliography on research methodology

Easterby-Smith, Throrpe, Richard and Lowe, Andy. Management Research: An Introduction. 1st ed. London: SAGE, 1991.

Grosfot, Miriam and Sardy, Hyman. A research primer for the social and behavioral sciences. 1st ed. Orlando: SAGE, 1985.

Kane, Eileen. Doing your own Research. 4th ed. New York: Marion Boyars, 1991.

McNeill, Patrick. Research methods. 2nd ed. London: Poutledge, 1990.

Phillips, Estelel and Pugh, D. S. How to get a PhD. 2nd ed. Buckingham: Open University press, 1995.

Rose, Gerry. Deciphering Sociological Research. 1st ed. London: The Macmillan Press, 1982.

CHAPTER 2

LITERATURE REVIEW AND EXPLORATORY STUDY

PHASE 1[1]

Initially it was intended to investigate how technology in general should be acquired by a country such as Oman. The term "technology acquisition" was taken to include licensing, indigenous manufacturing and product development etc. The initial literature survey and study in Oman which are reported in this chapter led to a refinement of the original project definition for this thesis.

2.1 Initial Literature review

2.1.1 Introduction

This review was conducted in the following order:

1. Technology policy
2. Technology transfer
3. Acquisition of Information Technology

The reviews of Technology Policy and Transfer are not reported in detail since they do not concern directly the main area of the research i.e. the acquisition of Information Technology. Detailed reports (30 and 40 pages long respectively) were produced at the time and are summarised briefly in the following pages.

[1] See research plan on page 11.

2.1.2 Literature review summary - technology policy and technology transfer

The works of Roessner, Prasad, Hireonymi and others concerning technology policy were examined. Policies in developed countries such as Japan, the USA and Europe and the newly industrialised countries i.e. the Asian Tigers as well as policies in developing countries such as India and Brazil, were considered. These reviews highlighted that technology policy was generally related to the degree of indigenous technological development. Countries which had no such capabilities - such as Oman - were viewed as clients acquiring necessary technology externally to meet immediate needs. This observation led to the need to consider the matter of technology transfer.

The work of Abdul-Rahman, Yin, Madu and others provided a number of insights into the benefits and problems associated with the transfer of technology from developed to developing countries. Successful technology transfer can benefit both the supplier and the recipient, though recent studies have shown that the strategic management of technology transfer remains problematic. Some researchers blame suppliers for selling inappropriate technology, whilst others focus blame on recipients for their inability to acquire what is appropriate for them or their inability to absorb the technology they acquire.

Sen and Rubenstein (1989) listed 12 reasons why firms may want to acquire technology externally rather than try to develop it in-house. These reasons are listed in Table 2.1. Presumably similar reasons could apply to a country rather than a firm.

1.	Reducing risk in product/process development
2.	Save resources needed to develop the technology in-house
3.	Gain time by increasing the speed of entry into the market
4.	Gain advanced know-how quickly
5.	Incapable of in-house development
6.	In-house work is blocked by patent
7.	Upgrade in-house technical skills
8.	More reliable estimates on probable commercial and technical success are available and thus easier to make a case for going into this area of market or technology
9.	An offer from a "source" too good to miss
10.	Availability of a proven "cost-saving" process
11.	Adopting industry product standards to provide compatibility to the consumer
12.	In-house ability is better suited to improve upon existing technology rather than create own know-how

Table 2.1 Reasons why firms may want to acquire technology externally rather than try to develop it in-house. Modified from Sen and Rubenstein (1989)

2.2 Exploratory study

2.2.1 Background

An exploratory study was undertaken in Oman between 15th June and 30th July 1993 in order to:

1. Confirm the need for such a research in Oman.
2. Highlight which issues needed to be addressed by the research.

The exploratory study involved the following:

1. A questionnaire was distributed to 18 ministries and organisations and filled in by 40 individuals.
2. Interviews were held with 3 senior government officials.
3. Meetings were held with a total of 32 IT managers, users and IT advisors.

The exploratory investigation is not reported here in detail since it led to a more substantive study (Chapter 3). No particular interview methodology was used at this stage.

2.2.2 Study findings

The study identified a number of findings relating to Information Technology issues in the government sector which are summarised as follows:

1. Investment in acquiring IT is rapidly growing.

2. Most IT acquisition takes the form of direct purchase. Since indigenous technology is lacking, organisations in Oman tend to import technology. Seventeen out of eighteen organisations surveyed acquired and continue to acquire IT systems by direct purchase. Hardware or software purchased

was sometimes installed and brought into use by the Omani purchasers whilst at other times partial to full implementation was undertaken by contractors.

3. Acquisition failure is costly. For example, a system intended as a comprehensive database and installed at a cost of £300,000, was finally used only as a word processing system for 6 users. Another system installed at a cost of £1.2 million was found to be obsolete after installation and will be even more costly to replace than its original purchase price.

4. IT Managers are the most influential in IT decision making. A generally poor understanding of IT among senior business managers has led to technical IT managers playing the most significant role in the IT acquisition process. However, many of these IT managers do not posses a broad technology management background and often did not fully understand the "business" function of their organisation. This often led to acquisitions being made for questionable technical reasons rather than to meet a specific business need.

2.2.3 Conclusions

There is clearly a general lack of guidance for IT acquisition suggesting that research focused on this area would have practical applications leading to considerable financial savings and an overall higher success rate in IT projects.

Although different forms of acquisition are covered in the literature (e.g. joint-venture, indigenous R&D etc.), by far the most important form of acquisition in practice is that which involves a direct purchase of hardware or software for a specific potential application.

2.3 Decision on project direction

With the Sultanate of Oman in mind, it was clearly appropriate to concentrate on the acquisition of technology through purchase. The work was restricted to Information Technology since this represents one of the fastest areas of growth with rapid infrastructural development currently taking place in Oman. Moreover, the researcher is currently involved in setting out IT acquisition strategy in the government sector in Oman.

2.4 The Literature relating to IT acquisition and related topics

Literature directly relevant to success in Information Technology acquisition appears to be non-existent. More than 100 potentially relevant references were studied with only a few from adjacent fields (e.g. management information systems and organisational buying behaviour) turning out to be of direct importance. It therefore appeared that this research could be undertaken from first principles.

In addition to the library on-line search, keyword searches were carried out on different databases such as ABI (abstracts from 800 business and management journal titles from around the world), F&S Index Plus Text (information from trade journals, business magazines and newspapers about products, companies, industries, technological development).

The literature review gave little guidance relevant to purchasing IT or to the conduct of research into purchasing IT. The literature review was updated at the end of the research and evaluated in the light of the comprehensive framework concerning IT acquisition which was produced by this research. The relevant literature found was classified by the researcher into three main headings:

1. Critical Success Factors in IT/IS projects (work on factors)
2. Information Systems Success (work on defining success)
3. Technology diffusion and IT project life cycle (work on the process)

Journals searched for relevant articles included:

- Harvard Business Review
- IEEE Engineering Management Review
- IEEE Technology and Society
- IEEE Transactions on Engineering management
- Industrial Marketing Management
- Information Strategy: The Executive's Journal
- Information Systems Management
- Information Systems Research
- Innovation and Technology Transfer
- International Journal of technology Management
- IS Analyser
- Journal of Information Technology
- Journal of Strategic Information Systems
- Long Range Planning
- MIS Quarterly (Management Information Systems)
- Project Management Journal
- Research Technology Management
- Sloan Management Review
- Technological forecasting and social change
- Technovation
- The Journal of Product Innovation management

2.4.1 Factors for success

(a) List of factors

Table 2.2 shows the 32 factors identified from the literature in column 2. The third column in Table 2.1 outlines the key references which mentioned the factor whilst the fourth column shows the method by which the factor was originally identified.
Since the process of factor identification and definition was undertaken empirically at a later stage of the research (Chapter 4), the definitions of the factors are not discussed at this stage.

Most of the factor names presented in table 2.2 were adopted from the literature. Factors produced later on by this research often look similar and mean some thing similar, but differ in detailed wording.

(b) Comments

Four main comments can be made concerning previous work on *factors for success*:

1. None of the research attempted to identify a comprehensive list of factors. The greatest number of factors found in one paper was 9 (The Audit Commission 1990).

2. The collation of factors presented in Table 2.2 is new.

3. The above factors were not intended by the literature authors to apply to IT acquisition, but to adjacent fields.

4. There is no reason to suppose that the 31 factors form a comprehensive list, and in fact the present research found more factors.

It is interesting that the factor "Do not buy IT that is too new or too old", suggested in Section 1.3.1 does not appear in this list.

No.	Factor	References	Method
1	Top management support	Yap et al. (1992)	Literature review
		Doll (1985)	Survey- questionnaire
		Barczak and Wilemon (1992)	Literature review
		Ryckman (1991)	Personal experience
		Biddle and Feingold (1993)	Personal experience
		Alter and Ginzberg (1978)	Literature review and survey (interview)
		The Audit commission (1990)	Personal experience
		Shulman (1990)	Personal experience
		Alexander (1989)	Literature review
2	Presence of a champion/ change manager	Madu (1989)	Literature review
		Curley and Gremillion (1983)	Literature review
		Alexander (1989)	Literature review
3	Use of independent consultant	Yap *et. al.* (1992)	Literature review
		Biddle and Feingold (1993)	Personal experience
		Soh *et. al.* (1992)	Survey- comparison study
4	Organisational structure (delegation of authorities and responsibilities)	Zaltman *et. al.* (1984)	Literature review
		Alexander (1989)	Literature review
5	Technical training	Madu (1989)	Literature review
6	Realistic project objective/mission	Madu (1989)	Literature review
		Barczak and Wilemon (1992)	Literature review
		Ryckman (1991)	Personal experience
		Biddle and Feingold (1993)	Personal experience
		Alter and Ginzberg (1978)	Literature review and survey (interview)

7	Supplier support/competence	Biddle and Feingold (1993) Alexander (1989)	Personal experience Literature review
8	Client-supplier relationship	Biddle and Feingold (1993) Griffiths and Willcocks (1994)	Personal experience Literature review
9	Previous IT experience	Alter and Ginzberg (1978)	Literature review and survey (interview)
10	Sufficiency of financial resources	Broadbent (1990)	Literature review
11	User involvement/participation	Tait and Vessey (1988)	Literature review
12	Indigenous skill level	Broadbent (1990) Biddle and Feingold (1993) Nelson and Cheney (1987) The Audit commission (1990) Griffiths and Willcocks (1994) Dahlman (1989)	Literature review Personal experience Literature review Personal experience Literature review Personal experience
13	R&D capabilities	Madu (1989) Yin (1992) Sen and Rubenstein (1989)	Literature review Case study- questionnaire Literature review
14	Public policy/ national strategy	Madu (1989) Roessner *et.al.* (1992) Broadbent (1990) Dahlman (1989)	Literature review Literature review Literature review Personal experience
15	Management skills	Madu (1989)	Literature review
16	Availability of appropriate technology	Madu (1989)	Literature review
17	Ease of use/user friendliness	Grafton (1994) Alexander (1989)	Survey-interview, questionnaire Literature review

18	Project manager	Barczak and Wilemon (1992) Biddle and Feingold (1993)	Literature review Personal experience
19	Internal communication	Barczak and Wilemon (1992) Biddle and Feingold (1993) The Audit commission (1990) Kirk (1992)	Literature review Personal experience Personal experience Personal experience
20	Information Systems Strategy/plan	Ryckman (1991) The Audit commission (1990) Alexander (1989)	Personal experience Personal experience Literature review
21	Open system interconnection	Ryckman (1991)	Personal experience
22	Existence of IT standards	Ryckman (1991)	Personal experience
23	Use of project management methodology	Ryckman (1991) The Audit commission (1990) Biddle and Feingold (1993)	Personal experience Personal experience Personal experience
24	Business plan/strategy	Biddle and Feingold (1993) Griffiths and Willcocks (1994)	Personal experience Literature review
25	Enhancability of software	Biddle and Feingold (1993)	Personal experience
26	Contract strategy	Biddle and Feingold (1993) The Audit commission (1990)	Personal experience Personal experience

27	User acceptance	Alter and Ginzberg (1978) Nelson and Cheney (1987)	Literature review and survey-interview Literature review
28	End user training	Nelson and Cheney (1987) The Audit commission (1990) Alexander (1989) Dahlman (1989)	Literature review Personal experience Literature review Personal experience
29	Information Technology strategy	The Audit commission (1990)	Personal experience
30	Defined user requirements	The Audit commission (1990)	Personal experience
31	Technology awareness	Alexander (1989)	Literature review

Table 2.2 Factors mentioned in the literature as influencing the success of IT projects; references and methods by which these factors were identified are also shown.

2.4.2 Measures of success

"A large number of studies have been conducted during the last decade and a half attempting to identify those factors that contribute to information systems success. However, the dependent variable in these studies-I/S success- has been an elusive one to define" (Delone and McLean 1992, p. 60).

(a) List of measures

A review of literature which included an attempt to identify measures for success produced the list shown in Table 2.3. Again measure names presented in table 2.3 were adopted from the literature.

(b) Comments

Previous work on success measures falls into one of three main categories:

1. Those who used a single measure to define success e.g. *user satisfaction.*

2. Those who used more than one measure (up to 5) but correlated such measures with only one factor (Soh *et. al.*, 1992).

3. Some other papers mentioned up to 6 measures though none of these attempted to correlate the measures with any factors. The greatest number of success measures found together in one paper was 6 (DeLone and McLean 1992).

One further comment can be made about the work on *success measures*:

4. No work which used more than one measure attempted to link such measures with the different phases of project life cycle. Phases are discussed in Section 2.4.3 below, but link to the definition of *acquisition* given by this research in Section 1.2.

No.	Success measure	References	Method adopted
1	User satisfaction	Yap et al. (1992) Tait and Vessey (1988) Delone and McLean (1992) Soh *et. al.* (1992)	Literature review Literature review Literature review Survey-comparison study
2	On time	Doll (1985) Soh *et. al.* (1992)	Survey-questionnaire Survey-comparison study
3	Within budget	Doll (1985) Soh *et. al.* (1992)	Survey-questionnaire Survey-comparison study
4	Economic return	Yin (1992) Soh *et. al.* (1992)	Case study- questionnaire Survey-comparison study
5	Impact (on individuals/organisation)	Tait and Vessey (1988) Delone and McLean (1992)	Literature review Literature review
6	System/Information quality	Delone and McLean (1992)	Literature review
7	Actual use	Delone and McLean (1992) Soh *et. al.* (1992)	Literature review Survey-comparison study

Table 2.3 Success measures mentioned in the literature (adjacent to IT acquisition): references and methods by which these measures were identified are also shown.

2.4.3 The process of IT acquisition

This section refers to the idea that an IT acquisition could be broken down into phases. There are very few reported studies which mention this. However, related areas such as Information Technology assessment and adoption, technology diffusion, and organisational buying behavior have provided some useful background concepts on the phases thought to be involved.

(a) List of phases

Table 2.4 shows the findings of the most relevant literature in these areas.

(b) Comments

Two main comments can be made concerning previous work on the *IT acquisition process*:

1. The concept of phases is adopted in different fields of research, but has not been studied in IT acquisition. The closest study was undertaken by Huff and Munro (1985) and focused on Information Technology assessment and adoption. This research is referred to by many researchers but does not talk about factors or success measures.

2. Most of the work was undertaken previously focused only on two main phases; initiation and implementation, and did not consider post implementation phases.

No.	List of phases identified by authors	References	Method adopted
1	Awareness, interest, evaluation, trial, implementation, diffusion	Huff and Munro (1985)	Survey-questionnaire and interview. How many respondents?
2	Need recognition, determination of solution characteristics, description of solution characteristics, search for sources, acquisition of proposals, evaluation of proposals, selection of order routine, performance evaluation	McWilliams *et. al.* (1992)	Literature review
3	Recognition, evaluation, acquisition, enhancement, and implementation	Cutler (1991)	Literature review
4	Inception, feasibility study, system analysis, design, specifications, programming, testing, training, installation, operations	Lucas	Statement
5	Planning and implementation	The Audit commission (1990)	Personal experience
6	Initiation, adoption, adaptation, acceptance, use, incorporation	Quaddus (1993)	Literature review

Table 2.4 The phases of IT projects as indicated in the literature; references and methods by which these phases were identified are also shown.

2.5 Critique

Five general comments arose from this literature survey.

1. Most of the factors, measures and phases mentioned in the publications were originally identified either from previous literature or personal experiences, with only a few identified empirically.

2. There is a gap in linking the above three areas of research - factors, measures and phases-together.

3. None of the work is comprehensive or applies specifically to the field of IT acquisition.

4. No work mentioned the concept that different categories of people involved in IT project might define success differently.

5. Work on any of the above three areas had not been undertaken previously in Oman.

The work described in the next chapter to compile comprehensive lists of factors and measures was carried out from a fresh start, without reference to the literature above.

References

Alexander, Mary Beckwith. *The adoption and implementation of computer technology on organizations: the example of database machines.* Indiana University, Ph.D. thesis, 1989.

Alter, Steven and Ginzberg, Michael. **Managing uncertainty in MIS implementation.** *Sloan management review,* 20(1), 1978, 23-31.

Barczak, G. and Wilemon, D. **Successful new product team leaders.** *Industrial marketing management,* 21(1), 1992, 61-68.

Biddle Mark. and Feingold, Mark. **Team mix can smooth information system acquisitions.** *Health care financial management,* 45(6), 1991, 68-76.

Broadbent, Kieran **New information-communication technologies in scientific communication: Implications for the third-world users.** *The information society,* 7(3), 1990, 203-232.

Culter, W. Gale. **Acquiring technology from the outside.** *Research technology management,* 34(3), 1991, 11-18.

Curley, F. and Gremillion, Lee. **The role of the champion in DSS implementation.** *Information and management,* 6(4), 1994, 203-209.

Dahlam, C. **Technological change in industry in developing countries,** Finance & Development, 6(1), 1989, 13-15.

Delone, William H. and Mclean, Ephraim R. **Information system success: The quest for the dependent variables,** *Information systems research journal* 6(1), 1992, 60-95.

Doll, W. **Avenues for top management involvement in successful MIS development.** *MIS quarterly*, 9(1), 1985, 17-35.

Griffiths, Catherine and Willcocks, Leslie. *Are major Information Technology projects worth the risk?*. Oxford Institute of Information Management, 1994.

Huff, S. and Munro, M. **Information technology assessment and adoption.** *MIS quarterly*, 9(4), 1985, 327-340.

Kirk, D. **Is staff, end users: a failure to communicate.** *INFOWORLD,* 14(49), 1992, 72.

Lucas, Henry C. Information Systems concepts for management. 2nd ed. London: McGraw-Hill international, 1982.

Madu, Christian. **Transferring Technology to developing countries-critical factors for success.** *Long range planning*, 22(4), 1989, 115-124.

McWilliams, R., Naumann, E. and Acott, Stan. Determining buying center size. Industrial marketing management, 21(1), 1992, 43-49.

Nelson, R. and Cheney P. **Training end users: an exploratory study.** *MIS quarterly,* 11(4), 1987, 547-559.

Quaddus, Mohammed. *Diffusion of Information Technology: A review of static and dynamic models.* Curtin Business School, School of Information Systems, working paper, 1993.

Roessner, J., Porter, A. and Huaidong, X. **National capacities to absorb and institutionalize external science and technology.** *Technology analysis & strategic management,* 4(2), 1992, 99-113.

Ryckman, Douglas A. **Information technology is not enough.** *Health care exclusive,* 6(3), 1991, 39.

Sen, F. and Rubenstein, A. **External technology and in-house R&D's facilitaive role.** *Product innovation management,* 6(2), 1989, 123-138.

Shulman, Richard E. **Why your CFO should get involved with technology.** Supermarket business, 45(6),1993,13-48.

Soh, C., Yap, C. and Raman, K. **Impact of consultants on computerization success in small businesses.** *Information & management,* 22(1), 1992, 309-319.

Tait, Peter and Vessey, Iris. **The effect of user involvement on system success: a contingency approach.** *MIS quarterly,* 12(1), 1988, 91-108.

The Audit commission for the-local authorities and The national health service in England and Wales. Acquiring IT. *A.U.D.I.T commission,* (4),1990, 1-12.

Webster F, Wind Y. **A general model for the understanding organizational buying behavior.** *Journal of marketing,* 36( ), 1972, 12-19.

Whyte, Grafton. *A new statement of factors affecting success with information systems.* Cranfield University, School of Management, Ph.D. thesis, 1993.

Yap, C., Soh, C. and Raman, K. **Information Systems Success factors in small business.** *OMEGA international journal of management science,* 20(5/6), 1992, 597-609.

Yin, J. **Technological capabilities as determinants of the success of technology transfer projects.** *Technological forecasting and social change,* 42(1), 1992, 17-29.

Zaltman, Gerald, Duncan, Robert, and Holbeck. Innovations & organizations. 1st ed. Florida: Robert E. Krieger publishing, 1984.

CHAPTER 3

CANDIDATE SUCCESS FACTORS AND MEASURES

(PHASE 2)

This chapter explains how the lists of candidate success factors and success measures were identified. These factors are then discussed and classified into categories. The measures are also discussed, and the concept of phases of IT acquisition success is introduced. In addition, three mini case-studies are presented.

In this qualitative survey the views of a wide sample of those involved in IT acquisitions were sought concerning:

1. Factors which they thought were associated with successful and unsuccessful acquisitions.

2. Measures by which they assessed the degree of success of IT projects.

3. The process of IT acquisition as experienced by them.

4. Categories of people they thought were actively involved in the IT acquisition process.

The findings of this phase of the research were used as inputs to the quantitative phase in which the relative importance of each of the factors to each of the measures of success was found (chapters 4 and 5). At this stage the success factors are called *candidate success factors* because the actual importance of each has not yet been established.

3.1 Survey techniques

The survey was carried out in Oman between January and May 1994 applying the semi-structured interview technique (section 3.2.1). The survey techniques used were first pilot-tested in Oman on 9 people, resulting in minor changes to the wording of some questions.

Thirty-three people were interviewed for an average of 75 minutes each. They were briefed beforehand about the research objectives and had been asked to select as a basis for discussion a single project in which they had been directly involved.

No possible factors or success measures were suggested by the interviewer. The idea was that all the elements should be derived empirically from the experiences of the interviewees.

From these interviews it was found that roughly half the projects were considered to be successful and half unsuccessful. This was considered to be a satisfactory finding for the purpose of this survey. Analysis of these discussions applying Content Analysis (section 3.2.2) established a list of statements from which 41 success factors and 8 success measures were developed.

3.1.1 Semi-structured interview

In these semi-structured interviews the aim was to discuss with people actively involved in IT acquisitions topics defined by an interview agenda, but also to allow discussion of any other topics which participants felt were relevant.

The interview format was devised to elicit views about recent IT acquisitions of which the participants had direct experience. Interviews were personal and confidential. Interviewees were sent a briefing paper in advance, which included the following agenda:

1. Respondent's background
2. Experience of one system on which the discussion would be based
3. Defining success
4. Success and failure factors
5. IT acquisition planning (IT strategy, parties involved, process of acquisition)
6. IT acquisition decision making

This briefing note is presented in Appendix 3.1[1].

A prepared interview agenda was used so that all interviews had a similar format to help with the analysis. This agenda was not seen by the interviewees.

A number of open-ended questions were also asked in an attempt to probe for views and issues not included in the agenda. These questions were also used to provide confirmation that the interviewees had understood the exercise. The interview agenda is given in Appendix 3.2.

Respondents generally found the briefing paper useful as a means of concentrating their thoughts in preparation for the interview.

The interviews were all tape-recorded to facilitate content analysis.

3.1.2 Content analysis

Content analysis is "a research tool for the scientific study of speeches, records, and other written communications to determine key ideas, themes, words, or other messages contained in the record" (Adams and Schavaneveldt, p. 305, 1985). The process of content analysis applied here consisted of listening to the interview tapes and devising headings into which the statements and opinions could be systematically

[1] Appendices are placed at the end of each chapter in this thesis.

grouped. This process was repeated until no new categories emerged and all statements or opinions fitted into the set of categories so devised (Easterby-Smith, Thorpe and Lowe, 1991; Krippendorff, 1980, and Gale and Grant, 1990). More details about this technique are given in Appendix 3.3.

The thirty three interviews were recorded and analysed using the above procedure. Similar statements were grouped under one heading to form a factor or a measure. The headings were composed by the researcher. For example, the following three quotes were grouped together to produce a factor called *provision of user training*. These quotes have been translated from Arabic.

1. "We have found that the time and money we have spent on training the users has been a great benefit in the end".

2. "By training the users well, they accepted change and participated more effectively in the process".

3. "I keep saying if you think the cost of training is high you should see the price of ignorance. We felt that we got a very good value for money we spent on training the users. They (users) not only were able to use the system more efficiently, but also were able to suggest areas for further improvements".

More examples are provided in Appendix 3.4.

A similar procedure was followed to derive success measures. The following is an example of deriving a success measure called *Completion of the project on time*:

1. "I (a senior manager) made all the resources available for this project in order to make sure that we completed it on time".

2. "This was a strategic project, we had to get it done on time; otherwise, it would have been useless".

3. "The Under-Secretary was personally following up the progress of the project in order to get it done by the National Day ".

3.1.3 Reliability of the content analysis: inter-rater test

To ensure that all the factors and success measures mentioned by the interviewees were considered, and to check for any impact of personal bias and prejudice in analysing the data, a second rater was asked to review the tapes of 4 of the interviews chosen at random and repeat the Content Analysis for these. This procedure was adopted from Gale and Grant (1990).

The rater was educated in the U.K., was familiar with the Content Analysis and had been working for the Omani government as an IT advisor for the last 18 years. He was fluent in English and Arabic, which was very important since many of the interviewees used both languages during their interviews.

The original headings were then compared with the second rater's headings. The numbers of factors and measures identified by the researcher and the rater from the 4 tapes are represented in tables 3.1 and 3.2. respectively.

Consider the first entry, 17 factors found by the researcher in table 3.1. This means that 17 out of 41 factors found in all 33 tapes were found in this one tape. The rater found 13 of these same 17 factors, and found no new ones.

Tape	Number of factors found (researcher)	Number of factors found (rater)	New factors
1	17	13	0
2	22	16	0
3	18	11	1
4	25	22	0

Table 3.1 Inter-rater reliability test for factors. Number of factors found by the researcher and rater in 4 randomly selected tapes.

Tape	Number of measures found (researcher)	Number of measures found (rater)	New measures
1	5	4	0
2	5	4	0
3	2	2	0
4	5	4	0

Table 3.2 Inter-rater reliability test for success measures. Number of measures found by the researcher and rater in 4 randomly selected tapes.

The following comments can be made about the above tables:

1. The researcher found more factors than the rater. This partially because the researcher conducted the interviews and therefore had more insight into the way the interviewees were thinking. In some cases, the researcher listened to the tapes more than once to ensure nothing was missed whilst the rater listened only once to each tape. The fact that the researcher found more factors than the rater is not considered harmful in view of his being able to look harder. Finding excess factors is not harmful as they would be rejected in the quantitative stage.

2. Only one factor (*ease of use*) identified by the rater was not identified by the researcher. However, this factor was identified by the researcher in other tapes and would therefore not have been missed in constructing the final list.

This Content Analysis was therefore considered to have produced reliable results.

The comparison between the two lists was based on the concepts of the factors and not on their names. For example, one of the factors identified by the researcher in tape 1 was called "*Realistic project objective*", whilst this was identified by the rater as "*the project was not over-ambitious*".

3.1.4 Further reliability test- expert opinion

Expert opinion was used also as a reliability tool, with experts asked to verify the following:

1. That the wording of each of the 41 factors and 8 success measures were representative of statements indicated by interviewees.

2. That each of the 41 factors and 8 success measures were independent of each other in terms of contents.

3. Whether they could think of other factors or measures not included in the list.

The experts were also asked to verify two other matters which are explained in sections 3.3.1 and 3.4.1 of this chapter (below):

1. That each of the 41 factors belonged to the assigned category.

2. That each of the 8 success measures belonged to the assigned phase of acquisition.

Six experts (3 from Oman and 3 from the UK) participated in this process. Their experience varied from academic to industrial as indicated below:

1. A head of a School at a British university who was also the head of the IT steering committee for the university.

2. An IT audit commissioner for the government sector in the U.K.

3. A senior IT and management consultant in the U.K. who has advised on IT related projects in Oman.

4. A senior IT and management advisor for a government body in Oman.

5. A head of the computer and communication department, Oman.

6. A senior IT user in Oman.

The process consisted of a series of interviews. Each expert was approached to comment on the lists of factors and success measures resulting from the content analysis. Their comments were accommodated, and modified versions of the lists were sent to all participants for a second round. This process was repeated three times until general agreement was reached.

This technique was successful and led to the rephrasing of some of the factors and measures in order to clarify their meanings (17% of the factors and 25% of the measures). Two factors *Sufficiency of financial resources* and *indigenous skill level* were moved from management and human categories to the organisational category (Section 3.3.1 (c)). No new factors or measures were suggested and none were deleted.

3.2 Survey results

3.2.1 Factors for success

(a) The list of factors

Forty-one factors influencing the outcome of IT acquisitions were derived empirically as described in Section 3.1.2. Twelve of these had not been mentioned in the literature (Table 2.2). Two additional factors were identified solely from the literature (*Indigenous R&D capabilities* and *Presence of IT champion*). These were added to the list, producing a final list of 43 factors.

Table 3.3 lists the 43 factors. The last column in Table 3.3 indicates the source of the factor with E indicating empirical derivation and L indicating a literature source. The second column indicates the categories of the factors (explained later Section 3.3.1(c)).

(b) Definitions of factors

Table 3.4 below explains in more detail the meaning of each of the factors. These were defined by Content Analysis of the original interview statements. The two factors found only in the literature are given their original literature definitions.

No.	Category	Factor	Source
1	I. TECHNOLOGICAL	Use of current technology	E
2		Use of proven technology	E
3		Ease of use	E&L
4		Enhancability of the system	E&L
5		Open system interconnection	E&L
6		Off-the shelf software	E&L
7		Existence of IT standards	E&L
8	II. ORGANIZATIONAL	Internal communication	E&L
9		Indigenous R & D capabilities	L
10		Previous IT experience	E&L
11		Sufficiency of financial resources	E&L
12		Indigenous skill level	E&L
13		Clarity of business objectives	E&L
14		Existence of IT strategy	E&L
15		Existence of IS strategy	E&L
16		Organisational structure	E&L
17		Presence of IT champion	L
18	III. MANAGEMENT	User involvement	E&L
19		Top management support	E&L
20		Realistic project objective	E&L
21		Feasibility study	E
22		Piloting the project	E
23		appointment of a project manager	E&L
24		Use of project management methodology	E&L
25		Accurate statement of requirements	E&L
26		Stable user requirements	E
27		Sufficient time for completion	E
28		Considering hidden costs	E
29		Supplier analysis	E
30		Provision of user training	E&L
31		Provision of technical training	E&L
32		Comprehensive contract terms	E&L
33	IV. HUMAN	Top management IT awareness	E&L
34		IT managers business understanding	E&L
35		IT staff technical capabilities	E
36		User maturity	E
37		User acceptance	E&L
38	V. EXTERNAL	Client-supplier relationship	E&L
39		Supplier competence	E&L
40		Use of independent consultant	E&L
41		Flexibility of general regulations	E&L
42	VI. DATA	Data availability	E
43		Data validity	E

Table 3.3 The final list of the 43 candidate success factors. E means that the factor was derived empirically (interviews), L means that the factor was found in the literature.

No.	Factor	Definition
1	Use of current technology	Technology which is state-of-the-art and still used and supported by the supplier and is not about to be replaced.
2	Use of proven technology	The technology has been successfully adopted in a similar environment.
3	Ease of use	The ease with which users can get the system to do what they want.
4	Enhancability of the system	Ability of the IT to adapt to future requirements beyond its original specifications. This includes future expandability of hardware, enhancement of software or ability to integrate with other systems in the future.
5	Open system interconnection	The ability to interconnect with other systems without major conversions; portable across hardware platforms.
6	Off-the-shelf software	Software written for a generic application, and available for immediate use without adaptation.
7	Existence of IT Standards	Setting by the purchaser organisation of documented standards in terms of what hardware or software are to be adopted for the organisation.
8	Internal communication	The extent and frequency of information sharing between management, technical staff and users. The process can take the form of meetings, reports or reviews.
9	Indigenous R&D capabilities	The capability of an organisation to search for, assess, adapt, modify, and develop relevant technology.
10	Previous IT experience	The depth of an organisation's previous experience in acquiring IT systems.
11	Sufficiency of financial resources	The availability of sufficient funds to complete the project.
12	Indigenous skill level	The availability of manpower with the skills to plan, manage, implement, use and maintain the system.
13	Clarity of business objectives	The business/strategic objectives of an organisation are clear at all levels.

14	Existence of IT strategy	A documented definition of the intended future deployment of information technology in terms of hardware and software.
15	Existence of IS strategy	A documented definition combining the role of information technology in supporting the business objectives of the organisation.
16	Organisational structure	There are policies and procedures for reaching decisions which define responsibilities and authorities of individuals involved.
17	Presence of IT champion	There is an individual who advocates the adoption of new IT systems by an organisation.
18	User involvement	Users are consulted and involved in planning the acquisition.
19	Top management support	Top management is involved in the progress of the project and the necessary resources are made available.
20	Realistic project objective	The project objective is understandable and achievable within available resources (not over ambitious). The project should be technically achievable, financially affordable and measurable in terms of benefits.
21	Feasibility study	A short practical assessment of the system before commitment to acquisition.
22	Piloting the project	A small scale pilot test was undertaken before commitment to the main project.
23	Appointment of a project manager	An individual who is given day-to-day responsibility for a project.
24	Use of project management methodology	A recognized structured set of procedures for managing the progress of a project.
25	Accurate statement of requirements	The degree to which a document was produced at an early stage in the acquisition process, spelling out user requirements.
26	Stable user requirements	The intended use and scope of the system were not changed once the implementation phase started.
27	Sufficient time for completion	Time allowed for completion proved to be realistic.

28	Considering hidden costs.	These are costs which were not foreseen at the outset of a project but became apparent during implementation or delivery phases. Examples are backlog data entry, backup system, training, extra manpower and loss of time.
29	Supplier analysis	Potential suppliers are analysed to measure technical capability, commercial standing and past experience.
30	Provision of user training	Formal efforts to prepare users to accept, absorb and exploit changes.
31	Provision of technical staff training	To prepare staff to maintain and support the system for the users.
32	Comprehensive contract terms	Spares, contingencies, acceptance criteria, delivery and payment schedules, liability, warranties, etc. were all considered for inclusion in the contract.
33	Top management IT awareness	Top management had a broad understanding of the potential benefits and risks of applying IT to business activities, and an ability to communicate with professional IT personnel.
34	IT managers business understanding	IT managers understand user business requirements and have the capability to integrate IT with an organisation's business strategies.
35	IT staff technical capabilities	The capability of individuals in the IT department to provide technical support to the users.
36	User maturity	The degree of previous experience in which users are capable of accepting and absorbing IT.
37	User acceptance	The degree to which users willingly adopt the new technology in the light of the fact that a new system can change individuals' circumstances. There may be loss of authority, a threat to job security, fear of technology or fear of learning new skills.
38	Client-supplier relationship	This relates to the mutual understanding of each other's respective needs and capabilities.
39	Supplier competence	The degree to which suppliers are capable of providing the services for which they are contracted. This includes technical capability (technical back-up support),

		human resources, commercial standing and experience.
40	Use of independent consultant	A consultant is an external company or individual who is expected to make independent and informed recommendations on IT policy and implementation.
41	Flexibility of general Regulations	Regulations include foreign exchange laws, technology transfer laws, national IT infrastructure, international collaboration laws, government regulations, political and economic stability.
42	Data availability	Data needed to operate the new system was available and in a compatible format.
43	Data validity	Data for transfer had been validated for accuracy.

Table 3.4 Definitions of the 43 candidate success factors shown in Table 3.3.

(c) Allocation of factors into categories

The 43 factors were grouped by the researcher into 6 categories, as shown in the category column of Table 3.3. These categories were:

I. Technological
II. Organisational
III. Management
IV. Human
V. External
VI. Data

This categorisation was done only for convenience and to help in presenting the 43 factors in a systematic order. These categories were used when the factors were presented in a later questionnaire (Chapter 4). It was assumed that respondents would prefer short divided lists of factors rather than one larger and cumbersome list.

Category definitions were as follows:

1. **Technological Category:** includes those factors which concern purely technical matters related to hardware and software.

2. **Organisational Category:** includes those factors which relate to the management structure of an organisation, and its resources.

3. **Management Category:** includes those factors concerning all aspects of the management of a single IT project.

4. **Human Category:** includes those factors relating to the experience and ability of individuals at all levels.

5. **External Category:** includes those factors which are outside the acquiring organisation, such as suppliers, consultants, and general regulations.

6. **Data Category:** includes those factors which concern the availability and validity of data which is input to the system.

(d) Discussion of success factors

The large number of factors identified by the interviewees as being associated with success in IT acquisition projects indicates that IT acquisition is a complicated process with success dependent on a complex group of factors which can vary in their degree of importance. The next phase of the research is intended to rank the factors in order of importance.

The list of factors presented here is thought to be comprehensive. The argument in support of this claim is as follows. From Table 3.1 we can see that on average one interview finds 20 out of the total 41 factors. It thus seems very likely that 33 interviews would find them all. This is argued further in Appendix 3.5, and it is also argued that even a factor of comparatively rare occurrence would be found. As shown in Appendix 3.5, seven interviews would have been sufficient to cover about 40 factors.

The possible factor "Do not buy IT that is too new or too old", mentioned in the light of two case experiences in Section 1.3.1, but which did not appear in the literature survey, has appeared here as factors 1, *use of current technology,* and factor 2, *use of proven technology.*

3.2.2 Measures of success

(a) List of success measures

Content analysis also identified the 8 success measures listed in Table 3.5.

No.	Measurement	Source
1	Business feasibility	E
2	Technical feasibility	E
3	On time	E&L
4	Within budget	E&L
5	System performance	E&L
6	Impact	E&L
7	User satisfaction	E&L
8	Actual use	E&L

Table 3.5 The list of 8 success measures. E means that the factor was derived empirically (interviews), L means that the factor was found in the literature.

(b) Definitions of the success measures

Table 3.6 explains in more detail the meaning of each of the measures. These were defined by Content Analysis of the original interview statements.

No.	Measure	Definition
1	Business feasibility	The degree to which the potential business benefits (financial and non-financial) of the organisation/department are expected to be achieved through the adoption of the IT system.
2	Technical feasibility	The degree to which the proposed IT system is likely to meet user technical and operational requirements.
3	On time	The extent to which the project is completed within schedule.
4	Within budget	The extent to which the project is completed within the allocated budget.
5	System performance	The extent to which the system performs according to user requirements. System performance includes characteristics of the system (capacity, disk space, speed) and the accuracy of outputs.
6	Impact	The impact of an IT system on the performance of individuals or the organisation. Impact includes return on investment, cash flow, cost reductions ability to expand without adding personnel, the quality of decision making, building indigenous capabilities and improved working environment.
7	User satisfaction	The degree to which users are satisfied with the system in terms of use and productivity.
8	Actual use	The extent to which the output of the IT system is used, in terms of frequency of use and utilisation of its full capability and capacity.

Table 3.6 Definitions of the 8 success measures

(c) Discussion of success measures

In the case of project SAPPHO (Chapter 1), a successful R&D project was defined as one which led to a new product or process which generated revenue. This could be related quite clearly and often quantitatively, by recognised methods, to the amount of expenditure. The R&D projects were judged on only one criterion, Return on Investment (financial *impact*). In IT acquisition, success may mean different things to different people, or may be defined differently from one project to another. Consequently, an objective of this research was to define a list of success measures which could be applied to IT acquisition.

Nearly all respondents stated that they had not thought about what was meant by success before being asked the question in their interview. This itself is highly significant. It implies that their thinking was restricted by an unconscious assumption of what defines success, or that they had not thought about the matter at all.

All measures found in the literature were also derived empirically though two measures: *business feasibility* and *technical feasibility* were introduced empirically and were not found in the literature*. Two measures found in the literature: Economic Return and System/Information Quality were called differently in the survey: *impact and performance*. *Impact*, as outlined in its definition, includes financial and non-financial improvements on performance. *Economic return* is considered to reflect financial impact. *System performance* includes the quality of performance of the technology as well as the quality of outputs. These two elements were referred to by DoLone and McLean (1992) as system and information quality.

By similar reasoning to that applied to factors (Section 3.2.1 (d)), there is a high probability that the 33 interviews identified all the measures.

* Further discussion of these particular measures appear in Section 7.3 (item 7)

3.3 Introduction of two new concepts

3.3.1 Phases of IT acquisition - life-cycle

From general experience gained during the survey work it seems clear that any IT acquisition project goes through three main phases: *Initiation*, *Implementation*, and *Service*. The rationale for such a categorisation is that the IT system must first be considered and purchased (*initiated*) then *implemented* before it can provide any benefits to the users (*service*). This categorisation allows the time scale within an acquisition occurs to be described. In other words, an IT acquisition has a project life-cycle.

Figure 3.1 summarises the three phases along with their elements. Events during each phase are listed, and milestones separating phases are shown.

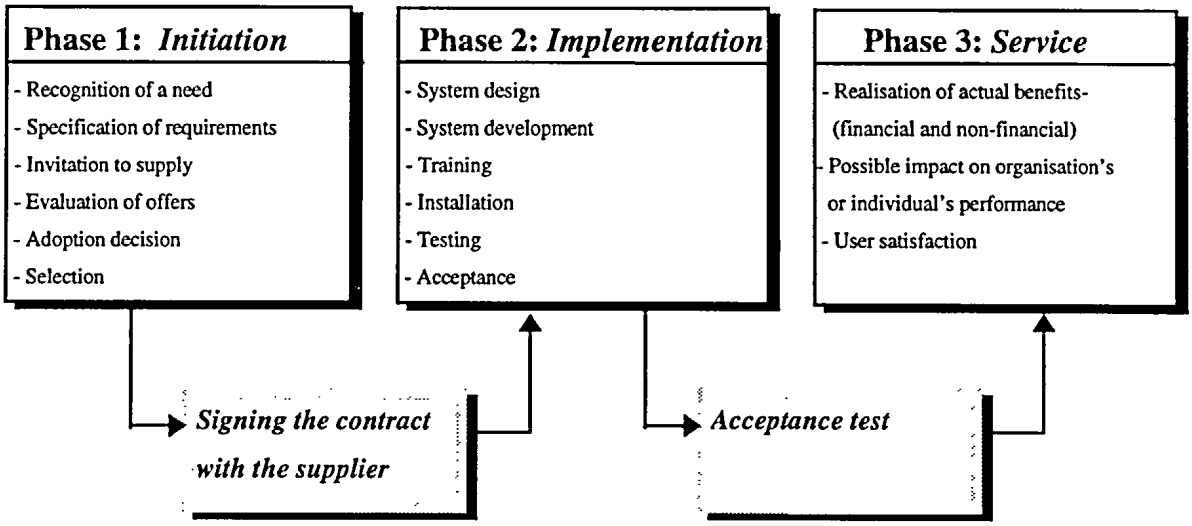

Figure 3.1 IT acquisition process (the life-cycle).

As shown in Figure 3.1 there are two high quality milestones: Signing the contract with the supplier and acceptance test. They are both very definite in time and can not be withdrawn. They signal total commitment to the next phase. The contract may only

be for hardware or software which worth much less than the effort commitment which follows, but the hardware or software purchased defines the nature of the project, and commits the effort. Acceptance tests are normal practice in Oman where users confirm that the system is functional according to their specifications.

3.3.2 Players in IT acquisition

Standard marketing theory tells us that when something is sold to a large organisation, a number of different people are involved. For example there will be an Initiator of the purchase, someone with Authority to sign for it, an eventual User, and a Purchasing official. There is often also an Influencer, who has no direct involvement but whose opinion on what to buy and who from, is respected (Huff and Munro, 1985). It was realised that this research concerns purchasing, not selling, but that we would expect for similar idea to apply. It was decided to coin the term *Players* to describe the different types of people involved in an acquisition.

The survey identified three main groups of players:

1. **Senior management**: Senior level staff involved in either IT decision-making or in using IT for management purposes.

2. **IT staff**: Persons working full-time in the IT department, such as IT managers, advisors, engineers, analysts, programmers or technicians.

3. **Users**: Staff who use a terminal as a regular part of their work, either as data entry clerks, or to retrieve information.

Most IT projects were shown to be initiated by senior managers or IT managers with the latter group being the most influential in terms of decision making. The role of lower level users was generally confined to assistance with the initial specification.

The comment may be made that an IT acquisition is a team project, but often players do not realise they are in a project or a team and they do not know how the game is played. Often the team has no captain.

Although this study has drawn on the experiences of people in different roles, it is beyond the scope of this research to asses how different players perceive success differently (Chapter 7).

3.4 General discussion - linking the measures with the phases

Since success measurement in IT acquisition is not a homogenous concept, it can not easily be quantified by a single measure. Consequently, a multi-dimensional measurement of success was adopted. Note that because success is defined in a more complex way than for project SAPPHO we can not now expect the output of this research to be a simple ranking of factors as was illustrated in Figure 1.1.

Projects at different phases of the acquisition process were covered in the survey. Some were rated as successful (or unsuccessful) even though the project concerned was uncompleted, provided that it had reached a point which allowed an assessment to be made. For example, a project at an early stage of acquisition (*implementation* phase) was perceived to be successful because the feasibility study indicated that it would be, in terms of achieving the intended benefits and because it promised to meet user technical requirements, which were the measures by which this phase was judged by that player.

This gives the hint that different success measures apply to different phases of the acquisition. It is now proposed that measures are allocated to phases as follows.

The success of Phase 1: Initiation success

This phase is judged solely by what the system **promises** to deliver. The success of this phase can be measured by asking to what extent it promises fulfillment of the following two measures:

1. Business feasibility
2. Technical feasibility

The success of Phase 2: Implementation success

The success of this phase is judged mainly on **cost, time** and **performance** measures. The measures are:

1. On time
2. Within budget
3. System performance

The success of Phase 3: Service success

This phase assesses the **actual benefits** of the acquisition. It is the stage at which **end-users** at all levels have the opportunity to assess the true value of the acquisition. The success of this phase can be measured by three main measures:

1. Impact on performance
2. User satisfaction
3. Actual use

See Table 3.6 for definitions.

3.5 Mini-case studies

Three cases covered in the survey were developed into mini case studies, one of which is presented below. The details of the other two cases are given in Appendix 3.6. The case presented here was analysed later (Chapter 6) in the light of later research findings. Some details have been omitted or changed to preserve anonymity.

A mini-case study: Data-base automation

The overwhelmingly large volume of paperwork with which a government committee was confronted led to the conclusion by the top management that the work would be done better using a computerised system. They gave the go-ahead to acquire an appropriate system. The problem then was to decide what was "appropriate".

Except for wanting to computerise, the members of the committee were not sure of their real needs and objectives. They only knew that they wanted a computer to solve their problems, to have less paperwork, and to do things faster, easier and more efficiently - and to do all these things at the press of a button.

The initial task of inviting proposals was given to a newly appointed Head of Computers, who was a fresh graduate in International Relations with no computing experience. His two subordinates were also inexperienced with one having limited experience as a data entry clerk, but being engaged as a programmer. This curious decision was made because the management did not understand the difference between programming and data entry, believing they were engaging a suitable junior employee and thus saving money.

As a further means of saving money on consultants, one supplier who offered a free study was invited to review the requirement and to advise on the preparation of tender documents for bidders. The supplier made a cursory attempt to assess the requirements, but since the committee had no clear picture of their needs, and no guidance was given to the supplier by the users as to whom should be interviewed,

they were not able to arrive at a clear definition. The results of the consultants study were arrived at by random interviews of a few individuals. The tender documents concentrated almost exclusively on technical matters concerning the hardware and software, and said little about the overall benefits which the system should deliver. The estimated cost for the system, as suggested by the supplier, was £60,000 and the project would be completed within 6 months. The budget of £60,000 was approved by the top management.

Two months from the start of the project, a number of suppliers submitted proposals with only one (not the cheapest) matching the specification of the tender documents. This bid was from the company which had reviewed the requirement, who were effectively bidding on their own specification.

Since the in-house computer team had no practical experience of IT projects, they invited an external technical expert from another government department with a computer science background to evaluate the proposals on their behalf. The evaluation was completed, but again only the technical capability of each system being offered was considered, focusing on factors such as response speed and memory capacity. This expert recommended the advising company's bid.

Neither the top management nor their inexperienced IT department really understood this evaluation, which was phrased in highly technical terms. Nevertheless they felt that the recommendation should be followed. One month later the recommended hardware and software was purchased.

Only at this stage was a more serious attempt made - again by the supplier - to analyse the actual business requirement. This process was complicated by several factors. Many of the users did not see why changes should be made to a manual system which, though cumbersome, worked adequately, and which they understood well. Other users feared at best, loss of authority and at worst, loss of their jobs. Others showed an unwillingness to learn something new. Individual members of the committee who

originally wanted computerisation, suggested features on the basis of personal preference rather than on the collective needs of the committee. Some senior managers wanted a terminal on their desks for their personal use with no clear idea of why they wanted it, or what it was supposed to do. They were motivated by the consideration that managers of similar grade in other departments had terminals on their desks.

Eventually, four months from signing the contract with the supplier, the software was installed. It was found that in practice the system did not perform as it had during demonstration, using the sales package.

Contractually, testing and acceptance of the system by the buyers should have been completed in six months from the date of installation. As there was no-one on the buying side capable of undertaking the required testing, two separate time extensions were agreed with the supplier. These extension periods ended without tests of any kind having been completed.

The supplier had available two categories of training - user and maintenance. However, the contract - which was written entirely by the supplier - made no allowance for the higher level maintenance training, which would have been essential for the organisation to be able to operate and maintain the system by themselves. The user training supplied under the contract was satisfactory only at the level of data entry. More comprehensive training was then offered by the supplier - at a further fee - but by this time there were no funds left to pay for more training. The supplier was often called upon to give technical support and general assistance, which usually came only after a long delay.

Data entry continued while a search was made to recruit a programmer expert in the system - which apparently was written in a non-standard computer language. Only one of 118 applicants had appropriate experience and there was no option but to hire

him, although he was far from being the best overall candidate. By now, 14 months had elapsed since the project was started.

Shortly after the newly recruited programmer started work, it was realised that the language being used was not only non-standard, but was also obsolete and no longer supported by the supplier who had provided it. At this late stage, and after prolonged negotiations, the supplier offered to make the conversion to a more recognised language - but for a further substantial fee.

Once this was done, some degree of testing could finally be carried out. It was found that the system had a number of corrupted files which inhibited data transfer. It was, however, now much too late for the supplier to be compelled to correct the faults, as the extended warranty period had long expired.

After 19 months and an expenditure of £140,000, the user had a costly system which did not work well. Furthermore, since the system software was non-standard, and only supported by the supplier, the organisation found itself locked into an expensive software support contract, which to date has cost more than the original budgeted sum for the whole system. Although the IT people continue to enter data, the old manual system continues in operation in parallel, and very little data is taken off the computerised system by the users.

References

Adams, Gerald and Schavaneveldt, R. Understanding research methods. 1st. ed. USA: Longman Inc., 1985.

Delone, William H. and Mclean, Ephraim R. **Information system success: The quest for the dependent variables,** *Information systems research journal* 6(1), 1992, 60-95.

Huff, Sid and Munro, Malcolm. **Information technology assessment and adoption: A field study.** *MIS Quarterly*, 9(4), 1985, 327-340.

Gale, Rodney and Grant, Janet. *Guidelines for change in postgraduate and continuing medical education.* The joint centre for educational research and development in medicine, 1990.

Easterby-Smith, Mark, Thorpe, Richard, and Lowe, Andy. Management research, an introduction. 1st ed. London: SAGE Publications Ltd., 1991.

Schnei der, Benjamin, Wheeler, Jill K., and Cox, Joanthan F. **A passion for service: Using content analysis to explicate service climate themes.** *Journal of Applied Psychology*, 77(5) 1992, 705-716.

Sayre, Shay. **Content analysis as a tool for consumer research.** *The Journal of Consumer Marketing*, 9 (1) 1992, 15-25.

Chan, Chi-fai, Lau, Kwok-fai, and Young, Kitty Y. **Transfer of marketing technology to China: A content analysis.** *Marketing Intelligence & Planning*, 11(2) 1993, 16-21.

Sayre, Shay. **Content analysis as a tool for consumer research.** *The Journal of Consumer Marketing*, 9(1), 1992, 15-25.

Manimala, Mathew J. **Entrepreneurial heuristics: A comparison between high PI (Pioneering-Innovative) and low PI ventures.** *Journal of Business Venturing*, 7(6), 1992, 477-504.

Baws, Graham. *Chief executives management development survey*-content analysis of the data. Cranfield Institute of Technology, School of Management ". Working paper, 1979.

Krippendorff, Klaus. Content analysis: An introduction to its methodology. 1st ed. USA: SAGE, 1980.

Kolbe. Richard and Burnett, Melissa. **Content-analysis Research: An examination of applications with directives for improving research reliability and objectivity.** *Journal of Consumer Research*, 18 (2), 1991, 243-250.

Appendices

APPENDIX 3.1

Briefing paper

Research Project on I.T. acquisition - Briefing paper for interviewees

Project title:
Factors for success in acquiring Information Technology

Definitions:

Acquisition:	The efforts of an organisation to adopt and use information technology.
Information Technology (I.T.):	The broad range of electronic means involved in information processing and handling, such as computer hardware, software, telecommunications and office information.

Project Statement:
The acquisition of a new information system may be very expensive and risky. Systems often fail entirely to provide the expected services, or may commit an organisation to a particular long-term solution to its information management needs which can be very costly to change. An improved understanding of the acquisition process will contribute to better I.T. decision-making and purchasing . The purpose of this research is to find out what factors need to be taken into account in acquiring I.T. and what are the avoidable pitfalls. This will enable improved success rates to be achieved by the acquirers of I.T. systems.

Research objectives:
1. To identify factors which are critical to success in the acquisition of information technology by an organisation.
2. To develop a meaningful measure of success in IT acquisition.
3. To devise a set of strategic guidelines for use by organisations intending to acquire information technology.

Interview aim:
You have been asked to help because you are actively involved in I.T. acquisitions. The aim of the interview is to discuss topics with you which are defined by the interview agenda, and also other topics which you feel relevant. You are asked to select, for initial discussion, one recent I.T. system acquisitions in which you have been directly involved (successful or unsuccessful). Interviews are intended to explore different concepts and models adhered to by different individuals. Interviews will be personal and confidential. They will be semi-structured and analysed by using the Content Analysis technique. This consists of identifying categories into which the statements and opinions can be systematically grouped, and counting and ranking the factors found.

Interview Agenda:
1. Respondent's background
2. Experience of a system on which discussion is based
3. Measuring success
4. Factors for Success or failure
5. I.T. acquisition process
6. Parties actively involved in the process

Interview length: 60-90 minutes

APPENDIX 3.2

Interview agenda sheet

Interview Number:
Name:
Place:
Date:
Interview length:

A. Respondent's background

Question A.1

- ☐ • **job title**:
- ☐ • **job function related to the IT acquisition**
- ☐ • **Qualifications**:
- ☐ • **Experience**

B. Experience on which discussion is based

☐ *Question B.1*

What is the system you have chosen to consider?

☐ *Question B.2*

How big is it? (COST, number of stations and number of users)

☐ *Question B.3*

What is the present status of the system? (Implemented, In-progress, Suspended)

- ☐ • **If abandoned or suspended, why?**

C. Success

☐ *Question C.1*

Looking at it back from now, was the acquisition successful?

☐ *Question C.2*

In what way it was successful / unsuccessful? (measuring success)

D. success / failure Factors

♦ *If Success*

☐ *Question D.1*

What were the main factors which made the acquisition successful?

(factors for success)

☐ *Question D.2*

What options did you deliberately exclude to make it successful?

(factors for failure)

♦ *If Un-success*

☐ *Question D.3*

What do you think were the main factors which made the acquisition unsuccessful? (factors for failure)

☐ *Question D.4*

What could have been avoided to make it successful? (factors for success)

Question D.5

☐ **What could have been done to improve the success of the acquisition?**

(factors for success)

Question D.6

☐ **In general, what are your success criteria?** (measuring success)

E. IT acquisition planning

♦ IS Strategy

☐ *Question E.1*

Did you have a corporate IT strategy before acquiring the system?

☐ • **If yes, did you have them written?** (no. of pages)

☐ • **Who did them?** (Indigenously, external consultant, other)

☐ *Question E.2*

Is the IT strategy integrated with the overall business plan for the organisation?

☐ *Question E.3*

What did you plan to achieve from the acquisition? (measuring success)

Question E.4

☐ **What did you actually achieve?**

Question E.5

☐ **If you didn't achieve all your goals, what do you think were the main obstacles?** (factors for failure)

♦ Parties involved (players)

☐ *Question E.6*

Who recognized the need for the IT system?

☐ • **Any resistance**

☐ *Question E.7*

Who was involved in the process of planning the acquisition?

☐ • **Did you use any external advice? If not, do you think it would have helped?**

☐ *Question E.8*

Who was the user?

♦ **Process**

☐ *Question E.9*

What was the sequence of events when this acquisition being planned?

F. IT Assessment

☐ *Question F.1*

Did you do any study for this system before acquiring it?

If yes, what type of study did you do?

☐ • **If yes, did you have them written?** (no. of pages)

☐ • **Who did them?** (Indigenously, external consultant, other)

☐ *Question F.2*

How did you evaluate the proposals?

☐ *Question F.3*

Has the system been used by you or by another user with similar requirements?

☐ *Question F.4*

How did you evaluate the system (h/w, s/w)?

☐ *Question F.5*

How did you select the supplier?

☐ *Question F.6*

How did you know about new IT available in the market and those under development? (sources of information)

☐ *Question F.7*

How did you seek further information about IT of particular interest?

G. IT acquisition decision-making

☐ *Question G.1*

Who was involved in the process of the acquisition decision-making?

☐ *Question G.2*

Who had the most influence on the decision?

☐ • **What was his/her background?**

☐ *Question G.3*

What were the most important factors in making the final decision?

H. Additional information

☐ *Question H.1*

Do you recall another less successful experience which your organisation went through?

☐ *Question H.2*

Any other comments?

APPENDIX 3.3

Content analysis

It is important to note that content analysis can be either used as quantitative tool (to determine frequency of events) or as qualitative tool (to understand subjective content such as attitudes or values) or a combination of the both. Therefore, researchers have used the technique in a way which falls midway between the qualitative survey and the quantitative observation (Schneider, Wheeler, and Cox , 1992) Content analysis is a multi-step process that requires developing categories for coding thematic content, transferring data in a form amenable to quantitative manipulation and statistically analyzing the resultant data. Content analysis is a time consuming process which yields two things of value. Firstly, it is possible to generate a set of categories into which all statements made in the (recorded interviews) tapes can be fitted. Secondly, it is possible to count the frequencies of response in each category and so make comparisons between subgroups in the sample.... The process of content analysis is designed to overcome the bias of personal judgment about information and to render the results valid"(Gale and Grant, 1990). This technique will also help to perform a number of comparisons:

- "The rank order of factors cited for the whole population
- The rank order of factors cited for each sub-group"

Content analysis is "especially appropriate for research problem...when available information or resources are limited". It has been used by researchers in different disciplines such as marketing (Chan, Lau, , and Kitty, 1993), (Sayre, 1992) and (Kolbe and Burnett, 1991), business (Manimala, 1992), applied psychology (Schneider, Wheeler, and Cox, 1992),educational R&D (Gale and Grant, 1990), and management (Baws, 1979).

In this current research the frequencies were counted to produce preliminary rankings of factors, but these are not related because the quantitative techniques employed in this research were far more effective.

APPENDIX 3.4

More examples of quotes from interview subjects

I. Five randomly selected factors from successful cases

1. Use proven technology:

Quotes

1. "We aimed for well-proven technology in Oman which also had a long life-cycle ahead."

2. "There is no doubt that we benefited from insisting that we should see the result of the software being used in a similar environment to our own."

3. "We made our final selection after seeing the other systems which worked well here.".

2. Internal Communication:

Quotes

1. "We had regular meetings between user groups and IT managers which helped enormously to sort out problems as they occurred"

2. "By having channels of communication between parties involved open, we managed to solve most of our problems"

3. "We always have to report the follow-up action on problems at every user-group meeting and this helped to complete the project on time.".

3. Top Management Support:

Quotes

1. "The Director general was aware of our requirements ... and was very helpful in terms of providing us with the necessary resources in order to complete the project on time."

2. "Basically, he (the Under-Secretary) followed up the progress of the main stages of the project and made sure we were aware of that."

3. "Our senior manager attended almost all the meetings regarding this project and asked us about those he missed."

4. Accurate statement of requirements:

Quotes

1. "We got what we wanted because we told them exactly what we need in detail".

2. "The time we spent on the user specification was time well spent".

3. In all our project work we stress the importance of the initial user requirement".

5. Supplier competence:

Quotes

1. "Our supplier is always ready to refer to the manufacturer if he can't solve a problem".

2. "We've been dealing with our vendor for eight years and get first class back-up".

3. "The vendor's technical staff are always available to help us in an emergency".

II. Five randomly selected factors from unsuccessful cases

1. Use proven technology:

Quotes

1. "We were told that the equipment was the latest technology. It was, and we effectively became a testing laboratory for equipment which was practically unusable in the local market".

2. We bought the equipment only because it was new and different, the consequence was very expensive".

3. "The Technology was good and new and we were the first to buy such a system in Oman but it did not find a place in the market and soon became obsolete. We learned that you should never be the first buyer!".

2. Internal Communication:

Quotes

1. "We all seemed to be working in isolation, with the left hand not knowing what the right hand was doing".

2. "People involved in this project didn't like to share ideas because they were afraid of giving benefit to others".

3. "There was supposed to be a regular monthly meeting to discuss about the progress of the project, but not everybody turned up. In fact, only a few were attending"

3. Appointment of a project manager:

Quotes

1. "A project manager was appointed, but he was moved to another job and not replaced, so things went wrong".

2. "Because no one person was responsible we didn't know whose fault it was when things went wrong".

3. "As a supplier, we didn't know who we are supposed to deal with and we are often sent to different people on the same aspect of the project".

4. Accurate statement of requirements:

Quotes

1. "We could have helped a lot more to get a better system if the users had said what they wanted more clearly".

2. "Failure to specify the requirement is like someone saying he only wants a blue car which seats four people and then, when he's given a saloon, he complains that it doesn't have a hatch back".

3. "Users asked the supplier to spell out their requirements for them. As a result the requirements stated were what the supplier wanted the users to have and not what the users needed.".

5. IT managers business understanding:

Quotes

1. "Our IT managers were technically good, but had no idea about our (users) business needs".

2. "Our IT manager is excellent, but he is only interested in electronics".

3. "The IT manager did his best, but he didn't know much about how the organization as a whole used to work".

APPENDIX 3.5

Why the factor list is probably comprehensive

On average, one interview found 20.5 of the 41 or so factors, which is about half of them (see Table 3.1). If we assume that each interview reveals exactly half of the factors and that all factors are equally likely to be found in all interviews, and are distributed at random among the cases, then we can reason as follows:

The 1st interview will find **20** factors
The 2nd interview will find 10 of those found in the first interview plus 10 new ones, so there are now a total of **30** factors.
The 3rd interview will find 5 new ones, so there are a total of **35** factors
The 4th will find 2.50, total will be **37.50**
The 5th will find 1.25, total will be **38.75**
The 6th will find .625, total will be **39.375**
The 7th will find .3123, total will be **39.6875**
The 8th will find .15615, total will be **39.844**
And so on...

After 5 interviews there is likely to be approximately one factor unfound. Thirty-three interviews should have a vanishingly small chance of missing any, and should have found many occurrences of each factor. This may seem like overkill, but because the factors appear in different forms in each case, it is useful to have several available when composing each factor's title and description, as explained in Section 3.1.2.

How rare a factor will 33 interviews catch?

Instead of assuming that all factors have a 50% chance of being found, it might be more realistic to assume that some factors are of common occurrence and some are rare.

If the probability of a rare factor being present in a first case is "P" (P was 0.5 in the case above), we want to know the probability of catching the factor one or more times

in 33 interviews. We can find this using Poisson's distribution which is used to describe random phenomena which occur at a known rate.

In "N" cases we expect to find the factor NP times. Define NP = r (rate).
For example, if N = 33 and P = 0.05 then NP = 1.65.

Poisson's equation states that

$$P(n) = \frac{(e^{-r}.\ r^{i})}{i!}$$

where i = number of times caught
r = rate of occurring in N trials

The probability of finding it one or more times is

$$P(\geq 1) = P(1) + P(2) + P(3) + \ldots$$
$$= 1 - P(0)$$
$$= \frac{1-(e^{-r}.\ r^{0})}{0!} = 1 - e^{-r}$$

If N = 33 and P = 5%,

$$P(\geq 1) = 1 - e^{-1.65} = .808\ (80.8\%)$$

We conclude that the 33 interviews should catch all factors including those whose occurrence is as low as 1 in 20 cases with the probability of 81%.

APPENDIX 3.6

Two mini-case studies

Some details have been omitted or change to present anonymity

1. Case study B: Payroll system

A large government department was running a computerised pay system which had been developed piece-meal over several years. Because of the way it had been developed - mainly by one person working alone - there was inadequate documentation for maintenance. It was therefore decided to replace the system with an up-to-date one specifically tailored to the purpose. Although the organisation had a small computer department staffed by experienced personnel, they did not have the in-house resources to write a major system. The options were either to engage a software house to write a system for them, or to look for a ready-made system.

After some market research, it was decided to approach a number of companies who specialised in personnel payroll systems, and to buy a ready-made system. Several European companies specialising in such systems were approached, and their references checked. One particular company had sold - and were supporting successfully - many systems in medium and large organisations. This company accepted the task, based on a general outline of the payroll requirements of the organisation.

A member of the organisation's computer section was appointed to work on the new system as project manager, reporting to the IT manager. Although this project manager was generally experienced and well qualified, he had not previously undertaken a similar task. Work began with the company's representative on adapting the system to the specific use of the organisation.

Initially, work went well in documenting the requirement, but some problems were encountered in adapting the system to allow for a wider range of allowance scales than were catered for in the company's basic system. Further problems were encountered in preparing procedural changes in paperwork which were required by the new system. It

was in the common interest of both parties to resolve the problems, which were gradually overcome by close co-operation between the organisation's project manager and the company's expert. However, because the company's representative was not available on site, and traveled every few weeks from Europe, he left documentation of changes to the project manager. This documentation was not done. The organisation's IT manager left the project manager to get on with the task with only cursory supervision, and reported to top management that things were progressing well. These assurances were accepted by top management, and also by the organisation's specialist finance staff, who would be the users of the new system.

After six months the system was ready for payroll data of individuals to be entered. No consideration had been given to the possibility of transferring data electronically from the old computer system, and data transfer was undertaken manually by a small team of data entry clerks. Since the old system was still running the payroll for actual use, any updates to data that were made to the old system should have been copied manually to the new system but were not. Then when attempts were made to run the new system, retrospective changes had to be made to its data which led to errors.

Finally, after nine months, the system was ready for trial use to calculate the monthly payroll. The company's expert was present for the first run. He and the project manager reported that the run was largely successful, and that the few errors found could be rectified. These errors were of two kinds; incorrect data resulting from trying to maintain the old and new systems in parallel, and errors due to malfunction of the changes which had been made to the operating system. After work to correct the problems - again undocumented - the project manager was left to supervise subsequent payroll runs alone. Again a trial run was carried out. Again there were errors to be rectified, but some were different from those which had been encountered on the first run. Once more the supplier's expert came from Europe to assist, but was hampered by lack of documentation. A further trial was more successful and again the project manager was left to cope. Yet again the system did not work to the required level of

accuracy, but this time, because of the outbreak of the Gulf war, the company would not send their representative.

It was by now clear that the project manager alone was incapable of bringing the task to a satisfactory conclusion, and the lack of documentation of changes made it impossible for anyone else to take over. The project was abandoned after considerable cost in time, money and effort.

2. *Case study C: Record automation system*

The top management of the London office of a foreign government-owned travel agency decided that they should computerise their manual records in order to work more efficiently. Their records concerned their own nationals who were visiting the UK on organised tours or on business, and also business arrangements and payments involved in hotel, travel and tour bookings. The office worked well, but heavy work pressure demanded improved working methods.

They had no clear idea of what was needed but felt that computerisation would help them to reduce their work load. As they had no IT experience and were not sure how best to set about the task, they contacted an associated organisation who had recently introduced a computer system. They requested information from them on the specifications they had used for computerisation. From the list of specifications sent by their associates they selected those details which seemed to be appropriate for their own case, and presented these as a specification for potential suppliers.

From the bids which were submitted it was clear that cost would be about £40,000. Funds for the purchase were sought from the organisation's head office and budget approval was given.

As the agency did not know how to evaluate the bids, the matter was left pending. After 9 months the agency was told by their head office that if the budget was not used within 2 months, the £40,000 would be forfeit, and that if the project was still needed, a fresh budget application would have to be made.

It was decided that it would be better to push the project through to a conclusion as quickly as possible, but that it would be necessary to seek assistance. Through personal contact with a computer expert the Chief Executive Officer (CEO) requested help. The delay in giving the go-ahead had only been due to lack of knowledge of computers, and he needed to be sure that computerisation, in whole or part, was the correct solution for the organisation's problems.

The expert suggested that the CEO should use an independent consultant, but no allowance had been included for consultancy in the initial bid for funds, and the CEO hesitated to pay this from a sum which was just enough to buy equipment. Again through personal contact, with a reputable consultant agreed to help the organisation, at no charge, to identify an appropriate supplier who would include evaluation of requirements in his bid. The users did not meet among themselves to discuss their requirements except under the "Chairmanship" of this supplier. The supplier helped the user to state the requirements and specification was drawn up for a system of PC's linked in a Local Area Network. This proposal was accepted.

Now that the project had reached the point of preparing a contract, the organisation asked the supplier to prepare it, and accepted the offered contract without question.

The consultant, who had initially offered his services free, suggested that, since the users were not computer literate, the most economic course would be to buy a small stand-alone with a single PC system as a pilot project and then, if the results were favorable, to buy the whole LAN system. The organisation's head office did not agree, saying that they wanted a single one-off contract to complete the project as has been initially proposed. The supplier then offered to develop the first phase software and

give it to the user for a trial period of one month. They would then to adapt the system as needed according to user experience and comments.

After the one month "test" period, the supplier found that no-one in the office had used the system, perhaps because no particular user had been responsible for the project. The supplier appealed to the CEO for action. The CEO was understanding, but explained that users were too busy with their routine work to devote time to trials, and were reluctant to spend time learning a new system which some feared might put their jobs at risk. The CEO asked the consultants for a further one month extension, which was agreed.

At the end of the second month, tests had still not been carried out, but as the time for scheduled completion of the project was now very near, the users felt compelled to give the go-ahead to the complete system without even cursory test use. The supplier therefore adapted the system based on the original specification and completed installation.

When the system was installed, the buyers stated that they were one PC short for the LAN. The supplier pointed out that they had installed the system according to the contract. During preliminary discussions an extra PC had been discussed verbally but was not included in the final written contract, which the user had signed without reading thoroughly.

A further problem arose when it was discovered that the final bill was greater than the agreed budget. This was because although the cost of the whole system was equal to the budgeted amount, no allowance had been made for the Value Added Tax payable in the UK. In order to settle this matter it was agreed to drop one of the printers from the network.

Another problem which arose concerned user training. The supplier proposal included extra training for one person to act as a system manager, and a secretary was

nominated for this training because of her keyboard experience. However, because of her heavy work load she did not have time to start the two day course. Additionally, the contract allowed only two days for general user training. This period was barely enough to give completely inexperienced users an introduction to basic keyboard and computer operations, and gave no opportunity for training in use of the system itself. The supplier was willing to provide the additional training, but at extra cost.

When the system was activated, users complained that system did not deliver as expected and that they would like a number of changes.. The supplier pointed out that they had been given the system for two months trial period to allow changes to be made, but now that the system was complete, changes could only be made at extra cost - for which the user had no funds available.

The PCs bought for the system are now used only as word processors, and the system itself remains unused until additional funds are agreed for its adaptation, and for more comprehensive training.

CHAPTER 4

DEVELOPMENT AND APPLICATION OF THE QUANTITATIVE SURVEY

(PHASE 3A)

This chapter outlines the development of the questionnaire survey and explains how it was applied to a broad spectrum of individuals with experience of the IT acquisition process at various levels of authority and responsibility.

This survey was based on a questionnaire which was used to collect data from a large number of projects on the degree to which each of the 43 factors and 8 success measures was present. This data is used in the following chapter to find which factors are most strongly associated with each measure of success.

The survey was conducted in Oman from November 1994 to March 1995. This phase of the research was done in three stages:

Stage One - Questionnaire design
Stage Two - Pilot application of questionnaire
Stage three - Main data gathering

4.1 Attributes, reasoning and perceptions

The survey focused on emphasizing *attributes* rather than *reasoning* or *perceptions*. Definitions adopted by Grafton Whyte (1995, p. 61) for these three terms are given below:

1. *Perceptions* are views we hold. For example, we may hold a view that system A is very successful.
2. *Reasoning* is the process we go through to arrive at our view. For example, we may say that system A is very successful because the top management was supportive.

3. *Attributes* are the measurement standards we use, often subconsciously, to arrive at held perceptions. For example, we may say that top management was supportive of project A.

For example, in this survey it was asked whether top management support was present in a particular project. Since what we get is the respondents' perceptions of whether the attributes were present, the data collected will comprise attributes modified by perceptions. At this stage we were not asking respondents to tell us what factors cause success or why i.e. they were not being asked for their perceptions or reasoning about the objectives of the research, only for statements about the presence or absence of attributes.

4.2 Questionnaire design

The aim of the questionnaire was to collect the data necessary to help quantify the degree of association between each of the 43 factors and 8 success measures that were identified previously. The questionnaire was designed to be closed-ended and specific enough to reveal answers to the questions, yet general enough to allow respondents not to reveal any privileged or sensitive information. A closed-end question offers a selection of answers from which the respondent is asked to select one. Close-ended questions force all respondents to answer the same questions with answers that can be meaningfully compared, and analysed using computer techniques (Foddy 1993).

Respondents were asked to select one specific project and answer questions based solely on that project. Questions concerning the degree of presence of factors and

measures were based on a scale of 1 to 5 with a value of 1 indicating a low presence for the factor or measure and 5 indicating a high presence.

Scales of 1 to 3, 1 to 4, 1 to 5, up to 1 to 10 are commonly used in this type of research with the appropriateness of the different scales being the subject of much debate. A scale of 1 to 5 was selected since it is probably the most commonly used (Foddy 1993; Oppenheim 1992) and because the pilot survey indicated that many respondents tended to shy from selecting the two extreme scales (1 and 5). This left the respondents with 3 main options which in effect meant low, medium and high. A scale larger than 5 would not necessarily prove more discriminatory since respondents would probably have difficulty in distinguishing between 7 and 8 on a scale of 1-10, for example.

The questionnaire consisted of a number of sequences of questions starting with factual questions about respondents' and projects' backgrounds, followed by questions about factors and measures. Questions were phrased in such a way as to try to avoid influencing respondent's answers. Much efforts went into making questions as short as possible, complete, and easy to read.

Filter options (*not sure* and *not applicable*) were used to exclude a respondent from a particular question sequence if those questions were irrelevant to him/her, or the respondent did not feel able to answer them.

The covering letter of the questionnaire is given in appendices 4.1 and 4.2 and the final version of the questionnaire is reproduced in appendices 4.3 and 4.4.

4.2.1 Operationalisation

(a) Introduction

Operationalisation is the process of translating concepts into measurable variables (Bryman & Cramer 1990; Berenson & Levine 1992). One mechanism for such operationalisation, adopted herein, is the questionnaire. Operationalisation was used in this research as a process through which factors were represented by questions in a quantitatively measurable way. These questions had a one-to-one correspondence with factors.

(b) Example of operationalisation - question 44 (Appendix 3.3)

The question

	Not at all				Very much so	Not sure
	1	2	3	4	5	?
Was the top management supportive of this project (*i.e. attending meetings and making necessary resources available*)?	☐	☐	☐	☐	☐	☐

was arrived at through the following steps:

Step 1: Gathering statements

From the semi-structured interviews (Section 3.1.1), the following statements had been gathered:

1. "The Director general was aware of our requirements ... and was very helpful in terms of providing us with the necessary resources in order to complete the project on time."

2. "Basically, he (the Under-Secretary) followed up the progress of the main stages of the project and made sure we were aware of that."

3. "Our senior manager attended almost all the meetings regarding this project and asked us about those he missed."

Step 2: Producing a factor

By using content analysis (Section 3.1.2), the above statements produced a factor which was called *top management support* (Table 3.3) and was defined as " the degree to which top management is involved in the progress of the project and makes the necessary resources are made available" (Table 3.4).

Step 3: Constructing a question

In order to ask about the presence of the above factor, the following question was constructed: "Was the top management supportive of this project? (*i.e. attending meetings and making necessary resources available.*").

Some questions had explanations given in brackets whilst for others this was felt to be unnecessary.

It was realised at an early stage that it would have been desirable to further operationalise the factors i.e. to pose several questions relative to each factor. This was ruled out as being impracticable since the questionnaire would then have been forbiddingly long, and the response would probably have been much lower. Berenson & Levine (1992) observed an inverse relationship between the length of a questionnaire and the rate of response to it.

Step 4: Constructing the response option

A key factor in constructing the questionnaire was not only to pose unambiguous questions, but also to consider how respondents could be prompted to answer simply and objectively. As explained earlier, it was felt that a ranged "Tick-box" response

would simplify completion and subsequent analysis. The questions were therefore posed to allow a graded response on a scale of 1 to 5. Initially, the range was designated for a response appropriate to each question. For example; "Very Late" - "On time", or "Very Supportive - "Not supportive". In all, there were 51 designations (43 for factors and 8 for measures). It was found in the pilot survey that respondents were not comfortable with the varied designation of the response scale because they felt that they needed as much time to read each response scale as to read the question itself. The responses were therefore then standardised with the designation "strongly agree" to "strongly disagree". Another stage of pilot survey then indicated that the words "agree" and "disagree" might influence the respondent's answer to the question. People did not feel comfortable to strongly disagree with given statements. The questions were therefore re-phrased to elicit a more neutral response as to the degree to which the factor was present or absent and for the degree of accomplishment regarding the measures. The grading designation was, therefore, standardised throughout as - "Not at all" to "Very much so". All questions had to be phrased so as to be answerable on this scale.

4.2.2. Questionnaire lay-out

The questionnaire was divided into five sections:

Section I: Respondent's background: Questions 1 to 7 dealt with the respondent's qualifications, experience, role and influence. The main aims of this section were to see whether individuals at various levels of authority and responsibility were covered in the survey. It also allowed the group of respondents to be described as a whole.

Section II: Project background: Questions 8 to 17 established the size, importance and type of technology employed for each project. The main aim of this section was to see whether projects with different backgrounds and importance were covered in the survey and to assess the nature of the projects as a whole.

Another important aim of this section was to help the respondent concentrate on one particular project.

Section III: Measures to be achieved: Questions 18 to 25 dealt with the degree of importance of each of the 8 success measures to the selected project. This section was not of direct use in meeting the main purpose of the survey. It was included because it was recognised that different success measures may have differing importance in different projects and this section could allow respondents' views on these matters to be examined. Although this examination was not made within the scope of this research, it would be an interesting topic to pursue in further research (Chapter 7).

Section IV: Project analysis - presence of factors: Questions 26 to 68 dealt with the degree to which each of the 43 factors of Table 3.3 was present in the selected project. This and the next section asked for the core data needed to correlate factors with measures.

Section V: The outcome of the project: Questions 69 to 79 measured the degree to which each of the 8 measures of success was fulfilled in the project.

4.2.3 Arabic translation of questionnaire

The purpose of the Arabic version of the questionnaire was to permit people with little or no knowledge of English, yet actively involved in IT projects to participate in the survey.

The questionnaire was first translated by the researcher into Arabic and then given to another person for reverse translation, from Arabic to English. The new English version of the questionnaire was compared with the original. Differences between the two English versions were identified and considered. The questionnaire was then translated into Arabic again, and the second Arabic version of the questionnaire was

again given to the same person for translation from Arabic to English. This process was done four times until no major differences occurred between the two English versions (the translation and the original one). Table 4.1 summarises the progress of this process.

Round	No. of questions with major difference	% of all questions
1	6	7.6
2	2	2.5
3	1	1.3
4	0	0

Table 4.1 English-Arabic translation process

The person who participated in this process neither discussed the contents of the questionnaire with the researcher, nor did he see the English version. He was not only familiar with both languages (English and Arabic), but also with IT, being a member of the team who developed one of the first Arabic encyclopedias of Information Technology terms.

This reliability check of the translation was important for two reasons:

1. To ensure that no misleading or missing concepts were introduced by the translation.

2. To ensure that both versions (English and Arabic) are understood in the same way.

4.3 Pilot application of questionnaire

The pilot testing of the questionnaire was conducted in person by the researcher. Thirty seven participants were asked to fill-in the questionnaire in the absence of the

researcher. They were asked to take note of items which they had difficulty in answering. The respondents were also asked to note how long it took to complete the questionnaire so that an estimated completion time could be mentioned in the planned covering letter for the main version of the questionnaire. The questionnaire took an average of 23 minutes to complete.

Immediately after completing the questionnaire the respondents were interviewed and asked to identify those items which were difficult to answer. The completed questionnaires were reviewed in order to discuss items not answered or answers that appeared inaccurate or inconsistent. Notes were taken on problem areas in the questionnaire design and improvements suggested by the participant. A few questions which were difficult to read or understand were identified by the first 25 respondents and were reconstructed. The questionnaire including these modified questions was then tested on the remaining 12 of the 37 people.

The main findings in this survey regarding the questionnaire were:

- Most of the respondents commented that they considered the questionnaire to be well-structured and phrased, and easy to complete.
- The respondents were able to fill-in the questionnaire easily without the presence of the researcher.

Although there was insufficient data at this pilot stage to attempt meaningful analysis of the results, it was decided to apply various analytical techniques to the data set to see if there were any difficulties. It was established that some factors emerged as more important to success than others and that statistically significant results would be likely from the main sample. Results of this exploratory analysis are not reported here since they were superseded by analysis of the results of the main survey (Chapter 5).

Factors and measures were recorded on a five-point scale. Taking all the answers together, there was a good spread of data across this range. This was taken to indicate

that the questions were well understood whilst also confirming that it would be possible to produce significant results with the data to be gathered using the questionnaire. If the data was not spread across the ranges, correlation could not have been carried out.

4.4 The main survey

4.4.1 Sampling consideration

Ideally one would take a complete list of IT projects and randomly select a sufficiently large sample of these to give statistically significant results. In practice no complete list of projects had ever been complied. Nor would it have been possible to compel all of a randomly selected sample of individuals to complete the questionnaire.

4.4.2 The sample

Enquiries of the Government Information Technology Committee (GITC list) established a list of 32 public organisations which had a substantial history of involvement in IT acquisition. These organisations were selected from the population of 44 public sector bodies (73%) in Oman. All 32 organisations were approached via IT directors and invited to participate in the research.

Each organisation was provided with 6 questionnaires (Total 192) to be completed by different players in the acquisition process (senior managers, IT staff and users). IT directors were asked to fill in a questionnaire themselves and nominate other potential participants from the above categories who are actively involved in the acquisition process. Some of the nominated people were approached by the IT directors while others were approached by the researcher.

One hundred and forty four questionnaires were completed and returned from 29 organisations, representing a response of exactly 75 %. Of the 144 questionnaires

returned, 86 (60%) were in English. Some researchers have indicated that a sample size of 100 is sufficient for most practical purposes (Oppenheimer 1966).

4.4.3 Questionnaire delivery and follow-up procedure

A covering letter (appendices 4.1 and 4.2) and the questionnaire (Appendices 4.3 and 4.4), were sent to the following categories of people-players:

- Senior managers (senior level staff involved in IT acquisition).
- IT staff (persons working in IT department).
- IT users (persons who use IT as a regular part of their work)

Questionnaires were given to two people in each of the above categories, a total of 6 questionnaires for each organisation. The rationale behind this was that during a previous phase of the research (Chapter 3) it had been noticed that 4-8 people belonging to the above categories were usually most actively involved in the IT acquisition process within any single organisation.

Since mailing a questionnaire is not a common practice in Oman, questionnaires were delivered and collected in person. Each questionnaire had both versions (English and Arabic).

One week after delivering the questionnaire the participants were contacted by telephone to determine whether they had received the questionnaire and to solicit their participation. At this point 55 questionnaires (29%) had been completed and returned.

By the end of the third week, 63 more questionnaires (33%) were completed and returned. During the fifth week, a second telephone follow-up was conducted and by the end of the sixth week 19 more questionnaires (7%) were completed and returned. In week eight, a third telephone follow-up was conducted. Extra copies of the questionnaires (total of 8) were sent to people who expressed a willingness to respond,

but who no longer had their questionnaires. At this point, those who were not willing to complete the questionnaires cited time constraints and the sensitivity of the issue as their reasons for non-participation. In week nine, 7 more questionnaires were completed and returned taking the total to 144 (exactly 75%). No further questionnaires were returned.

4.4.4 Data entry validity

As a first step toward the analysis, data in the returned questionnaires was transferred by the researcher into an SPSS file (explained later in Section 4.5.2). All this data was input a second time by another person. The two files were then checked for consistency and errors were corrected. Since the error rate was low (.08%), a second check was felt to be unnecessary. The consistency was as follows:

Total number of cells entered	11,232
Number of unmatched cells	9
% of error	.08%

Table 4.2 Data-entry reliability test

4.4.5 Data type

There are a number of terms used to define different types of data in the hard and soft sciences. These terms are: categorical (nominal or ordinal) and continuous (interval or ratio). Table 4.3 reproduces an illustration given by Fruin (1980) for the above categories.

Variable type	Variable name	Possible values
Nominal	Sex	Male / Female
Ordinal (rank order)	Social class	Working / Middle / Upper
Interval	Temperature °C	0 / 10 / 15
Ratio	Income	£750 / £1500 / 3000

Table 4.3 Different types of data (Fruin, 1980)

Data gathered in this survey was often subjective and dependent upon an individual's interpretation of the question. This indicates that our data is ordinal (rank order) based on the definition of ordinal data given by Fruin (1980, p. 106): "a variable whose values, which may be numbers or labels, can be ordered but lack a non-arbitrary zero point, e.g. social class, I.Q., problem severity, degree of introversion etc.. phrases such as three times, half as much or twice as much cannot be used." Oppenheim (1966, p. 93) commented that ranking tells us nothing about the differences between ranks; the distance between ranks two and three may be very large, but between five and six it may be minute. Ranking tells us the order or sequence, but the size of the rank-intervals is unknown and is unlikely to be equal.

4.5 Statistical analysis techniques

4.5.1 Overview

A considerable study of statistical methods was undertaken and advice was sought from a number of experts. So far, in this thesis, reference has been made to establishing correlations between factors and measures. However, it is important to be careful about terminology since correlation is normally taken to be between linear variables, i.e. continuous variables that can be measured on physical scales, such as height and weight. The data gathered in this research is not continuous, it is rank-order. Techniques used in physical science such as regression analysis and Pearson's

Correlation are not appropriate for such data and could give misleading results. Spearman's ρ Correlation is the preferred method for correlation between two rank orders variables (Oppenheim 1966). Correlation coefficient ranges between -1 to +1, with -1 meaning negative correlation, +1 meaning positive correlation and zero meaning no correlation. Spearman's rank order correlation is defined by Fruin (1980) as a measure of the degree of the relationship between two ranked order variables. Spearman's Correlation was used in this research to identify the degree of correlation between the 43 factors and the 8 success measures.

4.5.2 Statistical software used

Questionnaires were analysed using the SPSS package (Statistical Package for Social Sciences), version 6.0 for Windows on PCs (Marija 1993). This was newly available and was the standard version in the university. "SPSS is one of the, if not the, most widely used and comprehensive statistical programs in the social sciences" (Bryman & Cramer 1993, p. 16). This package permitted the 8x43 way correlation to be attempted which was fundamental to this research. SPSS also made it possible to select the most appropriate statistical tools from a comprehensive range.

4.6 Sample description

Analysis of the responses to the introductory questions in the questionnaire gave a picture of the body of respondents and projects on which this research was based.

4.6.1 The respondents

(a) Age range of respondents:

Age Range	*No. of respondents*
Less than 20	0
20 - 29	29
30 - 39	72
40 - 49	35
50 - 59	5
Over 60	3

Table 4.4 Age range of respondents

(b) Respondents' qualifications:

Qualifications	*No. of respondents*
Secondary or less	9
Higher Diploma	32
Bachelor	71
Post-graduate	25
Other	6
Didn't answer	1

Table 4.5 Qualifications of reseponsents

(c) Respondents' experiences:

Experience (years)	*No. of respondents*
No experience	3
Less than 1	4
1 - 4	31
5 - 14	65
15 - 25	35
More than 25	1
No answer	5

Table 4.6 Experience of respondents

(d) Respondents' roles:

Role	*No. of respondents*
User	20
IT staff	86
Top management	21
Consultant	6
Supplier	2
Other	2
No answer	7

Table 4.7 Roles of respondents in a given project

4.6.2 The organisations

Organisations participating in the survey are listed in Table 4.8. Some organisations requested to be anonymous and were therefore classified as "other government bodies".

Returned questionnaires indicated that people from varying positions of responsibility and authority had participated in the survey. They commented on projects of varying degrees of importance and on selected applications to which different technologies had

been employed. The majority of respondents with higher qualifications were educated in either the U.K. or the U.S.A.

Organisation name
Ministry of Finance & Economy
Ministry of Social Affairs & Labor
Ministry of Commerce & Industry
Ministry of Education
Ministry of Health
Ministry of Housing
Ministry of Development
Ministry of Water Resources
Ministry of Agriculture & Fisheries
Ministry of Civil Services
Ministry of Petroleum & Minerals
Ministry of Information
Diwan of Royal Court
Supreme Committee of Town Planing
General Telecommunications Organisation
Muscat Securities Market
Muscat Municipality
Oman Refinery Company
Central Bank
Sultan Qaboos University
Tender Board
Petroleum Development Oman
Other Government bodies

Table 4.8 List of organisations participating in the survey

4.6.2 The projects

(a) The size

Size (£)	*No. of projects*
Small (1,600 - 16,000)	34
Medium (16,000 - 160,000)	65
Large (160,000 - 1.6m)	37
Not Sure	7
No answer	1

Table 4.9 Size of projects

(b) The degree of success

Table 4.10 represents the degree of success/failure of the respective projects as indicated by the respondents on a scale of 1 to 5 (question 78 of the questionnaire).

Scale	DEGREE OF SUCCESS	NUMBER OF CASES
1	(GREAT FAILURE)	8
2	(FAILURE)	17
3	(IN BETWEEN)	41
4	(SUCCESS)	56
5	(GREAT SUCCESS)	18
	no answer	4
	TOTAL	144

Table 4.10 Degree of success of respective projects

Although from the point of view of the acquirers of IT systems, it would have been ideal for all the cases to be successful, from the point of view of this research, it would have been ideal to have an equal number of points in each of the 5 categories of Table

4.10. This would have been best for the purpose of establishing correlation lines. However, the sample shows a bias towards the centre and the high success end though there are still a reasonable number of points at the great failure end of the spectrum. The data is therefore considered well enough distributed to permit valid conclusions to be drawn.

References

Berenson, Mark and Levine, David. Basic business statistics, concepts and applications. 5th ed. USA: Prentice-Hall International, Inc., 1992.

Bryman, Alan and Cramer, Duncan. Quantitative data analysis for social scientists. 3rd ed. London & New York: Routledge 1993.

Foddy, William. Constructing questions for interviews and questionnaires, theory and practice in social research. 1st ed. UK: Cambridge University Press, 1993.

Fruin, David. *Data Analysis, a basic introduction.* National Institute foe social work, working paper 11, 1980.

Marija, Norusis. SPSS for Windows: Professional statistics. 6th ed. USA: SPSS Inc., 1993.

Oppenheim, A. N. Questionnaire design and attitude measurement. 1st ed. New York: Basic Books, 1966.

Oppenheim, A. N. Questionnaire design, interviewing and attitude measurement. 2nd ed. London: Printer Publisher Ltd, 1966.

Sidney Siegel. Nonparametric statistics, for the behavioral sciences. 1st ed. USA: McGraw-Hill Book Company, Inc., 1956.

Appendices

APPENDIX 4.1

Covering letter for the questionnaire- English version

Ali Qassim Jawad (Ministry of Information)
Cranfield University

Tel: 600104
Fax: 601979

Factors for success for acquiring information technology

Dear

I am now in the final phase of PhD research. To complete my research, I would greatly appreciate your assistance with this survey.

The results will be used for statistical purposes only, and contributors will remain anonymous. I will, of course, be pleased to send you a copy of the overall results if you would like to have them.

It is estimated that the fill-in time would be 23 minutes

Your role

Please specify one project with which you are personally familiar, and which has been completed, Having selected one particular project please complete the questionnaire accordingly.

May I take this opportunity to offer my grateful thanks for your-cooperation, especially if you have assisted in either of my previous surveys.

Yours sincerely,

Ali Q. Jawad

APPENDIX 4.2

Covering letter for the questionnaire- Arabic version

على قاسم جواد
وزارة الاعلام
جامعة كرانفيلد

العوامل المؤثره في عملية أقتناء تكنلوجيا المعلومات

عزيزي / عزيزتي

أنا في المرحلة الاخيرة من بحث الدكتوراة. سأكون ممنونا اذا أمكنكم مساعدتي بملئ الاستبيان المرفق. علما بأن اجاباتكم ستعامل بسريه والغرض منها هو فقط للاستخدامها في التحليل الاحصائي. أرجو التكرم بأختيار مشروع واحد الذي كان لك فيه دور فعال ثم أجب على أسئلة الاستبيان فيما يخص هذا المشروع.

الفترة الزمنية المتوقع استغراقها في ملئ هذا الاستبيان هي ٢٣ دقيقة.

شكرا للمساعدة

المخلص
علي قاسم جواد

APPENDIX 4.3

The questionnaire- English version

Project Questionnaire

Project title: Factors for Success in Acquiring Information Technology

Research objective
The acquisition of IT systems is not always completely successful. Failures can be serious and often incur considerable cost. This research is intended to find out what factors are critical in the outcome of IT acquisitions. The research is aimed at producing guidelines to help managers at all levels to acquire IT systems with greater chances of success.

Researcher: Ali Q. Jawad (Ministry of Information)

Representing: R&D Management Centre, Cranfield University

Your role
Please specify one project with which you are personally familiar, and which has been completed, Having selected one particular project please complete the questionnaire accordingly.

If you come across a question which you feel is not applicable to your project, please put "N/A" next to it.

Use of the information

Your answers will be kept completely confidential, and you will not be personally identified in my report. Your answers will be used for statistical purposes only. If you would like to receive a copy of the final report, please write your name and address on the last page of the questionnaire.

Definitions

Information Technology (IT):	The broad range of technologies involved in information processing and handling, such as computer hardware, software, communications and office automation.
Acquiring IT:	The whole process of adopting, implementing and using information technology.

THE QUESTIONNAIRE

Date .....

Name of your organisation (Optional) .....

Instructions: Please put a tick (✓) in the box that corresponds to your answer. Only one response is required for each question unless otherwise specified.

Section I. Your background

Q.1 Your qualification level? -

- Secondary or less ❑1
- Higher diploma ❑2
- Bachelor's degree ❑3
- Post-graduate ❑4
- Other (please specify)..... ❑5

Q. 2 Your background -

- Technical ❑1
- Management ❑2
- Other (please specify)..... ❑3

Q.3 Your age?

- Less than 20 ❑1
- Between 20 and 29 ❑2
- Between 30 and 39 ❑3
- Between 40 and 49 ❑4
- Between 50 and 59 ❑5
- 60 or more ❑6

Q.4

- Male ❑1
- Female ❑2

Q.5 How many years of experience do you have with IT in general?

- No previous experience ❑1
- Less than 1 year ❑2
- Between 1 and 4 ❑3
- Between 5 and 14 ❑4
- Between 15 and 25 ❑5
- More than 25 years ❑6

Q.6 How would you assess the degree of influence you had in the final decision to go ahead with the project?

❑1 No influence ❑2 Fairly influential ❑3 Decisive

Q.7 How would you describe your role in this project?

Your role	Definition	
- Operator / user:	Staff who use a terminal as a regular part of their work, either as data entry clerks, or to retrieve information.	❑1
- IT/Computer staff	Persons working full-time in IT/computer department, such as: managers, advisors, engineers, analysts, programmers or technicians.	❑2
- Senior manager/user	Senior level staff involved in either IT decisions, or in using the output of the system for management purposes (e.g. Directors and above)	❑3
- Independent consultant:	An individual employed by an external company for advising on IT policy or implementation	❑4
- IT supplier	An employee of a commercial company supplying goods or services to the organisation.	❑5
- Other (please specify)	----------	❑6

Section II. Project background

Instructions: The questions in this section refer only to the specific project you have chosen.

Q.8 What type of equipment or system have you selected for this questionnaire?

Tick 1 or more

- Personal computers ☐
- Mini-system ☐
- Main-frame ☐
- Image / Document processing system ☐
- Database management system ☐
- Local Area Network ☐
- Wide Area Network ☐
- Other communication system ☐

  *(please specify)*_____

- Telecommunication systems ☐

  *(please specify)*_____

- Other software ☐

  *(please specify)*_____

- Not sure ☐

Q.9 Which of the following categories best describes the application?

- It is an exploratory activity seen as having high potential for the future. ☐1
- It is an implementation of strategic importance to the organisation which may introduce a radically new approach ☐2
- It carries out a key operational process which is essential to everyday operations and without which the organisation could not function ☐3
- It carries out a support function more efficiently which is valuable but not critical ☐4

  Other category not listed above (Please specify) ☐5

  .....

- not sure ☐99

Q.10 Roughly how many people use the system, including operators and users at all levels?

- Less than 10 users ❑1
- Between 11 and 50 users ❑2
- Between 51 and 100 users ❑3
- Between 101 and 200 users ❑4
- More than 200 users ❑5
- Not sure ❑99

Q.11 What, roughly, is the total cost of the whole project? (including, not only hardware and software, but also buildings, staff, training etc.)

- Less than R.O. 1,000 ❑1
- Between R.O. 1,000 and less than R.O. 10,000 ❑2
- Between R.O. 10,000 and less than R.O. 100,000 ❑3
- Between R.O. 100,000 and less than R.O. 1 million ❑4
- R.O. 1 million or more ❑5
- Not sure ❑99

Q.12 Compared to other IT projects in your organisation, would you consider this project as:

- a small sized project ❑1
- a medium sized project ❑2
- a large sized project ❑3
- This is the first IT project ❑4
- not sure ❑99

Q.13 Was the project mainly intended to meet:

- Short term needs (next 12 months) ❑1
- Medium term needs (1-3 years) ❑2
- Long term needs (more than 3 years) ❑3
- not sure ❑99

Q.14 How many in-house people were involved in the planning, development, and implementation stages of this project?

- 3 or less ❑1
- Between 4 and 9 people ❑2
- Between 10 and 15 people ❑3
- Between 16 and 21 people ❑4
- More than 21 people ❑5
- Not sure ❑99

Q.15 Did the introduction of this system cause any changes to the overall business practices of the organisation?

- No change ❑1
- Minor change ❑2
- Major change ❑3
- Not sure ❑99

Q.16 Who first recognised the need for this project?

- Senior business management ❑1
- IT management ❑2
- User ❑3
- Independent consultant ❑4
- IT supplier ❑5
- Other (please specify)---------- ❑6
- Not sure ❑99

Q.17 In the order 1, 2, 3, rank the following criteria according to their criticality to the success of the project. (1 means most critical, 3 means least critical)

- Quality (The technical reliability of the system) ○
- Money (Completing the project within budget) ○
- Time (Completing the project within the schedule) ○
- Not sure ❑99

Section III. Criteria assessment.

Accepting the fact that the following criteria were important to the project in varying degree, the purpose of this section is to determine the relative criticality of each factor to the outcome of the project you have chosen.

		Slightly critical 1	2	3	4	Extremely critical 5	Not sure 7
Q. 18	How critical was it to complete the project on schedule?	☐	☐	☐	☐	☐	☐
Q. 19	How critical was it to complete the project within the allocated budget?	☐	☐	☐	☐	☐	☐
Q. 20	How critical was it that the adoption of this system would introduce improvements to the way that the organisation, or individuals did their work?	☐	☐	☐	☐	☐	☐
Q. 21	How critical was it to satisfy the expectations of the user ?	☐	☐	☐	☐	☐	☐
Q. 22	How critical was the system quality? (in terms of characteristics of the system (memory capacity, disk space, speed of response), and the accuracy of the output)	☐	☐	☐	☐	☐	☐
Q.23	How critical was it that the system would be used as predicted after implementation- in terms of frequency?	☐	☐	☐	☐	☐	☐
Q. 24	How critical was the weight placed on the evaluation carried out by your organisation into the *business aspects* of the suppliers' proposals in deciding to commit to the project? (e.g. achieving benefits)	☐	☐	☐	☐	☐	☐
Q. 25	How critical was the weight placed on the evaluation carried out by your organisation into the *technical aspects* of the suppliers' proposals in deciding to commit to the project? (e.g. compliance with the technical requirements of the project)	☐	☐	☐	☐	☐	☐

Section IV. Project Analysis

The following questions ask for information about your chosen project. There are a total of 43 questions, divided into 5 sets. For each question tick one box to indicate the degree to which you agree, or disagree, with the statement.

Set 1(of 6). Technological factors: *Factors which concern hardware and software.*

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 26	Was the technology bought "current" (not obscelecent) in terms of being still supported by the manufacturer and not about to be replaced.	☐	☐	☐	☐	☐	☐
Q. 27	Was the technology bought successfully used in a similar situation known to you?	☐	☐	☐	☐	☐	☐
Q. 28	Was the system easy to use? *(i.e. by the users)*	☐	☐	☐	☐	☐	☐
Q. 29	Was the system capable of adapting to future requirements? *(i.e. enhancement of hardware and software)*	☐	☐	☐	☐	☐	☐
Q. 30	Was the system open? *(able to communicate with other systems without major conversions)*	☐	☐	☐	☐	☐	☐
Q. 31	Was the software used commercially available without adaptation (off-the-shelf)?	☐	☐	☐	☐	☐	☐
Q.32	Does your organisation have documented IT standards to use?	☐	☐	☐	☐	☐	☐
Q. 33	Did all parties involved *(top management, IT staff and users)* meet as often as required to discuss developments on this project?	☐	☐	☐	☐	☐	☐
Q. 34	Did your organisation have technical development capability, in terms of Research and Development? *(i.e. to assess, adapt, modify, and develop relevant technology)*	☐	☐	☐	☐	☐	☐

Set 2(of 6). Organisational factors: *Factors which relate to the structure of your organisation, the capabilities, the availability of resources and general management of the organisation as a whole.*

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 35	Did your organisation have previous experience with IT in general?	☐	☐	☐	☐	☐	☐
Q. 36	Did your organisation have sufficient budget to complete this project? *(i.e. for training, support etc., in addition to hardware/software purchase)*	☐	☐	☐	☐	☐	☐
Q. 37	Did your organisation have the necessary skilled manpower in-house for this project? *(i.e. to plan, manage implement and use)*	☐	☐	☐	☐	☐	☐
Q. 38	Were business/policy objectives of the organisation clearly defined at all levels?	☐	☐	☐	☐	☐	☐
Q. 39	Was there a fully documented IT strategy for the organisation or department? *(i.e. where are we? where do we want to go? and how will we get there?)*	☐	☐	☐	☐	☐	☐
Q. 40	Was the IT strategy integrated with the business plan/ long term policy of the organisation?	☐	☐	☐	☐	☐	☐
Q. 41	In general, did the organisation clearly define responsibilities and delegation of authority for individual managers in reaching purchasing decisions?	☐	☐	☐	☐	☐	☐
Q. 42	Was there one individual more than others who advocated the adoption of new IT systems in general within the organisation? (i.e. champion, change manager, hybrid manager)	☐	☐	☐	☐	☐	☐

Set 3 (of 6). Management Factors: *Management factors concerning this particular project*

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 43	Were users (or user department/s) involved in the definition, and implementation of the system?	❑	❑	❑	❑	❑	❑
Q. 44	Was the top management supportive of this project (*i.e. attending meetings and making necessary resources available*)?	❑	❑	❑	❑	❑	❑
Q. 45	Was the objective of the project realistic in being understandable, technically achievable and financially affordable?	❑	❑	❑	❑	❑	❑
Q. 46	Was a feasibility or other assessment study conducted before the final commitment (*i.e. business case, benefit analysis , risk assessment, ...)?*	❑	❑	❑	❑	❑	❑
Q. 47	Was there a pilot project (prototype) before the final commitment or implementation) (*i.e. a short practical assessment of the project)?*	❑	❑	❑	❑	❑	❑
Q. 48	Was a project manager appointed who was given exclusive day-to-day responsibility for this project as his first priority?	❑	❑	❑	❑	❑	❑
Q. 49	Was a structured project management methodology used in this project? (*i.e. a recognised set of procedures for managing the planning and progress of the project)*	❑	❑	❑	❑	❑	❑
Q. 50	Were the user requirements well defined?	❑	❑	❑	❑	❑	❑
Q. 51	Were user requirements kept unchanged once the implementation phase started?	❑	❑	❑	❑	❑	❑
Q. 52	Was there sufficient time to complete the project?	❑	❑	❑	❑	❑	❑

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 53	Were all possible hidden costs considered at an early stage of the project? *(i.e. backlog data entry, training, lost time, extra manpower etc.)*	☐	☐	☐	☐	☐	☐
Q. 54	Was a technical and commercial analysis of potential suppliers carried out prior to the final commitment?	☐	☐	☐	☐	☐	☐
Q. 55	Were users provided with all the necessary training to use the new system?	☐	☐	☐	☐	☐	☐
Q. 56	Were the technical staff provided with all the necessary training to support the system for the user departments?	☐	☐	☐	☐	☐	☐
Q. 57	Were all necessary terms included in your contracts with suppliers? *(i.e. liability, warranties, delivery and payment schedules etc)*	☐	☐	☐	☐	☐	☐

Set 4 (of 6). Human Factors: *Factors relating to the experience and abilities of the people involved.*

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 58	Did the top management have a broad understanding or experience of IT? *(i.e. an appreciation of the potential benefits and risks of applying IT to business activities, and an ability to communicate effectively with IT professionals)*	☐	☐	☐	☐	☐	☐
Q. 59	Were the IT managers familiar with the organisational and user business/strategic needs?	☐	☐	☐	☐	☐	☐
Q. 60	Were IT staff competent to provide technical support for this new system?	☐	☐	☐	☐	☐	☐
Q. 61	Did the users have any previous experience in using IT in general?	☐	☐	☐	☐	☐	☐
Q. 62	Did the users accept the system without any resistance?	☐	☐	☐	☐	☐	☐

Set 5 (of 6). External Factors: *Factors which were outside your organisation, such as the actions of the State, consultants and suppliers.*

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 63	Was there a good relationship between your organisation and the IT supplier in terms of mutual understanding of needs and capabilities?	☐	☐	☐	☐	☐	☐
Q. 64	Was the supplier technically capable of delivering and supporting the system?	☐	☐	☐	☐	☐	☐
Q. 65	Was the advice of an independent consultant used for this project?	☐	☐	☐	☐	☐	☐
Q. 66	Were general regulations supportive of acquiring IT ?	☐	☐	☐	☐	☐	☐

Set 6 (of 6). Data Factors: *Factors relating to data management*

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q.67	Was the data required for input to the system available and in the right format?	☐	☐	☐	☐	☐	☐
Q. 68	Was the data required for input correctly structured and validated?	☐	☐	☐	☐	☐	☐

Section V. The outcome of this project

Thank you for working through to here. This is the last section! For each question tick one box

		Not at all 1	2	3	4	Very much so 5	Not sure ?
Q. 69	To what degree was the project completed on schedule?	☐	☐	☐	☐	☐	☐
Q. 70	To what degree was the project completed within the allocated budget?	☐	☐	☐	☐	☐	☐
Q. 71	To what degree did the adoption of this system have any beneficial impact on the way the organisation or its individuals did their work?	☐	☐	☐	☐	☐	☐
Q. 72	To what degree were the users satisfied with the system in terms of use and productivity?	☐	☐	☐	☐	☐	☐
Q. 73	To what degree did the system meet the expected quality? (in terms of characteristics of the system (memory capacity, disk space, speed of response), and the accuracy of the output?	☐	☐	☐	☐	☐	☐
Q. 74	To what degree was the system used after implementation?	☐	☐	☐	☐	☐	☐
Q. 75	Looking back, when commitment was first made to go ahead with the project, to what degree did it promise to be feasible in terms of achieving the expected benefits?	☐	☐	☐	☐	☐	☐
Q. 76	Looking back, when commitment was first made to go ahead with the project, to what degree did it promise to meet user technical requirements?	☐	☐	☐	☐	☐	☐

Q.77 This project

- was rated by you as a success. ☐1
- was rated by you as a failure. ☐2
- was killed, never implemented or used ☐3

Q.78 Overall, how would your organisation assess the degree of success of this project compared to other IT projects,

Least successful 1	2	3	4	Most successful 5	Not sure
☐	☐	☐	☐	☐	☐

Q.79 Briefly, what is/are the main reason/s for your response to the above question (Q78)? (*This is an optional question*)

.....

.....

.....

APPENDIX 4.4

The questionnaire- Arabic version

الإستبيان

* إسم الباحث : العوامل المؤثرة في عملية إقتناء تكنولوجيا المعلومات.

* الهدف من البحث: أن الهدف من هذا البحث هو التعرف عن أسباب نجاح أو فشل مشاريع تكنلوجيا المعلومات من خلال ذلك يمكننا صياغة أسلوب لرفع نسبة نجاح تلك المشاريع.

* الباحث : علي قاسم جواد

* الجامعة : مركز إدارة الأبحاث والتطوير، جامعة كرانفيلد

* دور المجيب على هذا الإستبيان :

أرجو التكرم بإختيار مشروع واحد الذي كان لك فيه دور فعال ثم إجابة أسئلة الإستبيان فيما يخص هذا المشروع.

* إذا كان السؤال غير مطابق للمشروع أرجو كتابة "غير مطابق" عند السؤال.

* إن إجابتكم متعامل بسرية والغرض منها هو فقط لإستخدامها في التحليل الإحصائي.

القسم الأول : خلفيات المجيب على الإستبيان
(إختيار واحد فقط)

اليوم :
إسم المؤسسة :

س١- المؤهل العلمي :

- متوسط أو أقل ☐١
- دبلوم عالي ☐٢
- ليسانس/بكلوريوس ☐٣
- دراسات عليا ☐٤
- أخرى (أرجو التحديد)..... ☐٥

س٢- الخلفية العلمية :

- فنية (أرجو التحديد) ☐١
- إدارة (أرجو التحديد) ☐٢
- أخرى (أرجو التحديد) ☐٣

س٣- العمر :

- أقل من ٢٠ سنة ☐١
- ٢٠ – ٢٩ سننة ☐٢
- ٣٠ – ٣٩ سنة ☐٣
- ٤٠ – ٤٩ سنة ☐٤
- ٥٠ – ٥٩ سنة ☐٥
- أكبر من ٦٠ ☐٦

س٤- الجنس :

١- ذكر ☐١
٢- أنثى ☐٢

س٥- عدد سنوات الخبرة في مجال تكنولوجيا المعلومات

- لا توجد خبرة سابقة ☐١
- خبرة أقل من سنة واحدة ☐٢
- من ١ إلى ٤ سنوات ☐٣
- من ٥ إلى ١٤ سنة ☐٤
- من ١٥ إلى ٢٥ سنة ☐٥
- أكثر من ٢٥ سنة ☐٦

س٦- كيف تصف درجة نفوذك في إتخاذ القرار النهائي للبت في هذا المشروع :

- لا نفوذ مطلقا ☐١
- نفوذ محدود ☐٢
- نفوذ واسع ☐٣

س٧- كيف تصف طبيعة عملك بالنسبة بهذا المشروع :

- مستخدم لنظام المعلومات ☐١
- إداري أو فني لدائرة الحاسب الآلي بالمؤسسة ☐٢
- مسئول إداري في المؤسسة (غير فني) ☐٣
- مستشار من خارج المنظمة (شركة أو شخص) ☐٤
- شركة مزودة لأنظمة المعلومات أو الخدمات المتعلقة بها ☐٥
- أخرى (أرجو التحديد) ☐٦

القسم الثاني يتعلق بخلفيات هذا المشروع

س٨- أرجو تحديد نوعية الأجهزة أو المعدات التي تم إختيارها كمكونات للنظام :

- حاسبات الشخصية ☐١
- حاسبات متوسطة ☐٢
- حاسبات كبيرة ☐٣
- نظام تخزين أو إسترجاع صور الوثائق ☐٤
- أنظمة إدارة قواعد البيانات ☐٥
- شبكات نقل بيانات محلية ☐٦
- شبكات نقل بيانات من بعد ☐٧
- أنظمة إتصالات أخرى (أرجو التحديد) ☐٨
- أنظمة إتصالات عن بعد ☐٩
- حزم برامج جاهزة (أرجو التحديد) ☐١٠
- لا أستطيع التحديد ☐٩٩

س٩- أي من العبارات التالية تصف طبيعة المشروع من حيث الأهمية :

- المشروع نظام تجريب قد يستخدم مستقبلا بالمؤسسة على نطاق أوسع. ☐١
- المشروع له أهمية إستراتيجية على مستوى العام داخل المنظمة في المدى البعيد. ☐٢
- المشروع له أهمية حساسة من حيث التطبيقات اليومية والتي تعتمد عليها المنظمة إعتمادا كليا في تحقيق أهدافها الرئيسية. ☐٣
- المشروع له أهمية من حيث تحسين أسلوب عمل بعض الأقسام في المنظمة. ☐٤
- المشروع له طليعة أخرى غير مذكورة (أرجو التحديد) ☐٥
- غير متأكد ☐٩٩

س١٠- ما هو عدد مستخدمي النظام بالتقريب ؟

- أقل من ١٠ مستخدمين ☐١
- بين ١١ و ٥٠ مستخدم ☐٢
- بين ٥١ و ١٠٠ مستخدم ☐٣
- بين ١٠١ و ٢٠٠ مستخدم ☐٤
- أكثر من ٢٠٠ مستخدم ☐٥
- لست متأكدا ☐٩٩

س١١- ما هي التكلفة الكلية للمشروع بالتقريب ؟

- أقل من ١٠٠٠ ريال عماني ☐١
- بين ١٠٠٠ و ١٠٠٠٠ ريال عماني ☐٢
- بين ١٠٠٠٠ و ١٠٠٠٠٠ ريال عماني ☐٣
- بين ١٠٠٠٠٠ وواحد مليون ريال عماني ☐٤
- أكثر من واحد مليون ريال عماني ☐٥
- لست متأكدا ☐٩٩

س١٢- ما حجم هذا المشروع الذي تم الحديث عنه في هذا الإستبيان مقارنة بالمشاريع الأخرى في مجال أنظمة معلومات الأخرى التي تم تنفيذها في المنظمة ؟

- صغير الحجم ☐١
- متوسط الحجم ☐٢
- كبير الحجم ☐٣-
- هذا أول مشروع لنا ☐٤
- لست متأكدا ☐٩٩

س١٣- هل تم التخطيط لتنفيذ المشروع لتلبية إحتياجات ؟

- قصيرة الأجل (١٢ شهر المقبلة) ☐١
- متوسطة الأجل (١ إلى ٣ سنوات) ☐٢
- بعيدة الأجل (أكثر من ٣ سنوات) ☐٣
- غير متأكد ☐٤

س١٤- كم عدد الأشخاص الذين شاركوا في عملية التخطيط، وضع المواصفات الإختيار والتطبق للمشروع ؟

- ٣ أو أقل ☐١
- بين ٤ و٩ ☐٢
- بين ١٠ و ١٥ ☐٣
- بين ١٦ و ٢١ ☐٤
- أكثر من ٢١ شخص ☐٥
- لست متأكدا ☐٩٩

س١٥- كم هو مقدار التغيير الذي حدث في طبيعة وأسلوب عمل القسم/الدائرة/المديرية العامة أو المنظمة نتيجة إستخدام هذا النظام ؟

- لا تغيير ☐١
- تغيير خفيف ☐٢
- تغيير كبير ☐٣
- لست متأكدا ☐٩٩

س١٦- من الذي قام داخل المؤسسة بتحديد الإحتياج بضرورة تنفيذ هذا المشروع ؟ هل هو

- مسئول إداري في المنظمة ☐١
- دائرة الحاسب الآلي ☐٢
- دائرة مستخدمي النظام ☐٣
- مستشار من خارج المنظمة ☐٤
- شركة موردة للأنظمة ☐٥
- أخرى (أرجو التحديد) ☐٦
- لست متأكدا ☐٩٩

س١٧- أرجو ترتيب المعايير التالية حسب أهميتها لهذا المشروع :
(١- يعنى الأهم ٢- يعني أقل أهمية)

- العامل الفني من حيث الكفاءة الفنية للأنظمة ١○
- العامل المالي من حيث تنفيذ المشروع حسب الموازنة الموضوعة له ٢○
- العامل الوقتي من حيث تنفيذ المشروع حسب الجدول الزمني الموضوع له ٣○
- لست متأكدا ٩٩○

القسم الثالث : أهمية بعض المعايير للمشروع

القسم الثالث : أهمية بعض المعايير للمشروع

أرجو تبيان درجة الأهمية كل من العناصر التالثة للمشروع من وجهة نظر المؤسسة (إختيار واحد فقط)

	مهم ١	٢	٣	٤	مهم جد ٥	لست متأكدا ؟
س١٨- مدى أهمية ضرورة إستكمال المشروع في الوقت المحدد له	☐	☐	☐	☐	☐	☐
س١٩- مدى أهمية ضرورة إستكمال المشروع حسب الميزانية المحددة له	☐	☐	☐	☐	☐	☐
س٢٠- مدى أهمية قيام المشروع بعد تنفيذه بتحسين أسلوب عمل المنظمة أو العاملين فيها	☐	☐	☐	☐	☐	☐
س٢١- مدى أهمية قيام النظام بتحقيق متطلبات مستخدمي النظام من حيث الإستخدام والإنتاج	☐	☐	☐	☐	☐	☐
س٢٢- مدى أهمية تحقيق النظام للمتطلبات الفنية من حيث السعة والسرعة	☐	☐	☐	☐	☐	☐
س٢٣- مدى أهمية تحقيق النظام لكفاءة الإستخدام من حيث قلة الإعطال	☐	☐	☐	☐	☐	☐
س٢٤- مدى أهمية إستخدام النظام من جهة الكمية كما كان محفظ سابقا	☐	☐	☐	☐	☐	☐
س٢٥- مدى أهمية تقييم العروض المقدمة لتوريد النظام من ناحية إحتمالية الأصول على الفوائد المرجوة منه في مرحلة الإختيار	☐	☐	☐	☐	☐	☐
س٢٦- مدى أهمية تقييم العروض المقدمة لتوريد النظام من ناحية إستيفاء النظام المعروض للمواصفات الفنية/التشغيلية المطلوبة في مرحلة الإختيار.	☐	☐	☐	☐	☐	☐

	مهم				مهم جدا	لست متأكدا
	١	٢	٣	٤	٥	؟
س٢٧- مدى أهمية تحقيق الهدف الأساسي للمشروع.	☐	☐	☐	☐	☐	☐

القسم الرابع : التحليلات المختلفة للمشروع

الجزء الأول (من ٦) -العناصر الفنية

	لا مطلقا ١	٢	٣	٤	نعم كليا ٥	لست متأكدا ؟
س٢٨- هل التكنلوجية التي تم إقتناعها ما زالت مستخدمة ومدعومة من قبل المصنع وليست في مرحلة إستبدال في القريب العامل ؟	❑	❑	❑	❑	❑	❑
س٢٩- هل التكنلوجية التي تم إقتناعها إستخدمت في نفس الظروف قبل دائرة أو منظمة أخرى ؟	❑	❑	❑	❑	❑	❑
س٣٠- هل كان النظام سهل التشغيل والإستخدام بواسطة المستخدمين ؟	❑	❑	❑	❑	❑	❑
س٣١- هل كان للنظام القدرة على إستيعاب الإحتياجات المستقبلية ؟	❑	❑	❑	❑	❑	❑
س٣٢- هل للنظام القدرة التخاطب (الإتصال) مع أنظمة أخرى دون الحاجة إلى عمليات تحويلية معقدة (نظام مفتوح) ؟	❑	❑	❑	❑	❑	❑
س٣٣ هل تم إستخدام حزم برامج تطبيقات جاهزة دون الحاجة إلى تحريرات ؟	❑	❑	❑	❑	❑	❑
س٣٤- هل يوجد لدى المنظمة مقاييس مكتوبة عن أنواع الأنظمة المستخدمة في المنظمة ؟	❑	❑	❑	❑	❑	❑

الجزء الثاني (من ٦)- العناصر التنظيمية بالمؤسسة

	لا مطلقا ١	٢	٣	٤	نعم كليا ٥	لست متأكدا ؟
س٣٥- هل كان العاملون في المشروع (المسئولين الإداريين، الفنيون، المستخدمون) يقومون بالإلتقاء دوريا لمتابعة خطة تنفيذ المشروع في مراحله المختلفة ؟	❑	❑	❑	❑	❑	❑
س٣٦- هل لدى المؤسسة قدرات فنية في مجال البحث وتطوير لأنظمة المعلومات ؟	❑	❑	❑	❑	❑	❑
س٣٧- هل كانت هناك خبرة سابقة للمؤسسة في مجال إمتناء أجهزى الحاسب الآلي بصورة عامة؟	❑	❑	❑	❑	❑	❑
س٣٨- هل كانت هناك موازنة كافية للمشروع بحث تغطى كافة متطلباته ؟	❑	❑	❑	❑	❑	❑
س٣٩- هل كانت هناك القدرات البشرية المتخصصة اللازمة لتنفيذ هذا المشروع ؟	❑	❑	❑	❑	❑	❑
س٤٠- هل كانت الأهداف الهامة للمؤسسة واضحة لدى كافة المستويات تنظيمية ؟	❑	❑	❑	❑	❑	❑
س٤١- هل كان لدى المنظمة دراسة معدة لإستر تيجية تكنلوجية المعلومات المستهدفة؟	❑	❑	❑	❑	❑	❑
س٤٢- هل كانت إستراتيجية تكنلوجية المعلومات المعدة لدى المؤسسة متوائمة مع خطة عمل المنظمة ؟	❑	❑	❑	❑	❑	❑
س٤٣- هل تم إختيار عرض توريد المكونات التكنلوجية للمشورع طبقا لأسس ومعايير واضحة ومحددة مسبقا ؟	❑	❑	❑	❑	❑	❑

س٤٤- هل كان هناك لدى المؤسسة شخص ما (إداري أو فني) وكل له كل ما يتعلق بأمور إدخال أنظمة المعلومات إلآ المنظمة بصورة عامة ؟

لا مطلقا				نعم كليا	لست متأكدا
١	٢	٣	٤	٥	؟
☐	☐	☐	☐	☐	☐

الجزء الثالث (من ٦)- العناصر الإدارية للمشروع)

	لا مطلقا ١	٢	٣	٤	نعم كليا ٥	لست متأكدا ؟
س٤٥- هل شارك مستخدموا النظام في عملية تحديد المواصفات وأسلوب عمل النظام؟	❑	❑	❑	❑	❑	❑
س٤٦- هل كان هناك إهتمام ودعم مستمر للمشورع من قبل متخذي القرار على كافة المستزيات للمنظمة ؟	❑	❑	❑	❑	❑	❑
س٤٧- هل كان الهدف الذي وضع للمشروع المستهدف تحقيقه وقعي من حيث موضوحه وممكن تحقيقه فنيا ويمكن تحقيق تغطيه كافة نفقاته المالية ؟	❑	❑	❑	❑	❑	❑
س٤٨- هل كانت المنظمة بعمل دراسة جدوى إقتصادية (أو شابه ذلك) قبل إتخاذ القرار النهائي في البت في تنفيذه ؟	❑	❑	❑	❑	❑	❑
س٤٩- هل تم تنفيذ مرحلة تجريبية (مصفرة) للمشورع قبل تنفيذ المشروع كاملا ؟	❑	❑	❑	❑	❑	❑
٥٠- هل كان هناك مدير (منسق) للمشروع مسئول عن إدارته ومتابعة خطة العمل به ؟	❑	❑	❑	❑	❑	❑
س٥١- هل تم إستخدام منهجية علمية لإدارة ومتابعة وتقيم المشروعات في هذا المشروع ؟	❑	❑	❑	❑	❑	❑
س٥٢- هل تم توصيف إحتياجات المستخدمين من النظام بصورة جيدة ؟	❑	❑	❑	❑	❑	❑
س٥٣- هل ظلت الإحتياجات الأساسية للمستخدمين كما هي دون أي تغيير عند بدء تطبيق إستخدام النظام ؟	❑	❑	❑	❑	❑	❑
س٥٤- هل كانت هناك فترة زمنية كافة لإتمام المشروع ؟	❑	❑	❑	❑	❑	❑

	لا مطلقا				نعم كليا	لست متأكدا
	١	٢	٣	٤	٥	؟
س٥٥- هل تم تحديد التكاليف الإضافية للمشروع (الطارئة) في مرحلة متقدمة من المشروع ؟	❑	❑	❑	❑	❑	❑
س٥٦- هل قامت المنظمة بتقييم الشركات المتقدمة للعروض من الناحية الفنية والتجارية ؟	❑	❑	❑	❑	❑	❑
س٥٧- هل تم تدريب مستخدمي النظام التدريب الكافي لإستخدام النظام ؟	❑	❑	❑	❑	❑	❑
س٥٨- هل تم تدريب المتخصصون الفنيون بالتدريب اللازم لإمكان قيامهم لتشغيل ودعم النظام ؟	❑	❑	❑	❑	❑	❑
س٥٩- هل كان بنود الإتفاقية الموقعة بين المنظمة والشركة الموردة للأنظمة شاملة لكافة حقوق المنظمة ؟	❑	❑	❑	❑	❑	❑

الجزء الرابع (من ٦) – العناصر البشرية

	لا مطلقا ١	٢	٣	٤	نعم كليا ٥	لست متأكدا ؟
س٦٠– هل كان لدى الإدارة العليا بالمنظمة أية خلفية عن تكنلوجيا المعلومات بصورة عامة في مجالات العمل المختلفة ؟	☐	☐	☐	☐	☐	☐
س٦١– هل كان لدى المسئولين بدائرة الحاسب الآلي الخلفية الكافية عن إحتياجات المستخدمين وطبيعة عملهم ؟	☐	☐	☐	☐	☐	☐
س٦٢– هل كان لدى المختصين لدائرة الحاسب الآلي إمكانية تقديم الدعم الفني لآنظمة المتواجدة لدى دوائر المستخدمين المختلفة ؟	☐	☐	☐	☐	☐	☐
س٦٣– هل كان لدى مستخدمي النظام أية خبرة سابقة في مجالات إستخدامات الحاسب الآلي ؟	☐	☐	☐	☐	☐	☐
س٦٤– هل قام مستخدموا النظام بتقبله دون مقامة أو تردد ؟	☐	☐	☐	☐	☐	☐

الجزء الخامس (من ٦) – العناصر الخارجة عن المؤسسة

	لا مطلقا				نعم كليا	لست متأكدا
	١	٢	٣	٤	٥	؟
س٦٥– هل كانت هناك علاقات طيبة بين المنظمة والشركة الموردة للأنظمة ؟	❑	❑	❑	❑	❑	❑
س٦٦– هل كانت لدى الشركة الموردة للأنظمة قدرات عالية في مجال الدعم الفني ؟	❑	❑	❑	❑	❑	❑
س٦٧– هل إستخدمت المنظمة مستشار خارجي للمساعدة في هذا المشروع ؟	❑	❑	❑	❑	❑	❑
س٦٨– هل كانت القوانين واللوائح العامة المطبقة مساعدة في تسهيل عملية إقتناع التكنلوجية سواء من الداخل أو الخارج ؟	❑	❑	❑	❑	❑	❑

الجزء السادس (من ٦) – عناصر البيانات

	لا مطلقا				نعم كليا	لست متأكدا
	١	٢	٣	٤	٥	؟
س٦٩– هل كانت البيانات اللازمة متوفرة وبالهيئة المناسبة الإدخالها مباشرة في النظام	☐	☐	☐	☐	☐	☐
س٧٠– هل كانت البيانات اللازمة تستقبل النظام ثم التأكد من صحتها قبل إدخالها	☐	☐	☐	☐	☐	☐

القسم الخامس : معطيات المشروع

	لم يتعمل أبدا ١	٢	٣	٤	أقصى حد ٥	لست متأكدا ؟
س٧١- إلى أي مدى إستكمل المشروع في المدة المحددة له ؟	❑	❑	❑	❑	❑	❑
س٧٢- إلى أي مدى إستكمل المشروع في حدود الميزانية المحددة له ؟	❑	❑	❑	❑	❑	❑
س٧٣- إلى أي مدى ساعد إستخدام النظام في تحسين أسلوب وإجراءات العمل في المنظمة أو لدى الموظفين ؟	❑	❑	❑	❑	❑	❑
س٧٤- إلى أي مدى كان المستخدمون سعداء بإستخدام النظام من حيث الإنتاج ؟	❑	❑	❑	❑	❑	❑
س٧٥- إلى أي مدى لب النظام الإحتياجات التشغيلية للمستخدمين من حيث السعة والسرعة ؟	❑	❑	❑	❑	❑	❑
س٧٦- إلى أي مدى كان النظام فينا يمكن الإعتماد عليه من حيث عدم تكرار حصول إعطال فنية فيه بصفة مستمرة ؟	❑	❑	❑	❑	❑	❑
س٧٧- إلى أي مدى تم إستخدام النظام بعد التشغيل من قبل المستخدمين	❑	❑	❑	❑	❑	❑
س٧٨- إلى أي مدى كان النظام منذ البداية يوحى بتلبية بجدواه من ناحية تحقيقية الفوائد المتوقعة منه ؟	❑	❑	❑	❑	❑	❑
س٧٩- إلى أي مدى كان النظام منذ البداية يوحى بتلبية الإحتياجات الفنية/التشغيلية للمستخدمين له من حيث التقييم الفني له ؟	❑	❑	❑	❑	❑	❑
س٨٠- إلى أي مدى تحققت الأهداف الرئيسية المرجوة من النظام ؟	❑	❑	❑	❑	❑	❑

س٨١- هل تعد هذا المشروع

- ناجح ☐١
- غير ناجح ☐٢
- ألغى قبل أن يستكمل ☐٣
- لم ينتهي بعد ☐٤

س٨٢- مقارنة بالمشاريع الأخرى في المنظمة، ما هي درجة نجاح هذا المشروع

أقل نجاحا			أكثر نجاحا	لست متأكدا
☐١	☐٢	☐٣	☐٤	☐٥	☐

س٨٣- بصورة مختصرة ما هي الأسباب وراء إجابتك سؤال السابق ٨٢ ؟ (سؤال إختياري)

.....
.....
.....

CHAPTER 5

ANALYSIS OF THE QUANTITATIVE SURVEY RESULTS (PHASE 3B)

In Chapter 3 it was explained how qualitative data on the presence of factors and measures in IT projects was gathered. The aim now is to identify which of the 43 factors were most important. This chapter presents the results of the statistical analysis of the qualitative data which was carried out in three stages:

1. Use of Spearman's Correlation to identify which of the 43 factors have significant correlations with each of the 8 success measures.

2. Use of Partial Correlation to identify which of the correlated factors have direct correlation with the success measures and which are indirectly correlated. This identifies the *superfactors*.

3. Use of Spearman's Correlation to identify which of the other factors have significant correlation with each the above superfactors. This identifies the *subordinate factors*.

5.1 Examples of the data

Tables 5.1 and 5.2 show examples of the distribution of the respondents' answers for two factors, *indigenous skill level* and *Sufficient time for completion*, in relation to one measure (*user satisfaction*). In the first case the correlation is high and in the second case it is low.

MX04SATS User satisfaction by F12SKILL Indeginous skill

MX04SATS		not at all 1	2	3	4	very much 5	Row total
not at all	1	3	2	3			8
	2	3	4	5	1		13
	3	2	4	3	11	1	21
	4	5	4	6	24	21	60
very much so	5			3	8	16	27
Column total		13	14	20	44	38	

Number of Missing Observations: 15

Table 5.1 Distribution of respondents' answers about user satisfaction (row) and indigenous skill level (column). For example, the top left box shows that there were three cases where indigenous skill levels were very low and users were not satisfied with the systems at all. Blank boxes mean zero. The correlation coefficient is 0.570 at 0.00 significance level (high correlation).

MX04SATS User satisfaction by F27TIME Sufficient time

MX04SATS	F27TIME not at all 1	2	3	4	very much so 5	Row total
1 not at all		1		3	4	8
2	3	1		4	5	13
3	1	4	7	7	3	22
4	1	6	13	25	15	60
5 very much so		3	6	4	14	27
Column total	5	15	26	43	41	130

Number of Missing Observations: 14

Table 5.2 Distribution of respondents' answers about user satisfaction (row) and Sufficient time for completion the project(column). For example, the bottom right box shows that there were 14 cases where sufficient time was allowed to complete the project and users were extremely satisfied with the systems. Blank boxes mean zero. The correlation coefficient is 0.107 at 0.22 significance level (low correlation).

5.2 Definitions of some statistical terms

5.2.1 Correlation coefficient:

Correlation coefficient is a numerical summary measure of the degree of correlation between two variables. By definition the value of the coefficient must lie within the range of -1 and +1. Where:

- Coefficient = +1 represents perfect positive correlation.
- Coefficient = 0 represents no correlation
- Coefficient = -1 represents perfect negative correlation

(Fleming and Nellis, 1991).

5.2.2 Significance Level

There is always some possibility that an apparent correlation coefficient could have arisen by fluctuations in the random sampling. It is important to decide how low probability of this occurring will be set in a research project. Most statisticians use a significance level of 5% as the criterion, but values as low as 1% or 0.1% might be needed if the consequences of the test could be very costly or crucial (Martin and Firth, 1983). Table 5.3 shows how Martin and Firth (1983) described different significance levels

5.2.3 Confidence level

Confidence level is the range within which a population parameter is likely to lie as the result of an experiment including sampling.

Confidence level = 1 - significance level

(e.g. 5% significance level = 95% confidence level).

Correlations with 0.05 or lower significance levels were considered significant for the purpose of this research (Section 5.4).

Significance level	Description
5%	Reject the null hypothesis with reasonable confidence.
1%	Reject with a high degree of confidence.
0.1%	Reject with an extremely high degree of confidence.
Close to 5%	No reason to reject the null hypothesis but no particular reason to accept it either.
No significance	Accept the null hypothesis.

Table 5.3 Description of significant levels (Martin and Firth, 1983). The null hypothesis is that there is no correlation.

5.3 Correlation between measures and factors

Table 5.4 shows Spearman's correlation between the 43 factors and the 8 measures of success. For key to codes see tables 5.5 and 5.6. Significant (5%) and highly significant (1%) correlations are marked with * and **.

The 43 factor codes used by the researcher in SPSS are interpreted in Table 5.5. For example, "F01CURNT" in SPSS output represents factor number 1 "*Use of current technology*", and "F02PRVN" represents factor number 2, "*Use of proven technology*". Table 5.6 represents the 8 success measures with their corresponding SPSS codes.

--- SPEARMAN CORRELATION COEFFICIENTS ---

	MX08B.EV (P.benefit)	MX09T.EV (P.IT capb)	MX01TIME (Time)	MX02MONY (Money)	MX05QUAL (Perform)	MX03IMPC (Impact)	MX04SATS (User sats.)	MX07USE (Use)
F01CURNT	.3831**	.3516**	-.0102	.1462	.1643	.2484**	.2067*	.1675
F02PRVN	.1236	.1959*	.0664	.0934	.1935*	.1069	.1445	.3059**
F03EASY	.1858*	.2618**	.3411**	.3242**	.4867**	.4412**	.4563**	.4057**
F04EXPND	.1455	.2405**	.1564	.1952*	.4545**	.3468**	.3314**	.3471**
F05OPEN	.1050	.2383**	.0397	.1456	.3491**	.2635**	.2343**	.2570**
F06AVAIL	.0590	.0494	.3086**	.2178*	.2640**	.1605	.1639	.1477
F07STAND	.0690	.0787	.0845	.0964	.1426	.1888*	.2189*	.1900*
F08COMM	.0529	.1570	.2319**	.3027**	.2354**	.2606**	.3075**	.3068**
F09TECDE	.1732	.2012*	.1596	.1415	.2642**	.4471**	.3385**	.2204*
F10EXPER	.1496	.1534	.0657	.1189	.1564	.2286**	.3223**	.2224*
F11FUNDS	.2170*	.2729**	.1680	.3031**	.2170*	.1632	.2647**	.1953*
F12SKILL	.1360	.2713**	.2595**	.3867**	.3506**	.4842**	.5700**	.4081**
F13BUSOB	.3728**	.4138**	.1824*	.2364*	.3137**	.2728**	.3471**	.3527**
F14ITSTR	.3073**	.2866**	.1182	.1739	.3206**	.4341**	.4650**	.4451**
F15BUSIT	.3460**	.3410**	.0862	.2574**	.2912**	.4710**	.4324**	.5469**
F16RESPO	.2643**	.3334**	.0923	.1590	.4452**	.3104**	.4060**	.3884**
F17CHAMP	.1534	.1460	-.0778	.0985	.0266	.1659	.1614	.1762
F18USRIN	.1291	.1229	.1495	.2272*	.1413	.1952*	.1953*	.0656
F19MGTSP	.2861**	.3919**	.2242*	.2173*	.2022*	.2370**	.2076*	.2641**
F20PROBJ	.3855**	.4522**	.2374**	.4201**	.3818**	.3386**	.3997**	.2894**
F21FEASB	.2480**	.2645**	.0675	.1919*	.2408**	.3415**	.3396**	.2516**
F22PILOT	.0723	.0344	.1415	.1110	.2308**	.2161*	.3320**	.1311
F23PRMGR	.1470	.1776*	.1689	.1159	.2560**	.2783**	.3080**	.1228
F24METHD	.1977*	.1749	.1830*	.1122	.2914**	.3641**	.3054**	.1369
F25USREQ	.2743**	.3209**	.2867**	.3148**	.3300**	.3959**	.3406**	.2268**
F26UNCHR	.4137**	.3713**	.2275*	.1162	.2635**	.2118*	.2285**	.1160
F27TIME	.2410**	.2822**	.2320**	.2987**	.1200	-.0129	.1072	-.0276
F28HDNCT	.2629**	.3493**	.3111**	.3994**	.4288**	.2866**	.3895**	.2117*
F29SUPAN	.1515	.2503**	.1288	.2330*	.2896**	.4235**	.4002**	.4020**
F30UTRAN	.2112*	.3242**	.1188	.3230**	.2890**	.3845**	.3690**	.3342**
F31TTRAN	.2777**	.3628**	.1983*	.2173*	.3055**	.4680**	.3651**	.4229**
F32CONTR	.1285	.3736**	.2924**	.1854	.2861**	.2893**	.1999*	.2641**
F33ITAWR	.2704**	.2749**	.1649	.2422*	.2031*	.4004**	.3116**	.4261**
F34BSUND	.1454	.3108**	.2489**	.2972**	.4266**	.4390**	.3937**	.2769**
F35TECAP	.2132*	.2989**	.1889*	.2478**	.4655**	.4427**	.4059**	.4118**
F36USRMA	.1510	.2278*	.0872	.1863*	.2448**	.1271	.2501**	.3108**
F37USRAC	.0826	.1441	.2089*	.4330**	.3121**	.1391	.3204**	.2113*
F38SUPRE	.2512**	.3272**	.3090**	.3203**	.2686**	.3517**	.2302*	.3363**
F39SUPCO	.2330*	.4044**	.3655**	.2411*	.2157*	.2427*	.1594	.2962**
F40CNSLT	.0679	.0305	.0012	-.2564**	-.0391	-.0190	-.1152	.0461
F41PBLIC	.3078**	.4455**	.1850	.1802	.1340	.1534	.1851	.1250
F42DATAV	.2867**	.3398**	-.2638**	.1676	.2156*	.2254*	.2353*	.2387**
F43DATVA	.2945**	.3183**	.2776**	.2256*	.3110**	.4177**	.3780**	.3962**

* - Signif. LE .05 ** - Signif. LE .01

*Table 5.4 Correlation between the 43 factors and the 8 measures of success by using Spearman's rank order correlation - SPSS output. * represents significance level of 0.05 or lower. ** represents significance level of 0.01 or lower.*

SPSS code	Factor
F01CURNT	Use of current technology
F02PRVN	Use of proven technology
F03EASY	Ease of use
F04EXPND	Enhancability of the system
F05OPEN	Open system interconnection
F06AVAIL	Off-the shelf software
F07STAND	Existence of IT standards
F08COMM	Internal communication
F09TECDE	Indigenous R & D capabilities
F10EXPER	Previous IT experience
F11FUNDS	Sufficiency of financial resources
F12SKILL	Indigenous skill level
F13BUSOB	Clarity of business objectives
F14ITSTR	Existence of IT strategy
F15BUSIT	Existence of IS strategy
F16RESPO	Organisational structure
F17CHAMP	Presence of IT champion
F18USRIN	User involvement
F19MFTSP	Top management support
F20PROBJ	Realistic project objective
F21FEASB	Feasibility study
F22PILOT	Piloting the project
F23PRMGR	appointment of a project manager
F24METHD	Use of project management methodology
F25USREQ	Accurate statement of requirements
F26UNCHR	Stable user requirements
F27TIME	Sufficient time for completion
F28HDNCT	Considering hidden costs
F29SUPAN	Supplier analysis
F30UTRAN	Provision of user training
F31TTRAN	Provision of technical training
F32CONTR	Comprehensive contract terms
F33ITAWR	Top management IT awareness
F34BSUND	IT managers business understanding
F35TECAP	IT staff technical capabilities
F36USRMA	User maturity
F37USRAC	User acceptance
F38SUPRE	Client-supplier relationship
F39SUPCO	Supplier competence
F40CNSLT	Use of independent consultant
F41PBLIC	Flexibility of general regulations
F42DATAV	Data availability
F43DATVA	Data validity

Table 5.5 Key to interpreting the SPSS codes used in Table 5.3 in terms of factor titles

No.	Success measure	SPSS code
1	Business feasibility	MX08B.EV
2	Technical feasibility	MX09T.EV
3	On time	M1TIME
4	Within budget	M2MONY
5	System performance	MX05QUAL
6	Impact	M3IMPC
7	User satisfaction	M4SATS
8	Actual use	M5USE

Table 5.6 Key to interpreting the SPSS codes used in Table 5.3 in terms of success measures titles

5.4 Comments on the results of the correlation calculations

5.4.1 Comments

1. Nearly all factors correlated at 0.05 or lower significance level (95% or higher confidence level) in varying degree with one or more success measure. This indicates that IT acquisition is a complex process and nearly all factors identified in the qualitative survey proved to be important. the idea of identifying just a few highly significant factors, as project SAPPHO did for R&D projects, can now be seen not to work. The situation with IT acquisition is more complicated. .

2. Only one factor was found not to be correlated with any of the 8 success measures, *the presence of IT champion.* This was not a surprising finding. The concept of a champion does not exist in Oman. Moreover, this factor is one of two factors (the other one is *indigenous R&D capabilities*) which were found in the literature survey but were not identified in the field survey in Oman (Section 3.2 above).

3. *Indigenous R&D capabilities* is the other factor which only was found in the literature. The correlation which this factor showed should be considered

carefully. The question which represented this factor in the questionnaire did not probably reflect the actual meaning of R&D. The question stated: "Did your organisation have technical development capability, in terms of Research and Development? *(i.e. to assess, adapt, modify, and develop relevant technology)*".

It seems that respondents did not quite understand this question as anticipated and felt that the capability of assessing or adapting IT could reflect R&D capability. Therefore, answers to this question can be considered unreliable. Since the question did not occur in the survey, the researcher made it up with guidance from the literature, and then tried to test it in Oman. However, this did not affect the final results of this research since the correlation level of this factor vanished during further analysis.

4. There is only one significant negative correlation, which is between the *"Within budget"* and the *"Use of independent consultant"*. As noted in certain case histories (Chapter 3), this negative relationship was generally due to an inadequate provision for consultancy fees. This was due either to not considering the consultancy fee at an early phase (*initiation*), or because additional work was required from the consultant as the project developed for which no budget was available. This factor has low correlation with other success measures.

5.4.2 The next step

The main finding of Table 5.4 is that the overall picture of correlating the 43 factors with the 8 success measures is complex. Consequently, a further investigation of these relationships was necessary in order to draw reasonable conclusions from the data-set. Interdependencies among the factors were sought in order to simplify the picture (Section 5.6).

5.5 Reliability check on the correlation technique

A dummy data-set was created by using Random Number Generation (Excel). A correlation analysis similar to the one used to generate Table 5.4 was applied with this random data set. Table 5.7 shows the output of this.

- - - S P E A R M A N C O R R E L A T I O N C O E F F I C I E N T S - - -

	MX08B.EV (P.benefit)	MX09T.EV (P.IT capb)	MX01TIME (Time)	MX02MONY (Money)	MX05QUAL (Perform)	MX03IMPC (Impact)	MX04SATS (User sats.)	MX07USE (Use)
F01CURNT	.0126	.1483	-.1743*	-.1088	-.0869	-.0825	.0518	-.0644
F02PRVN	.0316	.0034	-.0893	.0728	-.0891	.0059	.0377	.1136
F03EASY	.0120	.1140	.1152	-.0566	-.0560	-.0244	.0059	-.0026
F04EXPND	.0742	.1325	-.0215	.0510	.0405	.0427	.0158	-.2136*
F05OPEN	.0033	-.0195	-.0500	-.0555	-.1243	-.0728	.0099	.0797
F06AVAIL	.0438	.0528	.0380	-.0046	.1074	-.0295	.0018	-.0126
F07STAND	-.0525	.0449	-.0364	-.1233	-.0406	-.0547	-.1182	-.0614
F08COMM	.0390	-.0046	-.0127	-.0030	-.0571	-.0458	.1345	-.0763
F09TECDE	-.0675	.0387	.0666	.0397	.0369	-.0060	.0551	.0726
F10EXPER	-.0535	.0365	-.0140	.1028	-.0464	-.0616	-.0915	-.0678
F11FUNDS	-.1714*	-.0075	.0602	.0761	-.1051	-.1704	.0729	-.0129
F12SKILL	.0476	.0227	-.1354	-.0855	.0166	.0126	.0814	-.1118
F13BUSOB	.0414	-.0675	.0619	.0247	.0877	-.0023	.0408	.0497
F14ITSTR	.0184	-.0296	.0839	-.0290	.0113	-.0903	-.0209	-.0531
F15BUSIT	-.0312	.2098*	-.0384	.0513	.0666	.0932	.0398	-.0530
F16RESPO	-.0882	.0419	-.1317	-.1173	-.0170	.1687	.0444	.0761
F17CHAMP	.0618	-.0082	-.0074	-.0197	-.0127	-.0537	-.0384	.1122
F18USRIN	-.1100	-.1038	.0136	-.0086	-.0734	-.1421	.0495	-.1056
F19MGTSP	-.0657	-.0587	.0441	.0838	-.0365	-.0260	.0215	.0434
F20PROBJ	-.0225	-.1271	-.1466	-.0150	.1699*	-.0168	-.0712	-.0165
F21FEASB	.0456	.0092	.0795	-.0041	.0981	-.0561	.0896	.0076
F22PILOT	.0192	.0292	.0227	-.0793	-.0997	-.0293	.0682	-.0328
F23PRMGR	.0284	-.0897	.0645	.0134	-.0997	.0249	.0258	.0828
F24METHD	.0865	.0243	.0543	-.0262	-.0053	-.0117	-.0087	-.0445
F25USREQ	.0977	.0375	-.0065	-.0877	-.1065	-.0439	.0495	.0740
F26UNCHR	.0878	.0955	.0748	.0116	.1172	.0101	-.0566	.1549
F27TIME	.0211	-.0301	.1216	-.1413	.0044	-.0505	.0793	.0888
F28HDNCT	-.1135	-.0061	.0856	-.0737	-.0718	-.0595	-.0677	.0754
F29SUPAN	-.0381	.0855	.0006	.0561	.1172	.0708	.1043	.1992*
F30UTRAN	.1522	-.0524	.0016	-.0196	.0554	.0310	.1124	-.1191
F31TTRAN	.0962	-.0823	-.0274	-.0230	.0958	-.0354	.1685*	.0063
F32CONTR	.0903	.1054	-.0878	.1167	.0731	.0906	.0210	.0145
F33ITAWR	.0131	-.1358	*-.0346	.1023	.1942*	.0358	-.0678	.0933
F34BSUND	-.0997	-.0107	.0681	.1206	-.1507	.0038	.0153	.0348
F35TECAP	-.0357	.1780*	-.0012	-.1103	-.1032	-.1385	.0319	.0596
F36USRMA	.0255	.1011	-.0455	.0149	-.0359	-.0681	.0187	-.0480
F37USRAC	.0016	-.0521	.1050	.0674	-.0391	.0927	-.1481	.1399
F38SUPRE	-.0662	.0005	.0955	-.0165	.0653	-.0821	.0739	-.0325
F39SUPCO	-.0271	-.0814	.0287	-.0019	-.0003	.1711	-.0874	.0006
F40CNSLT	.1158	-.0133	-.0892	-.0841	.0406	-.0280	.0019	-.1095
F41PBLIC	.0031	-.0797	-.1647*	-.0261	.0783	-.0405	.1703*	-.0777
F42DATAV	-.0073	-.0217	.0255	-.0892	-.0140	-.0654	.0862	-.0288
F43DATVA	-.0536	.1114	.1047	-.0810	.1122	.0056	-.0606	-.0632

* - Signif. LE .05 ** - Signif. LE .01

*Table 5.7 SPSS output - Reliability check. Spearman's rank order correlation between the 43 factors and the 8 success measures based on a dummy random number set of data. * represents significance level of 0.05 or lower. ** represents significance level of 0.01 or lower.*

There are only 11 correlation coefficients with 0.05 or lower significance level, while in Table 5.4 shows 239 coefficients with such a significance level. We would expect something like 11 false correlations at 5% level, which is what we got. It can be concluded that the sample of 144 questionnaire was a large enough sample. A much smaller one would not have given such good results.

5.6 Derivation of superfactors

5.6.1 Methodology (partial correlation)

Kendall (1948) and Siegel (1956) commented that in interpreting an observed dependence between two qualities we are constantly faced with the question of whether an association or correlation of A with B is really due to the associations or correlation of each with a third quality. If one has observed a high correlation between variables A and B, this might be due to correlations between A and C, and B and C. Hence, when this effect of the variable C is controlled (take-off the effect of variable C), we may observe no significant correlation between variables A and B. Kendall (1948) illustrated this in the following example: "If there appears a significant correlation between mathematical and musical abilities in a number of subjects, the question arises whether this may be attributable to the correlation of each with some more fundamental quality such as intelligence".

In the theory of statistics, this kind of problem leads to the theories of partial association or correlation which attempt to decide the matter by considering a sub-population in which the variation of the third variable (C) is eliminated.

In this research, partial correlation was used to discriminate factors which directly correlated with success (*superfactors*) from those with no direct correlation. This approach allowed the 43 factors to be condensed into a smaller and more manageable number of categories which could be interpreted in a more useful way.

5.3.2 Results

Partial correlation was conducted for each of the 8 success measures, and 15 *superfactors* were derived.

The process is outlined below. the process for success measure 1 is shown in detail as an example of the methodology utilised. The detailed statistical results of the success measures are available in Appendix 5.1.

Success Measurement 1 - Business feasibility

Using Spearman's Correlation 24 factors were shown in Table 5.4 to be correlated with measurement 1 (*Business feasibility*-coded as MX08B.EV) at a significance of .05 or less. The highest correlation was "*Stable user requirements*"-No. 26 (see Table 5.8).

When the effect of this factor (*Stable user requirements*) was controlled (i.e. the effect of this factor was taken-off), the number of significant factors was reduced from 24 to 4 with the highest being "*Use of project management methodology*" (table 5.9).

When this factor (*Use of project management methodology*) was then used as a control factor, no more factors emerged as significant (table 5.10).

This indicated that a grey area had been reached where no more useful correlation will occur whilst some negative correlation will occur due to controlling a large number of factors (i.e. taking-off the effect of all significant positive correlations). It was therefore possible to conclude that all other factors depended on these 2 factors , which were then regarded as *superfactors*.

```
--- S P E A R M A N   C O R R E L A T I O N   C O E F F I C I E N T S ---

F01CURNT        .3831**
F02PRVN         .1236
F03EASY         .1858*
F04EXPND        .1455
F05OPEN         .1050
F06AVAIL        .0590
F07STAND        .0690
F08COMM         .0529
F09TECDE        .1732
F10EXPER        .1496
F11FUNDS        .2170*
F12SKILL        .1360
F13BUSOB        .3728**
F14ITSTR        .3073**
F15BUSIT        .3460**
F16RESPO        .2643**
F17CHAMP        .1534
F18USRIN        .1291
F19MGTSP        .2861**
F20PROBJ        .3855**
F21FEASB        .2480**
F22PILOT        .0723
F23PRMGR        .1470
F24METHD        .1977*
F25USREQ        .2743**
F26UNCHR        .4137**  (the highest)
F27TIME         .2410**
F28HDNCT        .2629**
F29SUPAN        .1515
F30UTRAN        .2112*
F31TTRAN        .2777**
F32CONTR        .1285
F33ITAWR        .2704**
F34BSUND        .1454
F35TECAP        .2132*
F36USRMA        .1510
F37USRAC        .0826
F38SUPRE        .2512**
F39SUPCO        .2330*
F40CNSLT        .0679
F41PBLIC        .3078**
F42DATAV        .2867**
F43DATVA        .2945**
              MX08B.EV
         (percieved benefits)
```

Table 5.8 Selected data from Table 5.4, showing correlation between the 43 factors and success measurement 1 (Business feasibility) - SPSS output

```
- - -  P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S  - - -

Controlling for..    F26UNCHR

            MX08B.EV
F01CURNT     .0206
F02PRVN     -.1694
F03EASY      .2338
F04EXPND     .1481
F05OPEN      .1399
F06AVAIL    -.1581
F07STAND     .2297
F08COMM      .0494
F09TECDE    -.1482
F10EXPER    -.0419
F11FUNDS     .0942
F12SKILL     .0615
F13BUSOB     .3249*
F14ITSTR     .1716
F15BUSIT     .2708
F16RESPO     .2314
F17CHAMP     .1549
F18USRIN     .2551
F19MGTSP     .3266*
F20PROBJ     .1744
F21FEASB     .2579
F22PILOT    -.1807
F23PRMGR     .1461
F24METHD     .3662*  (the highest)
F25USREQ     .1513
F27TIME      .0685
F28HDNCT     .3660*
F29SUPAN     .0183
F30UTRAN     .0550
F31TTRAN     .2048
F32CONTR     .1575
F33ITAWR     .1578
F34BSUND     .0731
F35TECAP     .0455
F36USRMA    -.1621
F37USRAC    -.0924
F38SUPRE     .1786
F39SUPCO     .2709
F40CNSLT     .2657
F41PBLIC     .2268
F42DATAV     .0047
F43DATVA     .0603
```

Table 5.9 Partial correlation between the 42 factors (excluding factor 26, "stable user requirements") and success measurement 1 (Business feasibility).

```
- - -  P A R T I A L   C O R R E L A T I O N   C O E F F I C I E N T S  - - -

Controlling for..    F26UNCHR  F24METHD

            MX08B.EV
F01CURNT     .1347
F02PRVN     -.1892
F03EASY      .1591
F04EXPND     .0760
F05OPEN      .0976
F06AVAIL    -.0621
F07STAND     .0073
F08COMM     -.1161
F09TECDE    -.2085
F10EXPER    -.1059
F11FUNDS    -.1150
F12SKILL    -.0635
F13BUSOB     .2276
F14ITSTR    -.0678
F15BUSIT     .0875
F16RESPO     .0884
F17CHAMP     .0091
F18USRIN     .1848
F19MGTSP     .1811
F20PROBJ     .0252
F21FEASB     .0682
F22PILOT     .2180
F23PRMGR    -.1737
F25USREQ    -.0142
F27TIME      .0958
F28HDNCT     .2516
F29SUPAN    -.1559
F30UTRAN    -.1388
F31TTRAN     .0796
F32CONTR     .0313
F33ITAWR     .0140
F34BSUND    -.0742
F35TECAP    -.0058
F36USRMA    -.1967
F37USRAC    -.1197
F38SUPRE     .1169
F39SUPCO     .2744
F40CNSLT     .2417
F41PBLIC     .1179
F42DATAV     .0617
F43DATVA     .0348

* - Signif. LE .05     ** - Signif. LE .01     (2-tailed)
```

Table 5.10 Partial correlation between the 41 factors (excluding "stable user requirements" and "use of project management methodology") and success measurement 1 (Business feasibility).

In summary, the two superfactors which emerged for this measure (*Business feasibility*) were:

- Stable user requirements
- Use of Project management methodology

Measurement 2 - Technical feasibility

Table 5.11 summarises the partial correlation process for this measure. Different cycles of correlations as explained above are called "rounds" in the table.

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	33	Realistic project objective
2	7	Clarity of business objectives
3	2	Stable user requirements
4	0	

Table 5.11 The derivation of superfactors for "technical feasibility".

Measurement 3 - On time

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	21	Supplier competence
2	6	Off-the-shelf software
3	3	Client-supplier relationship
4	1	Ease of use

Table 5.12 The derivation of superfactors for "on time".

Measurement 4 - Within budget

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	27	User acceptance
2	12	Considering hidden costs
3	1	Off-the-shelf software

Table 5.13 The derivation of superfactors for "within budget".

Measurement 5 - System performance

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	35	Ease of use
2	4	Enhancability of the system
3	0	

Table 5.14 The derivation of superfactors for "system performance".

Measurement 6 - Impact

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	34	Indigenous skill level
2	10	Ease of use
3	0	

Table 5.15 The derivation of superfactors for "impact".

Measurement 7 - User satisfaction

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	36	Indigenous skill level
2	15	Ease of use
3	5	Provision of user training
4	1	Realistic project objective

Table 5.16 The derivation of superfactors for "user satisfaction".

Measurement 8 - Actual use

Round	No. of significant factors	Factor with the highest correlation (superfactor)
1	23	Existence of IS strategy
2	5	Supplier competence
3	1	Use of proven technology

Table 5.17 The derivation of superfactors for "actual use".

The results of tables 5.11 to 5.17 are summarised in Table 5.18.

Success measure	Superfactor
Business feasibility	1. Stable user requirements 2. Use of project management methodology
Technical feasibility	1. Realistic project objective 2. Clarity of business objectives 3. Stable user requirements
On time	1. Supplier competence 2. Off-the-shelf software 3. Client-supplier relationship 4. Ease of use
Within budget	1. User acceptance 2. Considering hidden costs 3. Off-the-shelf software
System performance	1. Ease of use 2. Enhancability of the system
Impact	1. Indigenous skill level 2. Ease of use
User satisfaction	1. Indigenous skill level 2. Ease of use 3. Provision of user training 4. Realistic project objective
Actual use	1. Existence of IS strategy 2. Supplier competence 3. Use of proven technology

Table 5.18 Success measures and their superfactors

5.4 Inter-factor relationships- derivation of subordinate factors

5.4.1 Methodology (Spearman's correlation)

Under partial correlation, factors which were strongly correlated with a success measure and a superfactor disappeared when the superfactor was held constant. The presence of superfactors in a project thus implies also the presence of other factors which are associated with them. The next step is to identify these other factors. Spearman's correlation was applied to each of the 15 superfactors with the remaining 42 factors. Inter-relationships among the superfactors themselves were also identified. For elimination purposes, factors with ≥ .40 correlation coefficient and a .05 significance level or less were selected as closely correlated and called *subordinate factors*. These values are considered acceptable in social science research (Fruin 1980), Guilford (1956). Fruin quoted some researchers who adopted the table below (5.19) for correlation coefficient description.

Correlation coefficient	Description of the relationship
0.2	Slight; almost negligible relationship
0.2 - 0.4	Low correlation; definite but small relationship
0.4 - 0.7	Moderate correlation; substantial relationship
0.7 - 0.9	High correlation; marked relationship
0.9 - 1.0	Very high correlation; very dependable relationship

Table 5.19 Description of correlation coefficient

5.4.2 Results

The detailed statistical results for identifying the subordinate factors are available in Appendix 5.2. Table 5.20 represents the results. Only factors with correlation coefficients of 0.40 or greater are shown.

No.	*Superfactor*	*Correlated with (Subordinate factor)*	*Correlation coefficient*
1	Use of proven technology	Enhancability of the system	.42
2	Ease of use	Enhancability of the system	.62
		Feasibility study	.41
		Realistic project objective	.40
3	Enhancability of the system	Ease of use	.62
		Open system interconnection	.54
		Proven technology	.42
4	Off-the-shelf software	(none)	
5	Indigenous skill level	IS strategy	.46
		IT strategy	.46
		Technical capabilities of IT staff	.44
		R&D capabilities	.43
		User previous experience	.42
		Previous IT experience	.42
		Provision of technical training	.41
		Sufficiency of financial resources	.40
6	Clarity of business objectives	IT strategy	.53
		IS strategy	.52
		Defined responsibilities	.50
		Top management support	.48
		Feasibility study	.48
		IT awareness by top management	.48
		Internal communication	.47
		Realistic project objective	.46
		Provision of user training	.44
		Hidden costs	.41
7	IS strategy	IT strategy	.78
		Defined responsibilities	.58
		IT awareness by top management	.57

		IT standards	.55
		Clarity of business objectives	.52
		Data validity	.52
		Feasibility study	.48
		Indigenous skill level	.46
		Technical training	.46
		Realistic project objective	.45
		Use of project management methodology	.41
		R&D capabilities	.41
		Provision of user training	.40
8	Realistic project objective	IT awareness by top mgt.	.51
		Feasibility study	.52
		Defined responsibilities	.47
		Clarity of business objectives	.46
		Sufficiency of financial resources	.45
		IS strategy	.45
		Provision of technical training	.43
		IT strategy	.42
		Top management support	.42
		Defined user requirements	.41
		Provision of user training	.41
		Considering hidden costs	.40
		Business understanding by IT managers	.40
		Ease of use	.40
9	Use of project management methodology	Project manager	.60
		Defined user requirements	.50
		IT strategy	.49
		Feasibility study	.47
		User involvement	.45
		IT awareness by top management	.43
		Provision of technical training	.42
		IS strategy	.41
		Internal communication	.41
		Top management support	.40
		Business understanding by IT managers	.40

		IT standards	.40
10	Stable user requirements	(none)	
11	Hidden costs	User requirements Clarity of business objectives Client-supplier relationship Realistic project objective	.46 .41 .40 .40
12	Provision of user training	Feasibility study Technical capabilities of IT Top management support Technical capabilities of IT staff Technical training Business understanding by IT managers Internal communication Clarity of business objectives IT awareness by top management Realistic project objective	.49 .48 .48 .48 .47 .47 .47 .44 .41 .41
13	User acceptance	User maturity	.40
14	Client-supplier relationship	Supplier competence Contract terms Considering hidden costs	.56 .50 .40
15	Supplier competence	Client-supplier relationship Contract terms	.56 .45

Table 5.20 Superfactors and their related subordinate factors

Of the 15 superfactors 13 were found to be inter-correlated among themselves as well as with 20 other factors at 0.4 or greater correlation coefficient with 5% or less significance level. The remaining two superfactors (*off-the-shelf software* and *stable user requirements*) were found not to be correlated with any of the above. The detail distribution of the 43 factors are shown Table 6.1 below.

In the next chapter findings of correlation of the superfactors among themselves will be used for further discussion.

5.5 Further analysis- measures and the overall success

Spearman's rank order correlation between our 8 success measures and the degree of overall success as indicated by respondents is given in Table 5.21.

--- SPEARMAN CORRELATION COEFFICIENTS ---

MEASUREMENT NAME	COEFF.	N	Sig.
M1: Business feasibility	.0825	123	.364
M2: Technical feasibility	.1233	125	.171
M3: On time	.5344	128	.000
M4: Within budget	.4036	113	.000
M5: System performance	.5288	129	.000
M6: Impact	.6688	126	.000
M7: User satisfaction	.6119	127	.000
M8: Actual use	.6101	131	.000

(Coefficient / (Cases) / 2-tailed Significance)

Table 5.21 Correlation between the 8 measures and the overall success-SPSS output. The second column represents Spearman's correlation coefficient. The third column represents Number of respondents who answered the question corresponding to a particular measure (out of 144). The fourth column represents significance level.

Three main conclusions were drawn from Table 5.21 above:

1. Six of the 8 measures were found to be highly correlated with success at a 0.00 significance level (100% confidence level) i.e. these correlations could not have appeared by accident. This clearly indicated that these measures were representative of the degree of success as indicated by respondents. These measures are:

   Measurement 3 (On time)
   Measurement 4 (Within budget)
   Measurement 5 (System performance)
   Measurement 6 (Impact)
   Measurement 7 (User satisfaction)
   Measurement 8 (Actual use)

2. Two of the 8 measures were found to have little correlation with success. It is interesting to note these two measures belong to the first phase (initiation). Both were identified whilst covering incomplete cases (at implementation phase) during semi structured interviews in the previous phase of the research. Success for incomplete projects was judged by the outcome of the first phase (initiation). The two measures are:

   Measurement 1 (Business feasibility)
   Measurement 2 (Technical feasibility)

   Therefore, one or a combination of both of the following must hold true:

   a) Success is not measured at the initiation phase; you can only judge probable success since this phase is different to all other phases, in that it is an input phase whereas the others are outputs.

b) The way this phase (initiation) is undertaken in Oman does not allow for the prediction of the outcome of an acquisition. This is an area of weakness which should be considered more seriously. By managing this phase in a different way, organisations in Oman might have an opportunity to assess the possible outcome of their acquisitions and consequently minimize the risk of failure.

The above arguments may merit further investigation (Chapter 7).

3. If the above measures are ranked according to the correlation coefficient, we find the top 3 measures (with the highest correlation coefficient) are those which belong to the third phase (*service*). This suggests that the success of an IT acquisition project is mainly judged on the basis of what the project actually delivers. These three measures are (in descending order):

Measurement 6 (Impact)
Measurement 7 (User satisfaction)
Measurement 8 (Actual use)

References

Fleming, Michael and Nellis, Joseph. The essence of statistics for business. 1st rd. UK: Prentice Hall International, 1991.

Fruin, David. *Data Analysis, a basic introduction.* National Institute foe social work, working paper 11, 1980.

Guilford, J.P. Fundamental statistics in psychology and education. 4th ed. New York: MaGraw-Hill, 1965.

Kendall, Maurice G. Rank correlation method. 1st ed. London: Charles Griffin & Company Limited, 1948.

Martin, E. and Firth, J. Core business studies: Statistics. 1st ed. London: Mitchell Beazley, 1983.

Sidney Siegel. Nonparametric statistics, for the behavioral sciences. 1st ed. USA: McGraw-Hill Book Company, Inc., 1956.

Appendices

APPENDIX 5.1

The use of Partial Correlation to derive superfactors

Derivation of superfactors

MEASUREMENT 2: Technical feasibility

- - - P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S - - -

Controlling for.. F20PROBJ

	MX09T.EV
F01CURNT	.1521
F02PRVN	-.2198
F03EASY	.2355
F04EXPND	.3445*
F05OPEN	.2176
F06AVAIL	.0005
F07STAND	.0420
F08COMM	.1881
F09TECDE	.0068
F10EXPER	.0917
F11FUNDS	.1218
F12SKILL	.2039
F13BUSOB	.4344**
F14ITSTR	.1738
F15BUSIT	.2218
F16RESPO	.2501
F17CHAMP	.0035
F18USRIN	-.0537
F19MGTSP	.3381*
F21FEASB	.1411
F22PILOT	.0108
F23PRMGR	.0876
F24METHD	.1540
F25USREQ	.1335
F26UNCHR	.3961**
F27TIME	.2097
F28HDNCT	.3176*
F29SUPAN	.1265
F30UTRAN	.1714
F31TTRAN	.2696
F32CONTR	.2380
F33ITAWR	.0570
F34BSUND	.3578*
F35TECAP	.1629
F36USRMA	.0918
F37USRAC	-.0636
F38SUPRE	.1575
F39SUPCO	.3900**
F40CNSLT	.0762
F41PBLIC	.2689
F42DATAV	.1267
F43DATVA	.1501

--- PARTIAL CORRELATION COEFFICIENTS ---

Controlling for.. F20PROBJ F13BUSOB

	MX09T.EV
F01CURNT	.2655
F02PRVN	-.2910
F03EASY	.1345
F04EXPND	.2453
F05OPEN	.1571
F06AVAIL	.1059
F07STAND	-.0614
F08COMM	.0429
F09TECDE	-.0720
F10EXPER	-.0088
F11FUNDS	.0609
F12SKILL	.0670
F14ITSTR	-.0239
F15BUSIT	.0007
F16RESPO	.0768
F17CHAMP	-.1463
F18USRIN	.0882
F19MGTSP	.2179
F21FEASB	-.0199
F22PILOT	-.0046
F23PRMGR	.0228
F24METHD	.0739
F25USREQ	.0837
F26UNCHR	.3506*
F27TIME	.1974
F28HDNCT	.2979*
F29SUPAN	-.0228
F30UTRAN	-.0331
F31TTRAN	.1222
F32CONTR	.0718
F33ITAWR	-.1020
F34BSUND	.1754
F35TECAP	.1211
F36USRMA	.0001
F37USRAC	-.1104
F38SUPRE	.0201
F39SUPCO	.2603
F40CNSLT	.1077
F41PBLIC	.1054
F42DATAV	.0920
F43DATVA	.1009

--- P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S ---

Controlling for.. F20PROBJ F13BUSOB F26UNCHR

	MX09T.EV
F01CURNT	.2275
F02PRVN	-.1200
F03EASY	.1222
F04EXPND	.2802
F05OPEN	.1549
F06AVAIL	-.0512
F07STAND	-.0009
F08COMM	.0443
F09TECDE	-.1531
F10EXPER	-.0220
F11FUNDS	.1106
F12SKILL	.0428
F14ITSTR	-.0335
F15BUSIT	.0184
F16RESPO	.1400
F17CHAMP	-.1084
F18USRIN	.1058
F19MGTSP	.1906
F21FEASB	-.0007
F22PILOT	-.0823
F23PRMGR	.0110
F24METHD	.0814
F25USREQ	.0744
F27TIME	.0938
F28HDNCT	.2133
F29SUPAN	-.0338
F30UTRAN	-.0302
F31TTRAN	.1201
F32CONTR	.0450
F33ITAWR	-.1034
F34BSUND	.1363
F35TECAP	.0908
F36USRMA	-.0819
F37USRAC	-.1393
F38SUPRE	.0773
F39SUPCO	.2604
F40CNSLT	.1318
F41PBLIC	.1051
F42DATAV	.0182
F43DATVA	.0352

Derivation of superfactors

EASUREMENT 3: On time

- - - P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S - - -

Controlling for.. F39SUPCO

	M1TIME
F01CURNT	-.2588
F02PRVN	-.2379
F03EASY	.3692*
F04EXPND	.0319
F05OPEN	-.1017
F06AVAIL	.5016**
F07STAND	-.0251
F08COMM	.2678
F09TECDE	.2203
F10EXPER	.0265
F11FUNDS	.0615
F12SKILL	.2304
F13BUSOB	.0614
F14ITSTR	-.0647
F15BUSIT	-.0625
F16RESPO	-.0476
F17CHAMP	-.0611
F18USRIN	.1169
F19MGTSP	.1087
F20PROBJ	.0313
F21FEASB	-.0633
F22PILOT	.0040
F23PRMGR	.0485
F24METHD	.0794
F25USREQ	.3149*
F26UNCHR	.2498
F27TIME	-.0298
F28HDNCT	.3442*
F29SUPAN	.0076
F30UTRAN	-.0641
F31TTRAN	-.0723
F32CONTR	.3093*
F33ITAWR	.0542
F34BSUND	.0328
F35TECAP	.1859 *
F36USRMA	-.0425
F37USRAC	.0939
F38SUPRE	.3623*
F40CNSLT	-.0645
F41PBLIC	.0254
F42DATAV	.1400

Controlling for.. F39SUPCO F06AVAIL

	M1TIME
F01CURNT	-.1514
F02PRVN	-.2838
F03EASY	.3185*
F04EXPND	.0271
F05OPEN	-.2404
F07STAND	.0883
F08COMM	.2765
F09TECDE	.1496
F10EXPER	.0186
F11FUNDS	.0718
F12SKILL	.1716
F13BUSOB	.1786
F14ITSTR	.0794
F15BUSIT	.0902
F16RESPO	-.0396
F17CHAMP	-.0141
F18USRIN	.0296
F19MGTSP	.0895
F20PROBJ	-.0545
F21FEASB	-.0235
F22PILOT	-.0621
F23PRMGR	.1033
F24METHD	.2225
F25USREQ	.1982
F26UNCHR	.0944
F27TIME	.0268
F28HDNCT	.2341
F29SUPAN	-.0493
F30UTRAN	-.0614
F31TTRAN	-.0407
F32CONTR	.3476*
F33ITAWR	.1190
F34BSUND	.0352
F35TECAP	.1936
F36USRMA	-.0035
F37USRAC	-.0502
F38SUPRE	.3794*
F40CNSLT	-.0013
F41PBLIC	.1747
F42DATAV	.1942
F43DATVA	.0851

Controlling for.. F39SUPCO F06AVAIL F38SUPRE

	M1TIME
F01CURNT	-.1736
F02PRVN	-.2705
F03EASY	.3195*
F04EXPND	-.0183
F05OPEN	-.2393
F07STAND	.0700
F08COMM	.1547
F09TECDE	.0761
F10EXPER	-.0197
F11FUNDS	.0691
F12SKILL	.0777
F13BUSOB	.1158
F14ITSTR	.0576
F15BUSIT	.1017
F16RESPO	-.0129
F17CHAMP	.0135
F18USRIN	-.0741
F19MGTSP	.1114
F20PROBJ	-.1083
F21FEASB	-.0816
F22PILOT	-.1178
F23PRMGR	.0631
F24METHD	.1725
F25USREQ	.0967
F26UNCHR	.1574
F27TIME	.0800
F28HDNCT	.1125
F29SUPAN	-.0210
F30UTRAN	-.0507
F31TTRAN	.0021
F32CONTR	.1959
F33ITAWR	.0658
F34BSUND	-.1145
F35TECAP	.1070
F36USRMA	.0921
F37USRAC	-.0414
F40CNSLT	.0640
F41PBLIC	.1880
F42DATAV	.2379
F43DATVA	.1083

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Derivation of superfactors

MEASUREMENT 4: Within the budget

- - - P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S - - -

Controlling for.. F37USRAC

	M2MONY
F01CURNT	-.1874
F02PRVN	-.1753
F03EASY	.4493**
F04EXPND	.3441*
F05OPEN	.1571
F06AVAIL	.4794**
F07STAND	.0422
F08COMM	.3769*
F09TECDE	.3149*
F10EXPER	.1540
F11FUNDS	.2070
F12SKILL	.3911**
F13BUSOB	.0806
F14ITSTR	.0385
F15BUSIT	.0758
F16RESPO	.0108
F17CHAMP	-.0065
F18USRIN	.2032
F19MGTSP	.1623
F20PROBJ	.3667*
F21FEASB	.1741
F22PILOT	.0962
F23PRMGR	.1766
F24METHD	.1542
F25USREQ	.5332**
F26UNCHR	.1331
F27TIME	.2119
F28HDNCT	.6267**
F29SUPAN	.1005
F30UTRAN	.2355
F31TTRAN	.0336
F32CONTR	.3197*
F33ITAWR	.2428
F34BSUND	.3041*
F35TECAP	.2764
F36USRMA	-.0513
F38SUPRE	.4792**
F39SUPCO	.2134
F40CNSLT	-.1497
F41PBLIC	.1083
F42DATAV	.0649

Controlling for.. F37USRAC F28HDNCT

	M2MONY
F01CURNT	-.1769
F02PRVN	-.1897
F03EASY	.2341
F04EXPND	.0890
F05OPEN	-.0015
F06AVAIL	.3941**
F07STAND	-.0816
F08COMM	.2695
F09TECDE	.1723
F10EXPER	.0252
F11FUNDS	-.1291
F12SKILL	.0316
F13BUSOB	-.1708
F14ITSTR	-.1905
F15BUSIT	-.1807
F16RESPO	-.2470
F17CHAMP	-.0909
F18USRIN	.0643
F19MGTSP	-.0721
F20PROBJ	-.0143
F21FEASB	-.0517
F22PILOT	.0545
F23PRMGR	-.2117
F24METHD	-.1867
F25USREQ	.1984
F26UNCHR	-.0655
F27TIME	.0464
F29SUPAN	-.1930
F30UTRAN	.0028
F31TTRAN	-.2134
F32CONTR	-.0001
F33ITAWR	-.1025
F34BSUND	.0207
F35TECAP	.0888
F36USRMA	-.0877
F38SUPRE	.2373
F39SUPCO	-.0635
F40CNSLT	-.1856
F41PBLIC	.0686
F42DATAV	-.0463
F43DATVA	.0536

Derivation of superfactors

MEASUREMENT 5: System performance

--- P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S ---

Controlling for.. F03EASY

	MX05QUAL
F01CURNT	,1126
F02PRVN	-,0094
F04EXPND	,5872**
F05OPEN	,4489**
F06AVAIL	,1405
F07STAND	-,0695
F08COMM	,1783
F09TECDE	,1363
F10EXPER	,1349
F11FUNDS	,2197
F12SKILL	,1180
F13BUSOB	,1065
F14ITSTR	,1917
F15BUSIT	,0429
F16RESPO	,2050
F17CHAMP	,1744
F18USRIN	-,1408
F19MGTSP	-,0444
F20PROBJ	,1512
F21FEASB	,0051
F22PILOT	-,0395
F23PRMGR	-,0189
F24METHD	-,0442
F25USREQ	,1706
F26UNCHR	,1005
F27TIME	,1546
F28HDNCT	,2408
F29SUPAN	,1994
F30UTRAN	,2979*
F31TTRAN	,2534
F32CONTR	,0606
F33ITAWR	-,1740
F34BSUND	,3253*
F35TECAP	,2319
F36USRMA	,0639
F37USRAC	,0456
F38SUPRE	,0947
F39SUPCO	-,0302
F40CNSLT	-,2829
F41PBLIC	-,0242
F42DATAV	,1032
F43DATVA	,2671

* - Signif. LE ,05 ** - Signif. LE ,01 (2-tailed)

--- PARTIAL CORRELATION COEFFICIENTS ---

Controlling for.. F03EASY F04EXPND

	MX05QUAL
F01CURNT	,0441
F02PRVN	-,1618
F05OPEN	,2145
F06AVAIL	,2660
F07STAND	-,1904
F08COMM	,1557
F09TECDE	,1503
F10EXPER	,0042
F11FUNDS	-,0165
F12SKILL	-,1025
F13BUSOB	-,0412
F14ITSTR	-,0279
F15BUSIT	-,2117
F16RESPO	,0705
F17CHAMP	,1276
F18USRIN	-,1766
F19MGTSP	-,0577
F20PROBJ	,0160
F21FEASB	-,0358
F22PILOT	-,0950
F23PRMGR	-,1547
F24METHD	-,0938
F25USREQ	,1684
F26UNCHR	,1653
F27TIME	,1258
F28HDNCT	,1353
F29SUPAN	,1503
F30UTRAN	,1054
F31TTRAN	,1051
F32CONTR	,0214
F33ITAWR	-,2632
F34BSUND	,0989
F35TECAP	,0693
F36USRMA	-,0285
F37USRAC	,0817
F38SUPRE	,0300
F39SUPCO	-,1538
F40CNSLT	-,1847
F41PBLIC	-,0200
F42DATAV	,0467
F43DATVA	,1115

Derivation of superfactors

MEASUREMENT 6: Impact

--- PARTIAL CORRELATION COEFFICIENTS ---

Controlling for.. F12SKILL

	M3IMPC
F01CURNT	-.1241
F02PRVN	.0976
F03EASY	.5574**
F04EXPND	.5515**
F05OPEN	.3484*
F06AVAIL	-.0221
F07STAND	.0122
F08COMM	.2378
F09TECDE	.1789
F10EXPER	-.1054
F11FUNDS	.0425
F13BUSOB	.2005
F14ITSTR	.2694
F15BUSIT	.3576*
F16RESPO	.1328
F17CHAMP	.0230
F18USRIN	-.1606
F19MGTSP	.2195
F20PROBJ	.4076**
F21FEASB	.1639
F22PILOT	-.0592
F23PRMGR	.1793
F24METHD	.2465
F25USREQ	.2958
F26UNCHR	-.0136
F27TIME	-.0974
F28HDNCT	.1864
F29SUPAN	.1932
F30UTRAN	.4283**
F31TTRAN	.3540*
F32CONTR	.0744
F33ITAWR	.3320*
F34BSUND	.3871*
F35TECAP	.3960**
F36USRMA	-.0140
F37USRAC	.0992
F38SUPRE	.1334
F39SUPCO	.1299
F40CNSLT	.1995
F41PBLIC	.1429
F42DATAV	.0158

Controlling for.. F12SKILL F03EASY

	M3IMPC
F01CURNT	-.1588
F02PRVN	.0335
F04EXPND	.2784
F05OPEN	.1809
F06AVAIL	-.1211
F07STAND	.0443
F08COMM	.0861
F09TECDE	.1589
F10EXPER	-.1134
F11FUNDS	-.0827
F13BUSOB	.0016
F14ITSTR	.2612
F15BUSIT	.2689
F16RESPO	-.0084
F17CHAMP	.0678
F18USRIN	-.1554
F19MGTSP	.0390
F20PROBJ	.2076
F21FEASB	.0871
F22PILOT	-.1135
F23PRMGR	.1099
F24METHD	.1866
F25USREQ	-.1319
F26UNCHR	-.0739
F27TIME	-.1301
F28HDNCT	-.0052
F29SUPAN	.1139
F30UTRAN	.2892
F31TTRAN	.1187
F32CONTR	-.0873
F33ITAWR	.2623
F34BSUND	.3033
F35TECAP	.2926
F36USRMA	.0167
F37USRAC	-.0908
F38SUPRE	.0112
F39SUPCO	-.0864
F40CNSLT	.2011
F41PBLIC	-.0726
F42DATAV	-.0403
F43DATVA	.1981

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Derivation of superfactors

MEASUREMENT 7: User satisfaction

- - - P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S - - -

Controlling for.. F12SKILL

	M4SATS
F01CURNT	.0281
F02PRVN	.2424
F03EASY	.5957**
F04EXPND	.5173**
F05OPEN	.4203**
F06AVAIL	.1563
F07STAND	.1193
F08COMM	.3493*
F09TECDE	.0764
F10EXPER	.1134
F11FUNDS	.2640
F13BUSOB	.1764
F14ITSTR	.3817*
F15BUSIT	.3221*
F16RESPO	.3982**
F17CHAMP	.2172
F18USRIN	-.1907
F19MGTSP	.2176
F20PROBJ	.5732**
F21FEASB	.3058*
F22PILOT	.1273
F23PRMGR	.3131*
F24METHD	.2263
F25USREQ	.4556**
F26UNCHR	-.0690
F27TIME	-.1301
F28HDNCT	.2123
F29SUPAN	.3708*
F30UTRAN	.5678**
F31TTRAN	.4659**
F32CONTR	.0600
F33ITAWR	.1637
F34BSUND	.3743*
F35TECAP	.2947
F36USRMA	.0682
F37USRAC	.2649
F38SUPRE	.0157
F39SUPCO	-.0521
F40CNSLT	-.0105
F41PBLIC	.1646
F42DATAV	-.0584

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

--- P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S ---

Controlling for.. F12SKILL F03EASY

	M4SATS
F01CURNT	.0252
F02PRVN	.2014
F04EXPND	.1815
F05OPEN	.2644
F06AVAIL	.0890
F07STAND	.1931
F08COMM	.2265
F09TECDE	.0289
F10EXPER	.1672
F11FUNDS	.1965
F13BUSOB	-.0457
F14ITSTR	.4002**
F15BUSIT	.2203
F16RESPO	.3234*
F17CHAMP	.2991
F18USRIN	-.1951
F19MGTSP	.0204
F20PROBJ	.4215**
F21FEASB	.2635
F22PILOT	.1176
F23PRMGR	.2660
F24METHD	.1547
F25USREQ	.0872
F26UNCHR	-.1579
F27TIME	-.1790
F28HDNCT	.0096
F29SUPAN	.3286*
F30UTRAN	.4648**
F31TTRAN	.2529
F32CONTR	-.1129
F33ITAWR	.0460
F34BSUND	.2796
F35TECAP	.1524
F36USRMA	.1300
F37USRAC	.1112
F38SUPRE	-.1441
F39SUPCO	-.1363
F40CNSLT	-.0514
F41PBLIC	-.0544
F42DATAV	-.1458
F43DATVA	.0497

Controlling for.. F12SKILL F03EASY F30UTRAN

	MX04SATS
F01CURNT	.0319
F02PRVN	.1103
F04EXPND	.0655
F05OPEN	.1096
F06AVAIL	.2000
F07STAND	-.0586
F08COMM	.0976
F09TECDE	-.0304
F10EXPER	.0506
F11FUNDS	.0120
F13BUSOB	-.2657
F14ITSTR	.1208
F15BUSIT	-.1519
F16RESPO	.0316
F17CHAMP	.0582
F18USRIN	.0142
F19MGTSP	-.1936
F20PROBJ	.3386*
F21FEASB	.0304
F22PILOT	.1590
F23PRMGR	.0438
F24METHD	-.0016
F25USREQ	.0711
F26UNCHR	-.1830
F27TIME	-.1645
F28HDNCT	.0120
F29SUPAN	.1673
F31TTRAN	-.1159
F32CONTR	-.1094
F33ITAWR	-.1461
F34BSUND	.0100
F35TECAP	.0200
F36USRMA	.0672
F37USRAC	.0986
F38SUPRE	-.0409
F39SUPCO	-.1436
F40CNSLT	-.0013
F41PBLIC	-.0624
F42DATAV	-.1748
F43DATVA	-.0686

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

Derivation of superfactors

MEASUREMENT 8: Actual use

- - - P A R T I A L C O R R E L A T I O N C O E F F I C I E N T S - - -

Controlling for.. F15BUSIT

	M5USE
F01CURNT	.0244
F02PRVN	.3477*
F03EASY	.3628*
F04EXPND	.3194*
F05OPEN	.1084
F06AVAIL	.2735
F07STAND	-.1554
F08COMM	-.0803
F09TECDE	.1779
F10EXPER	-.0402
F11FUNDS	-.0669
F12SKILL	.0653
F13BUSOB	.2824
F14ITSTR	-.0617
F16RESPO	-.0098
F17CHAMP	-.0052
F18USRIN	-.2777
F19MGTSP	-.1079
F20PROBJ	.2561
F21FEASB	.1032
F22PILOT	.0669
F23PRMGR	-.1118
F24METHD	-.2804
F25USREQ	.0662
F26UNCHR	.0387
F27TIME	-.1042
F28HDNCT	.0274
F29SUPAN	.1140
F30UTRAN	.2908
F31TTRAN	.2638
F32CONTR	.1107
F33ITAWR	.3039*
F34BSUND	.0940
F35TECAP	.1027
F36USRMA	.1559
F37USRAC	.0933
F38SUPRE	.0603
F39SUPCO	.3977**
F40CNSLT	.1362
F41PBLIC	-.0962
F42DATAV	.1368

Controlling for.. F15BUSIT F39SUPCO

	M5USE
F01CURNT	.0677
F02PRVN	.3902**
F03EASY	.2504
F04EXPND	.1949
F05OPEN	.1022
F06AVAIL	.2423
F07STAND	-.1384
F08COMM	-.0815
F09TECDE	.1442
F10EXPER	-.0722
F11FUNDS	-.2088
F12SKILL	-.0106
F13BUSOB	.0842
F14ITSTR	-.0136
F16RESPO	-.0351
F17CHAMP	.0508
F18USRIN	-.1349
F19MGTSP	-.1438
F20PROBJ	.1580
F21FEASB	-.0138
F22PILOT	-.0040
F23PRMGR	-.1081
F24METHD	-.1133
F25USREQ	-.0740
F26UNCHR	-.0188
F27TIME	-.1034
F28HDNCT	-.1656
F29SUPAN	.1456
F30UTRAN	.2521
F31TTRAN	.2479
F32CONTR	-.0866
F33ITAWR	.2046
F34BSUND	.0214
F35TECAP	.1041
F36USRMA	.1194
F37USRAC	.1616
F38SUPRE	-.1981
F40CNSLT	.1104
F41PBLIC	-.2373
F42DATAV	.0630
F43DATVA	.1208

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

APPENDIX 5.2

The use of Spearman's Correlation to derive subordinate factors

Inter-factor relationship (identification of secondary factors)

- - - S P E A R M A N C O R R E L A T I O N C O E F F I C I E N T S - - -

F03EASY	.3747**					
F04EXPND	.4168**	.6182**				
F06AVAIL	.0235	.1406	.0789			
F12SKILL	.1484	.1069	.2110*	.2004*		
F13BUSOB	.2411**	.3505**	.2720**	-.0545	.3692**	
F15BUSIT	.2652**	.3618**	.2926**	.0847	.4632**	.5223**
F20PROBJ	.3249**	.4071**	.3211**	.0883	.3539**	.4631**
F24METHD	.0921	.2525**	.1614	-.0650	.2979**	.3086**
F26UNCHR	.0590	.1181	.0702	.2310*	.3048**	.2074*
F28HDNCT	.0999	.2918**	.2259*	.0937	.3886**	.4123**
F30UTRAN	.3135**	.3334**	.2290**	-.1393	.3091**	.4382**
F37USRAC	.1810*	.1625	.0486	.1491	.1951*	.1918*
F38SUPRE	.0941	.2533**	.3199**	.0892	.3034**	.3255**
F39SUPCO	.0748	.2418**	.2910**	-.0537	.2272*	.2427**
F01CURNT	.3453**	.1497	.2699**	.1805	.1779*	.0041
F05OPEN	.2295*	.3268**	.5373**	.2217*	.3173**	.2907**
F07STAND	.1760	.0973	.0338	.2509**	.3860**	.2737**
F08COMM	.1363	.2323**	.1433	.0124	.2778**	.4662**
F09TECDE	.1914*	.2561**	.1552	.0921	.4333**	.2644**
F10EXPER	.0684	.0938	.1410	.2277*	.4244**	.2089*
F11FUNDS	.1707	.2227**	.3129**	.0816	.4009**	.3528**
F14ITSTR	.2396**	.3132**	.2616**	.1213	.4631**	.5298**
F16RESPO	.1335	.2833**	.3224**	.1326	.3796**	.5042**
F17CHAMP	.1953*	-.0617	-.0041	.0374	.1525	.1462
F18USRIN	.0470	.0686	-.0418	-.1712	.2201**	.2739**
F19MGTSP	.2010*	.2778**	.1878*	-.0562	.1825*	.4756**
F21FEASB	.2585**	.4102**	.2161*	.0144	.2655**	.4817**
F22PILOT	.1639	.1150	-.0178	.1002	.2553**	.0689
F23PRMGR	.1225	.2306**	.1531	-.0997	.2806**	.2840**
F25USREQ	.0937	.3221**	.1342	.0347	.2813**	.3581**
F27TIME	.0449	.0463	-.0280	-.0848	.1414	.2527**
F29SUPAN	.0845	.2563**	.2522**	.1465	.3335**	.1496
F31TTRAN	.2743**	.3339**	.2582**	.0591	.4103**	.3473**
F32CONTR	.1640	.2333*	.2925**	.0222	.3365**	.2917**
F33ITAWR	.1793	.3357**	.2127*	.1030	.3772**	.4767**
F34BSUND	.1585	.2950**	.2705**	.0158	.2951**	.3613**
F35TECAP	.2176*	.2954**	.2658**	.1026	.4420**	.3326**
F36USRMA	.0563	.0334	-.0328	.1887*	.3277**	.2905**
F40CNSLT	-.0395	.0135	-.1336	-.1093	-.1584	-.0901
F41PBLIC	.0396	.2750**	.2172*	-.1095	.0416	.3376**
F42DATAV	-.0264	.2538**	.0890	.1361	.1840*	.1656
F43DATVA	.0634	.3007**	.2312*	.3183**	.3903**	.2147*
	F02PRVN	F03EASY	F04EXPND	F06AVAIL	F12SKILL	F13BUSOB

--- SPEARMAN CORRELATION COEFFICIENTS ---

	F15BUSIT	F20PROBJ	F24METHD	F26UNCHR	F28HDNCT	F30UTRAN
F20PROBJ	.4471**					
F24METHD	.4090**	.2798**				
F26UNCHR	.2216*	.2352**	.2602**			
F28HDNCT	.2465**	.4015**	.2990**	.3799**		
F30UTRAN	.3961**	.4143**	.3608**	.1741*	.3468**	
F37USRAC	.1510	.3118**	.0706	.1656	.2059*	.1749*
F38SUPRE	.1541	.2486**	.2151*	.1842*	.4020**	.1941*
F39SUPCO	.0218	.1644	.0267	.0737	.2959**	.2513**
F01CURNT	.1831*	.2526**	.0735	.1853*	.1143	.1322
F05OPEN	.2987**	.2678**	.1652	.0756	.2053*	.2127*
F07STAND	.5555**	.2521**	.4031**	.0565	.0895	.2672**
F08COMM	.3059**	.3139**	.4097**	.0726	.2464**	.4687**
F09TECDE	.3249**	.3871**	.2753**	.2866**	.1944*	.1325
F10EXPER	.3646**	.3203**	.1505	.1017	.0610	.1553
F11FUNDS	.3828**	.4531**	.1600	.1006	.2557**	.3381**
F14ITSTR	.7759**	.4193**	.4707**	.2213*	.2017*	.2784**
F16RESPO	.5817**	.4711**	.3580**	.2253*	.1900*	.3811**
F17CHAMP	.2822**	.1692	.1892	.0937	.0958	.2040*
F18USRIN	.0810	.3126**	.4530**	-.0356	.2013*	.3210**
F19MGTSP	.2804**	.4182**	.3964**	.0440	.2700**	.4805**
F21FEASB	.4783**	.5099**	.4931**	.1495	.3285**	.4890**
F22PILOT	.2261*	.2362**	.1781*	.2502**	.0783	.1061
F23PRMGR	.3519**	.3416**	.6016**	.2200*	.3212**	.3919**
F25USREQ	.3299**	.4108**	.4996**	.3072**	.4598**	.3264**
F27TIME	.0282	.3045**	.0549	.2719**	.3406**	.2213*
F29SUPAN	.2781**	.2386**	.3379**	.2118*	.2595**	.3003**
F31TTRAN	.4615**	.4290**	.4217**	.2465**	.3301**	.4682**
F32CONTR	.1185	.2074*	.2141*	.0725	.3012**	.2391*
F33ITAWR	.5704**	.5219**	.4318**	.2167*	.3232**	.4100**
F34BSUND	.3414**	.3991**	.3960**	.2325**	.2634**	.4699**
F35TECAP	.4088**	.3702**	.2812**	.1506	.3298**	.4780**
F36USRMA	.3362**	.3057**	.1419	.2059*	.0984	.1553
F40CNSLT	-.0243	-.0582	.1170	.0864	.0833	-.0633
F41PBLIC	.2294*	.2707**	.2622**	.1578	.0847	.2218*
F42DATAV	.3005**	.2278*	.0041	.2189*	.0784	.1954*
F43DATVA	.5221**	.3481**	.1535	.2252*	.0830	.2646**

--- SPEARMAN CORRELATION COEFFICIENTS ---

F38SUPRE	.1386		
F39SUPCO	-.0599	.5654**	
F01CURNT	.2090*	.1515	-.0127
F05OPEN	.0417	.1779	.0707
F07STAND	.0160	-.0134	-.0939
F08COMM	.1888*	.2659**	.0084
F09TECDE	.0546	.1282	.0212
F10EXPER	.2190*	.0639	-.1330
F11FUNDS	.2427**	.2731**	.1988*
F14ITSTR	.1419	.1484	-.0011
F16RESPO	.0941	.1717	.0732
F17CHAMP	.1919*	.1731	-.0144
F18USRIN	.1684	.2152*	-.0212
F19MGTSP	.1169	.2304*	.2050*
F21FEASB	.1067	.2900**	.2308*
F22PILOT	.1531	.0135	-.0521
F23PRMGR	.0019	.0951	.1538
F25USREQ	.1386	.2609**	.1377
F27TIME	.0508	.1620	.2546**
F29SUPAN	.1250	.2464*	.0773
F31TTRAN	.2689**	.2087*	.1248
F32CONTR	-.0280	.5000**	.4495**
F33ITAWR	.0700	.2748**	.0869
F34BSUND	.0801	.3387**	.1824
F35TECAP	.2339**	.2782**	.1848
F36USRMA	.4022**	.0720	-.0610
F40CNSLT	-.1334	-.0694	-.1139
F41PBLIC	.0597	.3250**	.3260**
F42DATAV	.1495	.0308	.2838**
F43DATVA	.0661	.1944*	.3002**
	F37USRAC	F38SUPRE	F39SUPCO

* - Signif. LE .05 ** - Signif. LE .01 (2-tailed)

CHAPTER 6

INTERPRETATION OF THE RESEARCH FINDINGS

This chapter syntheses the results presented earlier and represents them in different forms. Moreover, this chapter discusses the application of the research by evaluating (in an outline) one mini-case study presented earlier (Chapter 3) and some selected literature (Chapter 2) in the light of the research findings.

6.1 Development of the IT acquisition "Success Map"

6.1.1 General Success Map (GSM)

The research comprised three main components:

I. Factors associated with success
II. Measures by which the degree of success can be assessed
III. Phases through which an IT acquisition passes

Forty three factors, eight success measures and three phases were identified as components of the IT acquisition process. The following associations were also identified (Chapter 5):

1. The association between the 43 factors and the 8 success measures resulted in the identification of 15 *superfactors* (Section 5.3).

2. The association between each of the 15 superfactors and the remaining 42 factors. This resulted in establishing 33 *subordinate factors*, 13 of which were also superfactors.

Table 6.1 places the 43 factors into 4 main categories.

No.	Category	Subtotal No. of factors	Total No. of factors
1.	**Superfactors**		**15**
	a. Superfactors	2	
	b. Super and subordinate factors	13	
2.	**Subordinate factors**		**20**
	a. Subordinate factors	20	
	b. Super and subordinate factors	13*	
3.	**Factors with low correlation**		**7**
	a. Positive correlation	6	
	b. Negative correlation	1	
4.	**Factors with no correlation**		**1**
	TOTAL NUMBER OF FACTORS		**43**

Table 6.1 The classification of the 43 factors.

** Same category as 1.b.*

Having classified the factors, the next phase involved establishing links between the superfactors, subordinate factors, success measures and phases of IT acquisition in one generic map. This *General Success Map* is shown in Figure 6.1 and shows both the results of Spearman's Correlation and Partial Correlation. Showing all the established links graphically produces a confusing tangle of results from which the essential components need to be abstracted.

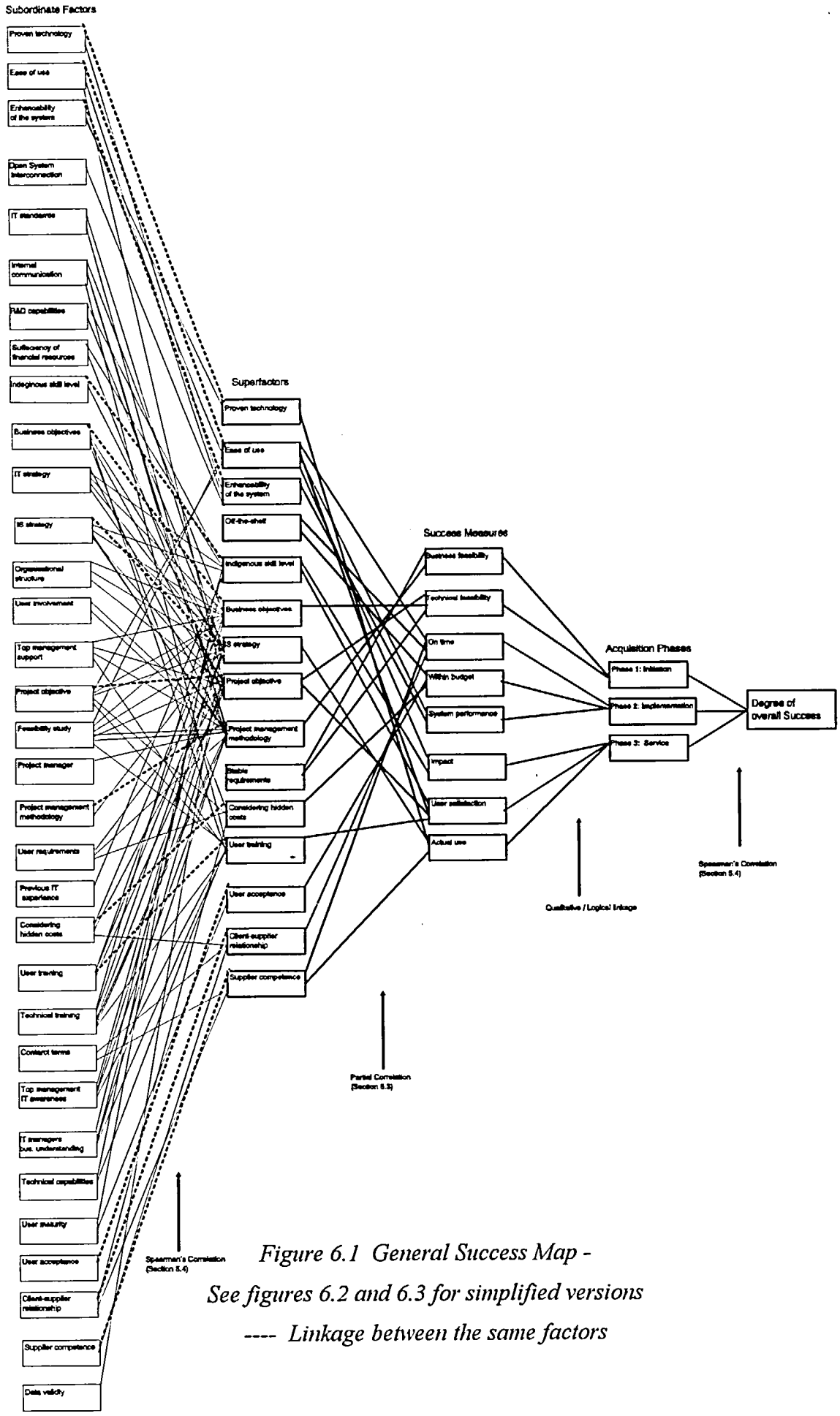

Figure 6.1 General Success Map -

See figures 6.2 and 6.3 for simplified versions

---- Linkage between the same factors

6.1.2 The Success Map

The *Success Map* shown in Figure 6.2 is a simplified version of Figure 6.1 based solely on the superfactors. It shows those superfactors which are directly and indirectly linked to phases of acquisition and the corresponding success measures. Superfactors which are directly linked are called *primary superfactors* (i.e. direct link to a particular measure), and those which are indirectly linked are labeled as *secondary superfactors* (link through other superfactors as being their subordinate factors). For example, the factor *Realistic project objective* is a superfactor of the success measure *Technical feasibility* (Section 5.3) and therefore was called a primary superfactor for this measure. While the same factors *Realistic project objective* is not a superfactor for the success measure *On time* but is a subordinate factor for *Ease of use* (Section 5.4) which is in turn a superfactor for *On time* and was therefore called a secondary superfactor for this measure.

The *Success Map* (Figure 6.2) can be simplified by removing the success measures and showing only the links between the superfactors and the phases (Figure 6.3). The *Simplified Success Map* in Figure 6.3 allows the identification of those factors which are critical to success and indicates the phase in which they are critical.

Figures 6.2 and 6.3 show the links between the primary superfactors and their corresponding secondary superfactors. Figure 6.3 also shows the *Pervasive Factors* which will be explained in the next section.

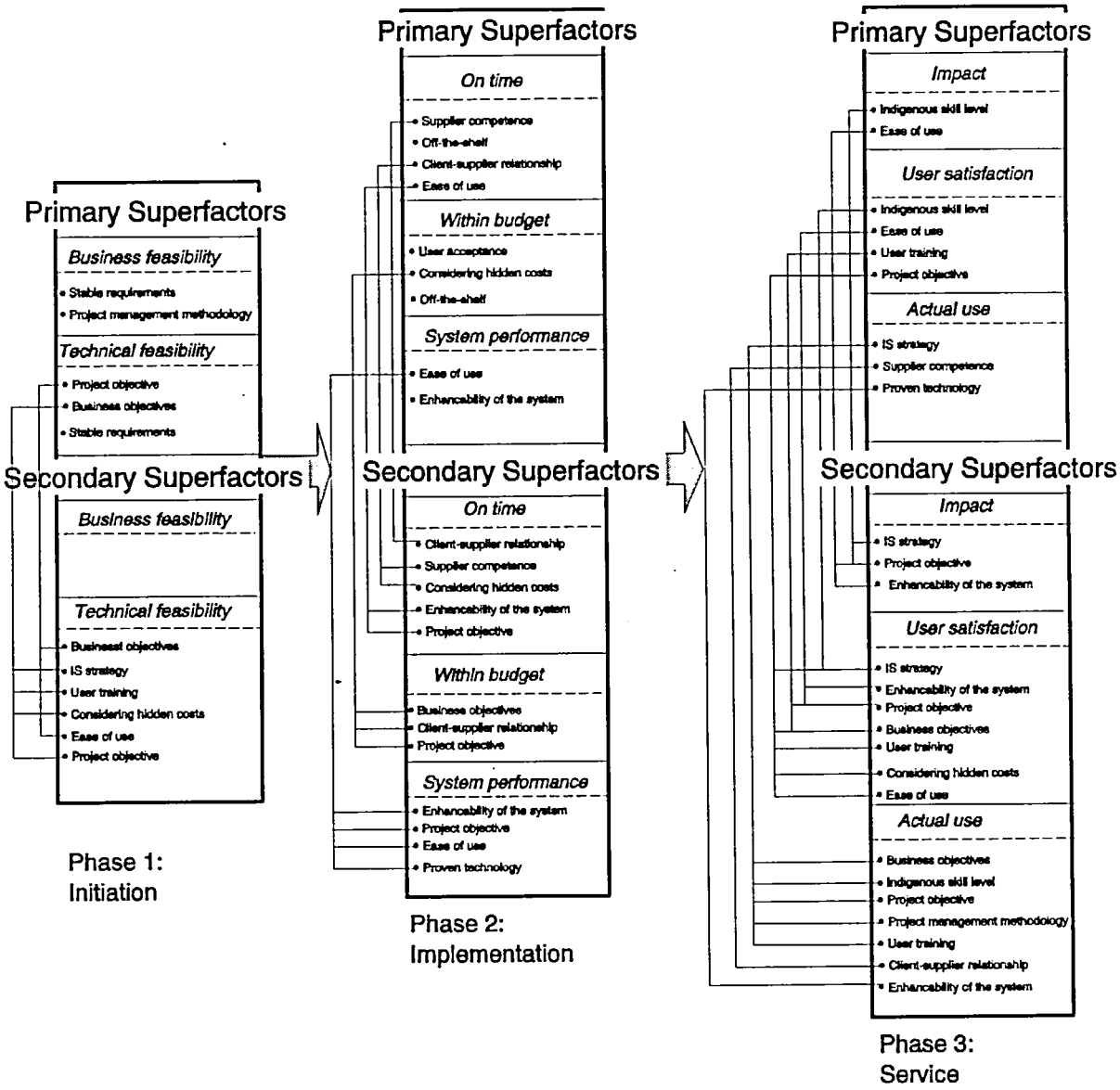

Figure 6.2 The Success Map

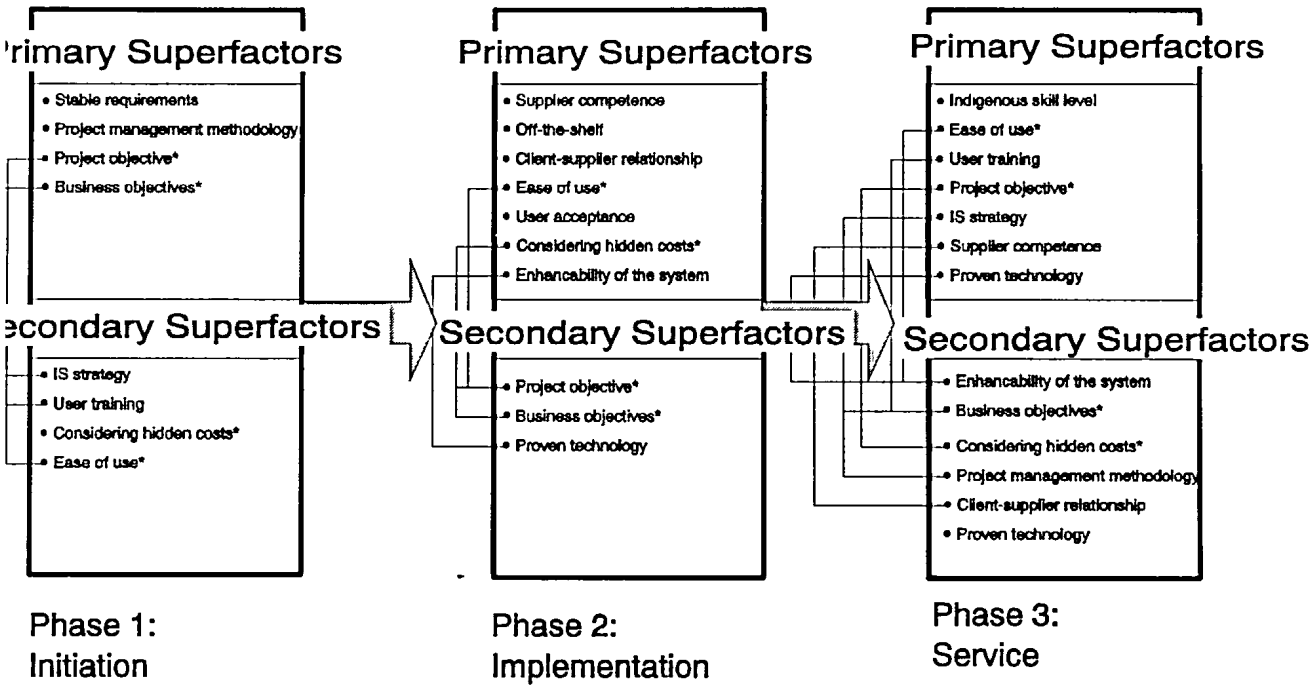

Figure 6.3 The Simplified Success Map (of Figure 6.2 based on superfactors and IT acquisition phases only).

* *Pervasive factors*

6.2 Ranking the factors (the Success Table)

From Figure 6.3, two types of factor are identifiable:

1. Those which are critical to one or two phases of the acquisition.

2. Those which are critical to all the phases of acquisition which are called the *Pervasive superfactors.*

Four *pervasive superfactors* have been identified (Figure 6.3) which vary in their degree of correlation with different success measures from one phase to another. They are associated with some measures as primary superfactors whilst with others they are present as secondary superfactors.

Table 6.2 lists the 15 superfactors and the number of measures and phases with which they are associated in ranked order. Table 6.2 shows an alternative presentation of this information as Success Table instead of a Success Map (Figure 6.2). Table 6.2 summarises the number of occurrences of each factor at different measures and phases and provides a measure of the relative importance of different factors.

No.	Factor name	No. of measures	No. of Phases
1	Realistic project objective	7	3*
2	Ease of use	5	3*
3	Considering hidden costs	4	3*
4	Clarity of business objectives	4	3*
5	Enhancability of the system	5	2
6	Existence of IS strategy	4	2
7	Provision of user training	3	2
8	Client-supplier relationship	3	2
9	Use of proven technology	2	2
10	Use of project management methodology	2	2
11	Supplier competence	2	2
12	Off-the-shelf system	2	1
13	Indigenous skill level	2	1
14	Stable user requirements	2	1
15	User acceptance	1	1

Table 6.2 The Success Table represents the number of measures and phases with each of the 15 superfactors is correlated

** Pervasive superfactors*

6.3 Application of the Success Map to one of the three mini-cases

Case A (database automation) presented earlier (Section 3.5) is now analysed in the light of the Success Map.

The objective in this case was to automate an existing manually operated database in order to handle an increased demand in a more efficient way whilst at the same time reducing running costs and providing a quicker service.

6.3.1 Evaluation of the presence of the superfactors

Table 6.3 shows the presence or absence of the 15 superfactors in case A.

No.	Factor name	Status	Comments
1	Realistic project objective	×	the project objective was not defined and the need for the system was not clear.
2	Ease of use	×	The system was perceived by the users to be very difficult to use though it had looked easy enough to use when demonstrated by the supplier.
3	Considering hidden costs	×	When attention was concentrated on the purchase of equipment the budget was based solely on actual hardware and software costs. No thought was given to training needs, learning time and software modification.
4	Clarity of business objectives	√	Most of the parties involved knew what the business objectives of their organisation were.
5	Enhancability of the system	×	The possibility of enhancing the system for future work requirements was not addressed. When enhancement was needed it was not possible as the technology had become obsolete and it

			was not an open system.
6	Existence of IS strategy	×	There wasn't any IS strategy in the organisation to show how different IT systems could support the business function of the organisation.
7	Provision of user training	×	Little attention was paid to this issue especially considering different user level training (introductory, intermediate and advanced).
8	Client-supplier relationship	×	The supplier did not indicate that the system was obsolescent and would soon be phased out. The organisation on more than one occasion did not meet the supplier's deadline for stating users' requirements and testing the system.
9	Use of proven technology	√	Similar technology had been adopted by other organisations in the country. However, this organisation did not realise that these organisations were about to replace this technology because it was about to be phased out.
10	Use of project management methodology	×	When the decision was reached to acquire the new IT, the approach was unsystematic and disorganised. There was no clear plan of the steps to be taken.
11	Supplier competence	√	The supplier had a very good business and technical reputation in the country.
12	Off-the-shelf system	×	For what appears to have been a fairly routine requirement, an Off-the-Shelf system ought to have been available rather than something purpose-written, and should at least have been considered.
13	Indigenous skill level	×	At several points in the project it was clear that indigenous skills were lacking.

			Users could not clearly state their requirements and IT staff did not have the background or the experience to evaluate proposals or test the system after it was delivered by the supplier.
14	Stable user requirements	√	Although user requirements were poorly defined, they were never changed.
15	User acceptance	×	This was well indicated by the user's reluctance to consider learning new skills. This was probably because they were rightly not convinced about the system and they feared of loosing their jobs.

Table 6.3 The presence or absence of the 15 superfactors in case A.

It is evident from the above table that only 4 (out of 15) superfactors were considered. By focusing on any of the missing superfactors the probability of success might have been dramatically increased.

6.3.2 Assessment of the degree of success

Table 6.4 briefly assesses the degree of success of case A in the light of the *Success Map*. This assessment is at phase and measurement level.

PHASE	MEASURE	STATUS	COMMENTS
Phase 1 Initiation			
	Business feasibility	×	No business evaluation was done. There was no formal study or even informal evaluation to identify the real need for the system and the possibility of achieving business benefits.
	Technical feasibility	×	No technical proposal evaluation was undertaken to assess the appropriateness of the proposed technology and the possibility of it meeting user technical requirements. Had this been done, the corrupted files and bugs might have been revealed prior to commitment to purchase the system.
Phase 2: Development & Implementation			
	On time	×	The time-frame for this project was 6 months whilst the actual time spent was 19 months.
	Within budget	×	The allocated budget was £60,000 whilst the actual cost was £140,000.
	System performance	×	The system failed to provide three main criteria for performance quality: 1. Speed: Users found the system to be very slow. 2. Inaccuracy of the output: Outputs were not accurate due to bugs and corrupted files in the software which were detected

			after use. 3. Maintainability: The supplier was unable to fully maintain and support the system because by the time the system was delivered, the technology of this particular system had become obsolete.
Phase 3: Delivery			
	Impact	×	The system was put into use but did not deliver any benefit in terms of saving time or money. The manual system is still operated in parallel.
	User satisfaction	×	Users were not satisfied with the system because they did not feel that they got any value for the money they spent on the system.
	Actual use	×	Although the system was heavily used by the IT department for data entry, users rarely make an attempt to retrieve data from the system and make use of it.

Table 6.4 Assessment of the degree success of case A (measures and phases)

It is evident from the above table that none of the success measures identified in the research was achieved and therefore, the project should be considered as a total failure.

6.4 Evaluation of the literature in the light of the Success Map

Table 6.5 represents a brief comparison between the 7 most relevant publications found in the literature and the findings of this research in terms of the number of

factors, success measures and acquisition phases covered in a single research and any establish links between them.

No.	References	Factor	Measure	Phases	Linkage presented (between)
1	Doll (1985)	√ (1)	√ (2)	×	×
2	Yap *et. al.* (1992)	√ (2)	√ (1)	×	√ (2 factors and 1 measure)
3	Audit Commission 1990	√ (9)	×	√ (2)	×
4	Delone and McLean (1992)	×	√ (6)	×	×
5	Soh, *et. al.* (1992)	√ (1)	√ (5)	×	√ (1 factor and 5 measures)
6	Quaddus (1993)	×	×	√ (3)	×
7	Huff and Munro (1985)	×	×	√ (3)	×
	THIS RESEARCH	**√ (43)**	**√ (8)**	**√ (3)**	**√ (43 factors, 8 measures and 3 phases)**

Table 6.5 An outline comparing between selected literature and this research in the light of the Success Map.

It is evident from the above table that this research represents a comprehensive study in the area of IT acquisition, and that previous work considered only a few of the factors and measures involved.

CHAPTER 7

DISCUSSION AND CONCLUSIONS

This chapter indicates the importance of the research, highlights some limitations, recommends areas for further investigation and discusses how to apply the research findings. This is followed by a supplement offering of 15 simplified guiding principals for acquiring Information Technology.

7.1 Importance of the research

The results of this research hold interest for both academics and practitioners. For academics, the combination of a theoretically based study (literature survey) and empirical investigation (interview and questionnaire surveys) provides more reliable results than many of the earlier studies which were based solely on theoretical grounds. Empirical studies of this nature incorporating methodology of soft and hard techniques are rare. As far as the author is aware this is the first time that mixed research techniques combining content analysis and statistical analysis have been applied to the study of IT acquisition.

Practitioners will be able to benefit because the research collates the experiences of many organisations acquiring IT. Respondents who filled up the questionnaire commented that it was a useful exercise to complete the questionnaire, which would have been valuable to have had as an aide-memoir in the planning stage of their project, and for post-implementation evaluation.

Since the research is exploratory in its nature (i.e. it does not test a previous hypothesis) it may serve as a basis for a new research. Its findings can help to develop strategies and guidelines for IT acquisition.

7.2 Limitations of the research

There were two main limitations of the research which need to be highlighted:

1. **Generalisation**: The findings of this research have only been applied in Oman. However, the methodology adopted could be applied in other countries. As indicated in Section 3.2.1 (d), seven interviews are sufficient to identify most (if not all) of the factors. Therefore, conducting seven interviews in another country (e.g. the UK) would be sufficient to reveal the pattern of the factors. If similar factors are identified, the questionnaire used in Oman can be used in the other country. If this is not the case, the questionnaire would need to be recompiled.

2. **Sample selection**: Although all organisations which had a history of involvement in IT acquisition were approached (73% of the total), the process in which these organisations or respondents were selected was not totally random (controlled sample). Unfortunately, at present it is not possible to select a totally random sample in Oman. Records of IT acquisition projects had not been compiled.

7.3 Further research

As with many studies, this research has raised more questions than it begun to answer. Research limitations suggest several fruitful avenues for further research.

1. **Other environments**: Other data sets should be studied in order to determine whether the results of this research can be extended to:

    a) Other sectors in Oman such as the private sector.
    b) Other countries with similar socio-economic infrastructure such as other Gulf countries.
    c) Other geographical areas such as the U.K.

2. **Randomness**: Another sample should be randomly selected for further investigation.

3. **In-depth project study**: An in-depth study of one project should be carried out. For such research, as many players as possible from all categories (senior managers, IT professionals and users) should be involved. This will help to identify

    a. How each category of players defines success for the same project.
    b. How the nature of the project could prioritize the measures of success.

4. **Operationalisation**: The superfactors identified should be studied in greater depth, to allow further statistical analysis to be applied. In order to do this, these factors need to be operationalised in more detail i.e. to pose several quantitative questions relative to each factor.

5. **Decision support system**: The findings of this research could be used as a basis for software development. This could be done in support of the development of a decision support system with the capability to grow and develop as it is applied to more cases. As indicated in Chapter 1, Cooper has developed a questionnaire to be filled by managers involved in the R&D to measure the presence of the different factors in R&D projects. Cooper's computer program is widely used to predict the degree of success of R&D projects.

6. **More failures**: A larger sample with a higher number of failure cases could be selected to allow a more detailed analysis of the data at a sub-group level (success and failure cases) to be conducted.

7. **Hypothesis testing**: Research should be carried regarding the first phase (initiation) to determine why this phase did not statistically correlate with the overall success. Two hypotheses (outlined in chapter 5) were drawn from this finding which merit further investigation:

(1) Success can not be measured at initiation phase. This phase is different from other phases because it is an input phase where as the others are outputs.

(2) The way this phase (initiation) is done in Oman does not allow for the prediction of the outcome of an acquisition. This is an area of weakness which should be considered more seriously. By managing this phase differently organisations in Oman may be able to predict the possible outcome of their acquisitions and consequently minimize the risk of failure.

8. **Quantitative linkage between measures and phases:** Further research should be done to examine the relationship between the success measures and acquisition phases in a more quantitative manner.

7.4 How to apply the findings of the research

The research offers a structured approach for acquiring IT systems. The approach can be summarised in four main steps:

STEP 1. Identify individuals from different categories who will be actively involved in the project *(players)*. Such categories were identified in section 3.3.2. Make sure representatives of all categories are identified and asked for their participation in this process.

STEP 2. Get the players to define *success* in a measurable form. This can be done by asking each category of players to prioritise and operationalise the 8 success measures identified and defined in Table 3.6. Discuss the different lists developed by different players and come up with one list which is acceptable by all of them. Repeat this process until you reach consensus This should lead to a picture of what success means in your particular project.

STEP 3. Use the *questionnaire* developed in chapter four and available in Appendices 4.3 and 4.4 as an aide-memoir in the *initiation* phase of the acquisition to ensure that factors listed in the questionnaire have been considered. *Phases* of IT acquisition were identified in Figure 3.1.

STEP 4. Use the *Success Map* developed in Section 6.1 (Figure 6.3) as an IT project management supporting tool. Make sure that before committing to the next phase of the acquisition, all the *superfactors* of that phase are present. Superfactors of the whole process were identified in Section 5.3.

As well as following these steps, it would also be useful to study the 15 guiding principles given as a supplement to this thesis.

7.5 Recommendations in the case of Oman

As the economy becomes more globalised and information based, the demand for information infrastructure will grow. This is necessary in order to play a full part in international business and trade, and to match the sophistication of large multi national companies, many of whom have greater resources, and more influence on economic development and society at large, than national governments of smaller countries. Availability of information professionals is the most important element in such infrastructure. It is possible that the lack of appropriately trained individuals will prove to be a greater constraint on national economic development than deficiencies in technology.

Building an information trained workforce will therefore be the country's most important challenge. Oman's predominantly young population is therefore the nation's greatest asset. The national university and technical institutes have a pivotal role to play in maintaining academic links at international level and responding creatively to the challenge of the information future.

Two main observations at national level were made during the research. First, big failure rate was observed in the government sector, but no serious consideration was given to investigating the causes of such failures. Second, a number of acquisitions by different organisations were essentially for purposes which duplicated - at least in part - functions/processes in other organisations of government. The main reasons seemed to be is the poor inter-organisational communication and lack of clear national policy on information standards.

It should be recognised that a study of the findings of this research would only constitute a starting point in addressing areas of concern in managing IT acquisition. Individuals and organisations should embark on a continuous process of learning from their own situations and the experiences of others in order to improve their success

rates in introducing IT. A mechanism for experience transfer to and within Oman should seriously be considered by Omani organisations.

Oman is in a better situation than many other countries where heavy investments and expensive mistakes have already been made and are deeply embedded in the infrastructure, making corrections difficult or even impossible.

7.6 Conclusions

This research identified those factors which are most important for success in IT acquisition and highlighted the need to define "success". Organisations embarking on IT acquisition should pause and consider at the outset how they would define success. In this research few had considered this prior embarking on IT acquisition projects.

Comprehensive lists of factors for success and success measures were identified and defined, as was the acquisition life-cycle. These results were linked together in the *Success Map.*

Factors:- Forty-three factors were found to influence success in IT acquisition. By applying statistical analysis, fifteen of these factors were found to dominate and were called *superfactors.* The superfactors identified comprised:

1. Use of proven technology
2. Ease of use
3. Enhancability of the system
4. Off-the-shelf software
5. Indigenous skill level
6. Clarity of business objectives
7. Existence of IS strategy
8. Realistic project objective
9. Use of project management methodology
10. Stable user requirements
11. Considering hidden costs
12. User training
13. User acceptance
14. Client-supplier relationship
15. Supplier competence

Different superfactors were found to be critical at different phases of IT acquisition. Of the fifteen superfactors, four were found to be critical at all phases of the acquisition process and were therefore labeled *Pervasive superfactors.* These were:

1. Realistic project objective
2. Ease of use
3. Considering hidden costs
4. Clarity of business/strategic objectives

Success measures:- Eight measures were established as contributing to the judgment of success in an IT acquisition. These measures comprised:

1. Business feasibility
2. Technical feasibility
3. Completion of the project on time
4. Completion of the project within budget
5. System performance
6. Impact
7. User satisfaction
8. Actual use

Acquisition process:- Three distinct phases which an IT acquisition passes through were identified. These phases comprised:

1. Initiation
2. Implementation & development
3. Delivery

When these key elements were identified and considered the projects had reasonable chances of success. However, when none, or only a few of these elements were considered, the end result was often a costly failure, as demonstrated by the mini-case studies.

The research offers 16 guiding principles and a structured approach which can be used as a planning tool for IT acquisition.

SUPPLEMENT

FIFTEEN PLUS ONE GUIDING PRINCIPLES

The fifteen superfactors identified in this research are interpreted below as fifteen guiding principles.

1. Use proven technology

Whenever possible, buy IT which is both established and proven i.e. do not be the first to buy something new and untried.

2. Aim for user friendliness

The "best" system designed to meet all user requirements is destined to be a failure if the users find it too complicated to use.

3. Think beyond the present requirements

Buy a technology which is capable of adapting to future requirements beyond its original specifications. This includes future expandability of hardware, enhancement of software or ability to integrate with other systems.

4. Buy rather than develop

Whenever possible, buy proven off-the-shelf software rather than develop something bespoke.

5. Get the right team

Recognise that the people involved in an IT acquisition are a team and take time and consideration in bringing them together. Evaluate whether the group of people involved has the right skills to manage, support, and use the system.

6. Clarify your business/strategic aims

Make sure that the business and strategic objectives of your organisation are defined and understood at all levels.

7. Integrate IT and business plans

IT planning can not be done in isolation. The role of IT is to support the business function; therefore, the strategies must be integrated. The strategies should be documented, and written in a style which is understandable at all levels.

8. Set a realistic project scope

The scope of the project must be achievable within the constraints of the available resources and the expected benefits must be measurable.

9. Be structured

Follow a recognised set of procedures (methodology) for managing the progress of a project. Do not follow a standard methodology blindly, be flexible to accommodate your own organisation's circumstances and requirements.

10. Don't keep changing your mind

Put an early effort into drawing up your plans, especially with regard to business and operational user requirements. Get it right before you commit yourself. Changes cost money.

11. Be prepared for surprises

It is not always possible to foresee problems such as loss of time, or a need for further training. However, good planning should be flexible enough to allow for the unexpected.

12. Train the users

Training people to use the system is a fundamental in ensuring that the IT will be both usable and accepted by the users. "If you think the cost of training is high you should see the price of ignorance".

13. Convince the users to accept the IT

The ultimate value of IT in the business process depends on the degree to which it is used. Users must be convinced of the value of the system and keen to use it. If the system is not actually useful then they will not be convinced.

14. Manage your relationship with the supplier

A good working relationship with the supplier ensures a smooth transition through the stages of IT acquisition and encourages early warning - and thus control - of potential problems.

15. Select your supplier carefully

Be sure that your supplier can deliver what he promises. Analyse his technical capability, human resources and commercial standing and experience.

One further principle ....

16. Define success

Those responsible for IT acquisition should have a clear understanding of what success means in the case of their project and how it should be measured.