

SWP 12/97 SUCCESSFUL ACQUISITION OF IT SYSTEMS

DR.ALI QASSIM JAWAD
Data Management Consultancy
P.O.Box 244
Jabroo 114
OMAN

and

DR.RICHARD REEVES
R&D Management Centre
School of Mechanical Engineering
Cranfield University
Cranfield
Bedfordshire MK43 0AL
Tel: +44 (0)1234 754773

The Cranfield School of Management Working Papers Series has been running since 1987, with approximately 430 papers so far from the nine academic groups of the School: Economics; Enterprise; Finance and Accounting; Human Resources; Information Systems; Logistics and Transportation; Marketing; Operations Management; and Strategic Management. Since 1992, papers have been reviewed by senior members of faculty before acceptance into the Series. A list since 1992 is included at the back of this paper.

For copies of papers (up to three free, then £2 per copy, cheques to be made payable to the Cranfield University), please contact Wayne Bulbrook, Research Administrator, at the address on the back of this booklet.

Copyright: Jawad & Reeves, 1997

ISBN 1 85905 106 5

SUCCESSFUL ACQUISITION OF IT SYSTEMS

An examination of the IT acquisition process, and the factors which promote success or failure.

Ali Quassim Jawad, BSc PhD, Data Management Consultancy, P O Box 244, Jabroo 114, Oman

Richard Reeves, BSc ARCS MSc(Eng) DIC MInstP PhD, R&D Management Centre, Cranfield University, Bedford MK43 0AL, UK

This paper has been submitted to *IEEE Engineering Management Transactions* for consideration.

© A Jawad and R Reeves, 1997.

SUMMARY

When organisations acquire IT systems the result is often costly failure. This research offers a structured approach to the successful management of acquisitions. Information was gathered from a large number of successful and unsuccessful cases. The importance of defining “success” for each case was discovered and eight measures of success were found. Forty-three factors were found which influence the occurrence of success. Fifteen of these were found to dominate and were called the superfactors. It was found that IT acquisitions follow a regular process, and pass through three distinct phases: initiation, implementation and service. Different success measures and factors were found to be critical in the different phases. A way to apply the findings to the management of individual projects is outlined.

SUCCESSFUL ACQUISITION OF IT SYSTEMS

An examination of the IT acquisition process, and the factors which promote success or failure.

INTRODUCTION

The acquisition of a new Information Technology system is often very expensive and risky. Systems sometimes fail entirely to provide the expected benefits, or they may commit an organisation to a particular approach that can be very costly to change if it proves to be inappropriate. IT disasters occur on projects of all sizes. The attempted computerisations of the London Stock Exchange and of the London Ambulance Service were well-publicised examples of very costly failures, where the new computerised systems had to be abandoned.

This research has identified the factors associated with success or failure in the acquisition of IT systems, and presents guidelines to assist organisations planning to acquire IT systems. The research is based on the empirical study of a large number of different IT acquisitions which were made by government departments in the Sultanate of Oman.

Exploratory case studies

Three acquisition cases were examined in a some detail as case studies. These provided background understanding of the topic to inform the research, but are only reported in summary form here, to illustrate the types of problem that occur.

In one case 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. 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 bought, but within only six months the supplier announced that their pioneering model was being discontinued and would be replaced by a second generation model. This model used more standard tapes, and the special tapes needed for the model just bought would no longer be supplied. In the third case a system intended as a comprehensive database and installed at a hardware cost of £30,000 was finally used only as a word processing system for 6 users.

The application of improved knowledge to future IT acquisitions would result in significant financial savings and performance improvements. The cost of installing the system in the second case above was £1.2 million, and it will be even more costly to replace than its original purchase price.

One particular comment may be made on the basis of the exploratory studies. A generally poor understanding of IT among senior business managers often led to technical IT managers playing the most significant role in the IT acquisition process. However, many of these IT managers did not possess a broad management background and many 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.

Acquisition and purchase

Acquisition through purchase is the most common mechanism for introducing new IT systems to organisations. Hardware or software purchased is sometimes installed and brought

into use by the purchasers, and at other times partial or full implementation is 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 an 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. The total process includes the adoption, implementation and use of an information technology system.

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. Only a few from adjacent fields, such as Information Systems and Organisational Buying Behaviour, turned out to be of direct importance. None of the work was comprehensive or applied specifically to the field of IT acquisition. It therefore appeared that this research could be undertaken from first principles.

The research plan

The success factor approach was adopted, and consisted of two main stages:

- A) By interviewing a large number of people involved in IT acquisitions we identified a list of **candidate success factors**, which were thought to influence the outcome of IT acquisition projects.
- B) By measuring with a questionnaire the degree to which each of the above factors was present in a large number of IT acquisitions of different degrees of success, we set out to identify by correlation which were the most important factors.

It became apparent as the first stage progressed that the definition of "success" is a major factor in IT acquisitions. A new objective therefore arose, which was to develop means of measuring success. We decided to add to stage A) the task of compiling a list of **success measures**.

The two stages of the work will be referred to as the qualitative survey and the quantitative survey. The research plan is summarised in Table 1.

Table 1. The research plan. Terms used in the table are explained in the appropriate sections below.

STAGES	ACTIONS	OUTCOMES
A) Qualitative survey (Interviews)	1. Semi-structured interviews 2. Content analysis 3. Reliability tests a. Inter-rater test b. Expert opinion	1. Candidate success factors 2. Measurements of success 3. Phases of IT acquisition 4. Project players
B) Quantitative survey (Questionnaire)	4. Questionnaire design 5. Pilot surveys 6. Main survey 7. Statistical analysis	5. Superfactors and Subordinate factors
Discussion and Synthesis	8. Discussion and interpretation of the results 9. Application of the results	6. The Success Map 7. The Success Table 8. Guidelines for acquiring IT

THE QUALITATIVE SURVEY: CANDIDATE SUCCESS FACTORS AND SUCCESS MEASURES

Survey technique

This survey was carried out using the semi-structured interview technique. The survey techniques used were first pilot-tested on 9 people, resulting in minor changes to the wording of some questions.

Thirty-three people involved in IT acquisitions were then interviewed for an average of 75 minutes each. Most interviewees were IT managers, but two ministers and a number of managers of other departments were included. They were each asked to select as a basis for discussion a single recent project in which they had been directly involved. Most of the projects had been completed. It happened that roughly half the projects were considered to be successful and half unsuccessful, which was a suitable balance for our purposes.

Interviewees were sent a briefing paper in advance, which explained the research objectives and 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

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

A more detailed prepared agenda was used by the interviewer so that all interviews had a similar format, to help with the analysis. This agenda was not seen by the interviewees. No possible factors or success measures were suggested by the interviewer. A number of open-ended questions were included 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 interviews were all tape-recorded to facilitate content analysis.

Content analysis

This process consisted of listening to the interview tapes and grouping similar statements and opinions systematically together to form success factors. (see Adams and Schavaneveldt, 1985). Then descriptive headings were composed for each group of statements. The process was repeated until no new categories emerged and all statements or opinions from all interviews fitted into a category.

For example, the following three quotations were grouped together to produce a factor called **provision of user training**.

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 very good value for money we spent on training the users. They were not only able to use the system more efficiently, but were also able to suggest areas for further improvements".

A similar procedure was followed to derive success measures. The following quotations led to 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".

Reliability of the content analysis: inter-rater check

A second rater, who was familiar with content analysis, reviewed the tapes of four of the interviews chosen at random and repeated the content analysis for these. The numbers of success factors identified by the researcher and by the second rater are shown in table 2. 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"**. The second rater found the same factors as the researcher, but fewer of them: the researcher had conducted the interviews and so had more insight into the way the interviewees were thinking, and in some cases had listened to the tapes more than once.

Table 2. Inter-rater reliability test for factors. Number of factors found by the researcher and second rater in 4 randomly selected tapes.

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

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

The Content Analysis was therefore considered to have produced reliable results. A similar inter-rater check was carried out on the list of **success measures**.

Further reliability test - expert opinion

Expert opinion was used also as a method of checking interview results. The six experts were the head of the IT steering committee of a British university; an IT audit commissioner for the UK government sector; a senior IT and management consultant; a senior Omani IT management advisor for a government body, the head of an Omani computer and communication department, and a senior Omani IT user.

These experts were asked to verify:

1. That the wording of the titles and definitions of each of the 41 success factors and 8 success measures was a fair representation of the statements made by interviewees.
2. That each of the 41 factors and 8 success measures were independent of each other in terms of content.
3. That they could think of no other factors or measures not included in the list.
4. That each of the 8 success measures belonged to the assigned phase of acquisition (explained below).

An iterative consultation process was used. Each expert was asked 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. After a third round general agreement was reached.

This technique led to the rephrasing of 17% of the factors and 25% of the measures in order to clarify their meanings. No new factors or measures were suggested and none were deleted.

Survey results

Factors for success

Forty-one factors influencing the outcome of IT acquisitions were found from analysis of the interviews. Two additional factors were found in the literature but not in our survey (**indigenous R&D capabilities** and **presence of IT champion**). These were added to the list, producing the final list of 43 factors shown in Table 3. We argued that the extra two factors, if wrong, would be found to be unimportant in the quantitative phase of the research.

Table 3. The final list of 43 candidate success factors.

	CANDIDATE SUCCESS FACTORS
	<i>TECHNOLOGICAL FACTORS</i>
1	Use of current technology
2	Use of proven technology
3	Ease of use
4	Enhancability of the system
5	Open system interconnection
6	Off-the shelf software
7	Existence of IT standards
	<i>ORGANIZATIONAL FACTORS</i>
8	Internal communication
9	Indigenous R & D capabilities
10	Previous IT experience
11	Sufficiency of financial resources
12	Indigenous skill level
13	Clarity of business objectives
14	Existence of IT strategy
15	Existence of IS strategy
16	Organisational structure
17	Presence of IT champion
	<i>MANAGEMENT FACTORS</i>
18	User involvement
19	Top management support
20	Realistic project objective
21	Feasibility study
22	Piloting the project
23	Appointment of a project manager
24	Use of project management methodology
25	Accurate statement of requirements
26	Stable user requirements
27	Sufficient time for completion
28	Considering hidden costs
29	Supplier analysis
30	Provision of user training
31	Provision of technical training
32	Comprehensive contract terms
	<i>HUMAN FACTORS</i>
33	Top management IT awareness
34	IT managers business understanding
35	IT staff technical capabilities
36	User maturity
37	User acceptance
	<i>EXTERNAL FACTORS</i>

38	Client-supplier relationship
39	Supplier competence
40	Use of independent consultant
41	Flexibility of general regulations
42	Data availability
43	Data validity

The 43 factors were grouped under 6 headings in Table 3: **Technological**, **Organisational**, and so on. This was done only to help present the 43 factors in a systematic order, and has no other significance. Some factor names in the list are self-explanatory, other are not. Associated with each factor is a definition, which explains in more detail the meaning the factor. The definitions are listed in Appendix A.

The number of factors identified as being associated with success in IT acquisition projects was quite large. The next phase of the research was intended to rank the factors in order of importance.

Comprehensiveness of the factor list

The list of factors presented here is thought to be comprehensive. On average one interview found 20 out of the total of 41 factors. From this it can be argued statistically that seven interviews would probably have been sufficient to find all the factors, and that it is very likely indeed that 33 interviews would find them all. We believe that this concept of comprehensiveness in a factor list is novel and important, and we will prepare a separate publication on this.

Measures of success

Content analysis also identified the 8 success measures listed in Table 4.

Table 4. The 8 success measures found.

No.	Success Measure
1	Business feasibility
2	Technical feasibility
3	On time
4	Within budget
5	System performance
6	Impact
7	User satisfaction
8	Actual use

Definitions of each of the measures are given in Appendix B. There is a high probability that the 33 interviews identified all the measures.

DISCUSSION RESULTING FROM THE FIRST PHASE OF THE RESEARCH

Defining success for a project

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. In IT acquisitions success may mean different things to different people, or may be defined differently from one project to another. Having compiled the list of success measures which is shown in Table 4, we needed to decide how it should be used. This led us to introduce the following two new concepts.

Phases of an IT acquisition, and milestones

The survey had included questions about the process of acquisition. We formed the view that any IT acquisition project goes through three phases, which we have named **initiation**, **implementation**, and **service**. The IT system must first be considered and purchased (**initiated**), then **implemented** before it can provide any benefits to the users (**service**). Figure 1 shows activities that can occur in each of the three phases.

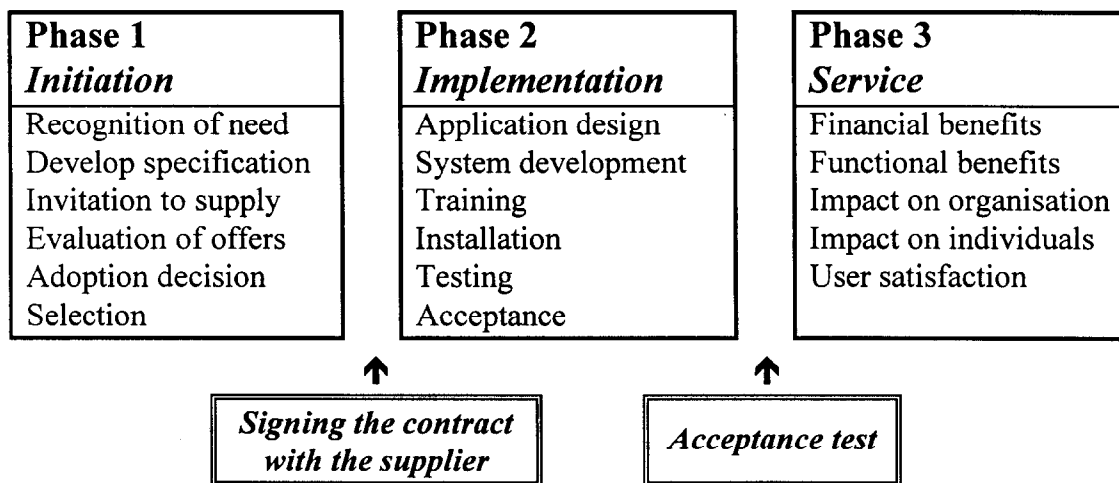


Figure 1. Phases in the IT acquisition process.

Two high quality milestones are shown in Figure 1: **signing the contract** with the supplier, and the **acceptance test**. These are both very definite in time and can not be withdrawn. They signal total commitment to the next phase. The contract may be for hardware or software which is worth much less than the effort commitment which follows, but the hardware or software purchased defines the nature of the project, and commits the following effort. Acceptance tests are normal practice in Oman, where users confirm that the system is functional according to their specifications.

Linking the success measures with the phases

Success in IT acquisition can not easily be quantified by a single measure. The key to the situation is that different success measures apply to different phases of the acquisition. Figure 2 shows how we have allocated the success measures of Table 4 to the different phases.

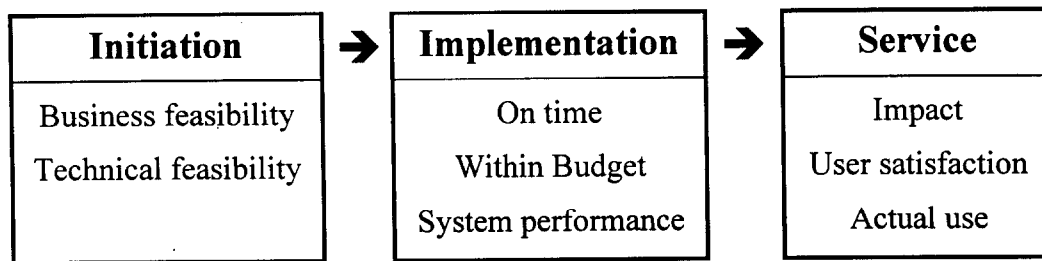


Figure 2. Allocation of success measures to phases

The **initiation phase** is judged solely by what the system promises to deliver in terms of **business feasibility** and **technical feasibility**. The **implementation phase** is judged on whether the system is brought to a functioning state as expected, and the **service phase** is judged on whether the system then provides actual benefits for the organisation.

Perception of success can depend on the viewpoint. A few uncompleted projects were included in the survey. Respondents rated these as successful or unsuccessful on the basis that they had reached a point which allowed an assessment to be made. A project in the **implementation** phase was perceived by one interviewee to be successful because the feasibility study indicated that it was going to achieve the intended benefits and meet user technical requirements. These were the measures by which the phase seen by that person was judged by that person.

Players and team work in IT acquisitions

Standard marketing theory tells us that when something is sold to a large organisation, a number of different roles are involved. During the interview process our attention was drawn to the importance of considering the different roles played by people in an acquisition. The interviews had included questions about parties involved, and we were able to identify three main roles. We coined the term **players** to describe them, and the players were:

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 found from the interviews to have been initiated by senior managers or IT managers, with the IT managers being the most influential in decision making. The role of lower level users was generally confined to assistance with the initial specification.

Different players are concerned with different parts of the process shown in Figure 2, which explains why some people describe a project as a success, while others describe it as a failure.

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.

DEVELOPMENT OF THE QUANTITATIVE SURVEY

The aim of the questionnaire was to collect data from a large number of projects to quantify the degree of association between each of the 43 success factors and each of the 8 success measures. The questionnaire asked closed questions to force all respondents to answer the questions with answers that could be collated.

Respondents were asked to select one specific project which had been completed, and to answer questions based solely on that project. Much effort went into making questions as short as possible, complete, and easy to read.

Operationalisation of the factors and measures

Operationalisation is the process through which each factor was represented by a question in a quantitatively measurable way. A typical question was arrived at through the following steps:

From the semi-structured interviews the following statements had been gathered by content analysis:

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."

These statements had produced a factor which was called **top management support** and which was defined as "the degree to which top management is involved in the progress of the project and the necessary resources are made available".

In order to ask about the presence of this factor, the question illustrated in Figure 3 was constructed in the questionnaire.

	Not at all 1	2	3	4	Very much so 5	Not sure ?
Was the top management supportive of this project (<i>i.e. attending meetings and making necessary resources available</i>)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 3. An example question in the questionnaire.

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

The ranged "tick-box" format prompted respondents to answer simply and objectively and simplified subsequent analysis. The questions were all posed to require a graded response on a scale of 1 to 5, representing the presence of a factor on the scale "not at all" to "very much so". The questions were all put in this same format because it had been found in a pilot survey that respondents were not comfortable if the response scale was different for different questions: they needed as much time to read each response scale as to read the question itself.

The particular format “not at all” to “very much so” was decided upon after trying several formats.

Coverage of the Questionnaire

The questions were divided into sections:

The first section of 7 questions asked about the respondent’s qualifications, experience, role and influence. This allowed the group of respondents to be described as a whole.

The next 10 questions established the type of technology, size and importance of the selected project. This helped the respondent to concentrate on one particular project.

Two sections asked for the core data needed to correlate factors with measures. 43 questions asked for the degree to which each of the 43 factors of table 3 was present in the selected project, and 8 questions measured the degree to which each of the 8 success measures was fulfilled in the project.

Finally three questions asked for the respondent’s view of the overall success of the project.

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

The questionnaire was translated with blind checks into Arabic to permit people with little or no knowledge of English, yet actively involved in IT projects, to participate in the survey. In practice most preferred to work with the English version.

Pilot application of the questionnaire

A first group of twenty five participants were asked to fill in the questionnaire in the absence of the researcher and to take note of any items which they had difficulty with. Immediately afterwards they were interviewed to identify questions which were difficult to answer. The completed questionnaires were reviewed in order to discuss items not answered or answers that appeared inaccurate or inconsistent. A few questions which were difficult to read or understand were identified in this way and were reconstructed. The questionnaire including these modified questions was then tested on another group of 12 people.

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

Taking all the answers together, there was a good spread of data across the five-point scales. This was taken to indicate that the questions were well understood and that it would be possible to produce significant results with the data to be gathered.

THE MAIN QUANTITATIVE SURVEY

The sample

The questionnaire was then filled in by 144 individuals with experience of the IT acquisition process at various levels of authority and responsibility. They worked in 32 public organisations in Oman which had substantial histories of involvement in IT acquisition.

Each organisation was provided with 6 questionnaires. IT directors were asked to fill in a questionnaire themselves and to nominate other potential participants who were actively involved in different roles in the acquisition process. Some of the nominated people were approached by the researcher rather than IT directors. The response rate was 75%. This high

response may reflect interest in the topic and the quality of the questionnaire after its thorough development.

Statistical analysis techniques

The term 'correlation' is normally taken to apply to linear variables, i.e. continuous variables that can be measured on physical scales, such as height or weight. The data gathered in this research is not continuous, it is of the type known as rank-order. Techniques used in physical science such as regression analysis and Pearson's Correlation are not directly appropriate for such data. Spearman's ρ Correlation is the preferred method for correlation between two rank order variables (Oppenheim 1966), and was used in this research to identify the degree of correlation between the 43 factors and the 8 success measures.

Questionnaires were analysed using the SPSS package (Statistical Package for Social Sciences), version 6.0 for Windows on PCs.

Data entry validity

Data in the returned questionnaires was transferred into an SPSS file. All the data was input a second time by another person. The two files were then checked for consistency and errors were corrected. Nine errors were found in 11,232 entries.

Sample description - the respondents and the projects

Analysis of the responses to the first set of questions in the questionnaire gave a picture of the body of respondents, as shown in the following tables.

Table 5. Age range of respondents

<i>Age Range</i>	<i>Respondents</i>
Less than 20	0
20 - 29	29
30 - 39	72
40 - 49	35
50 - 59	5
Over 60	3

Table 6. Qualifications of respondents. The majority of respondents with higher qualifications were educated in either the UK or the USA.

<i>Qualifications</i>	<i>Respondents</i>
Secondary or less	9
Higher Diploma	32
Bachelor	71
Post-graduate	25
Other	6
Didn't answer	1

Table 7. Experience of respondents with IT in general.

<i>Experience (years)</i>	<i>Respondents</i>
No experience	3
Less than 1	4
1 - 4	31
5 - 14	65
15 - 25	35
More than 25	1
No answer	5

Table 8. Roles of respondents in the projects.

<i>Role</i>	<i>Respondents</i>
User	20
IT staff	86
Top management	21
Consultant	6
Supplier	2
Other	2
No answer	7

The tables above show that people from varying positions of responsibility and authority had participated in the survey. IT staff might be thought to be over-represented

The next set of questions yielded a picture of the body of projects.

Table 9. Types of organisations participating in the survey. Total employment in these organisations is 100,000.

<i>Organisations participating</i>
12 Government Ministries
Diwan of Royal Court
Muscat Municipality
Supreme Committee of Town Planing
General Telecommunications Organisation
Central Bank
Muscat Securities Market
2 oil companies
Sultan Qaboos University
Tender Board

Table 10. Size of projects.

Size (£)	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 11. Degree of success of the projects.

Scale	Degree of success	Cases
1	great failure	8
2	failure	17
3	in between	41
4	success	56
5	great success	18
	no answer	4
	TOTAL	144

It would have been ideal for the purpose of establishing correlation lines to have an equal number of points in each of the 5 categories of Table 11. The sample shows a bias towards the centre and the high success end but there are still a reasonable number of points at the great failure end of the spectrum and the data is considered well enough distributed to permit valid conclusions to be drawn.

RESULTS OF THE QUANTITATIVE SURVEY: CORRELATIONS BETWEEN SUCCESS FACTORS AND SUCCESS MEASURES

Between the 43 factors and the 8 measures, $8 \times 43 = 344$ Spearman's correlation coefficients were calculated using the standard facilities in SPSS. 188 of the correlations were significant at 99% or higher confidence level. This meant that there was less than a 1% chance that apparent correlations had arisen by chance, due to the random variability of the data in the sample. A further 54 of the correlations were significant at 95% or higher confidence level. The correlation coefficients showed how much of the variation in a success measure was due to the corresponding factor, and these ranged up to 0.547.

The general picture was that there were no very strong correlations between single factors and single success measures, rather each measure was very significantly correlated with a number of factors, and nearly all factors were significant in connection with one or more measures.

The original intention of ranking the factors in order of importance can be seen to have been too simplistic. IT acquisition is a complex process and nearly all the factors identified can be important. Deeper analysis had to be undertaken to identify a smaller number of highly significant factors, as explained later on.

Three anomalous factors

Only one factor was found not to be correlated with any of the 8 success measures: **the presence of an IT champion**. This was not surprising. The concept of a champion does not exist in Oman. Moreover, this factor was one of two factors which had not been identified by

the qualitative interviews, but had been found in the literature survey. The fact that it was rejected by the quantitative survey adds to our confidence in the whole process.

Indigenous R&D capabilities was the other factor which was only found in the literature, not in the semi-structured interviews. This factor showed some quite strong correlations. This question was composed with guidance from the literature, and with hindsight it was probably poorly framed. The wording was:

“Did your organisation have technical development capability, in terms of Research and Development? (*i.e. to assess, adapt, modify, and develop relevant technology*)”.

This can be read to mean different things. Fortunately this did not affect the final results of this research since the correlation level of this factor vanished during the further analysis explained below.

There was only one significant negative correlation, which was between **use of independent consultant** and **within budget**. In our case histories it was noted that there could be inadequate provision for consultancy fees due either to not considering the consultancy fee at the initiation phase, or because additional work was required from the consultant as the project developed, for which no budget was available. **Use of independent consultant** had no significant correlation with other success measures.

Reliability check on the correlation technique

A dummy data-set was created using the random number generation facility in Microsoft Excel. This was subjected to the same correlation analysis. There were 11 correlation coefficients with 95% significance level and none at 99%, compared with 242 at 95% or 99% in the real data set. We would have expected fewer than 5% of 344 false correlations, i.e. fewer than 17. It is thus not likely that any of the main conclusions of the research are in error due to random sampling effects. It can also be concluded that the sample of 144 respondents was a large enough sample, but a much smaller one might have run into confidence level problems.

INVESTIGATION OF RELATIONSHIPS BETWEEN SUCCESS FACTORS

The complexity of having 40 or so factors to consider would be reduced if there were relationships between the factors, so that when one was present, certain others could also be expected to be present. To take a conjectured example, if whenever there was adequate **top management support** you could rely on there being **clarity of business objectives**, then only the first factor would have to be considered. We set out to discover such relationships empirically from the quantitative survey data.

This further statistical analysis was carried out in two stages:

1. Use of partial correlation to identify which of the factors have direct correlation with the success measures and which are indirectly correlated. This identified 15 **superfactors**.
2. Use of Spearman's correlation to identify which of the other factors have significant correlation with each of the superfactors. This identified the **subordinate factors**.

Derivation of superfactors - partial correlation

Under partial correlation one factor was held constant while correlating all the other factors against the success measure. Any factors that co-varied strongly with the trial factor

would drop out of correlation with the measure. Factors remaining strongly correlated with the measure were acting independently of the trial factor. One of these was then held constant, and so on until no significant correlations remained.

Example of superfactor derivation.

Twenty four factors had been found to be correlated with measure 1, **business feasibility**, at a confidence level of 95% or more. The highest correlation was for **stable user requirements** with a correlation coefficient of 0.414.

When the effect of this factor was taken off, by performing the correlation at constant values of this factor, the number of significant factors was reduced from 24 to 4, the highest now being **use of project management methodology** with a coefficient of 0.366. When this factor in turn was used as a control factor, no more factors emerged as significant. The highest remaining correlation was now 0.25 and there 16 negative and 25 positive values, indicating that nearly all covariance had been removed, and only random variation remained. It was conclude that all other significant factors depended on these two factors, which were then regarded as the **superfactors** for **business feasibility**.

The process was repeated for all eight success measures. Each measure has its own set of superfactors, there is not a global set for the whole acquisition process. Another example of the process is shown below.

Table 12. The derivation by partial correlation of superfactors for “user satisfaction”.

Round	Significant correlations	Factor with highest correlation (superfactor)
1	36	Indigenous skill level
2	15	Ease of use
3	5	Provision of user training
4	1	Realistic project objective

A total of 15 superfactors was found, and these are listed in table 13.

Table 13. Success measures and their superfactors.

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

Inter-factor relationships - subordinate factors

The presence of superfactors in a project implies also the presence of other factors which are associated with them. The next step was to identify these **subordinate factors**. Spearman's correlation was applied to each of the 15 superfactors with the remaining 42 factors. The somewhat arbitrary decision was made to include only factors with correlation coefficients of 0.40 or greater, and a 95% confidence level. These values are considered acceptable in social science research (Fruin 1980), Guilford (1956). The subordinate factors for each superfactor are listed in Appendix C.

A factor can be a superfactor in association with one measure and occur as a subordinate factor with another. **Off-the-shelf software** and **stable user requirements** occurred as superfactors only.

Table 14 summarises the different roles played by the 43 success factors.

Table 14. Roles of the 43 factors.

Role	Factors
Superfactor only	2
Super and subordinate factor	13
Subordinate factor	20
Factor with low positive correlation	6
Factor with low negative correlation	1
Factor with no correlation	1
TOTAL	43

INTERPRETATION OF THE RESEARCH FINDINGS

The Success Map

Figure 2 showed how the eight success measures belong to the three phases of an acquisition. We can now use the information from Table 13 to add in the superfactors which are associated with each success measure. This leads to Figure 4, **the success map**. In this figure **primary superfactors** are those which are directly linked to measures, while **secondary superfactors** are those which are linked through the role they can also have as subordinate factors to other measures. These are found by identifying the superfactors which occur in the subordinate factor column of Appendix C. For example, the factor **realistic project objective** is a superfactor of the success measure **technical feasibility** and therefore was called a primary superfactor for this measure. The same factor is a subordinate factor for **ease of use** which is a superfactor for **on time** and was therefore called a secondary superfactor for this measure.

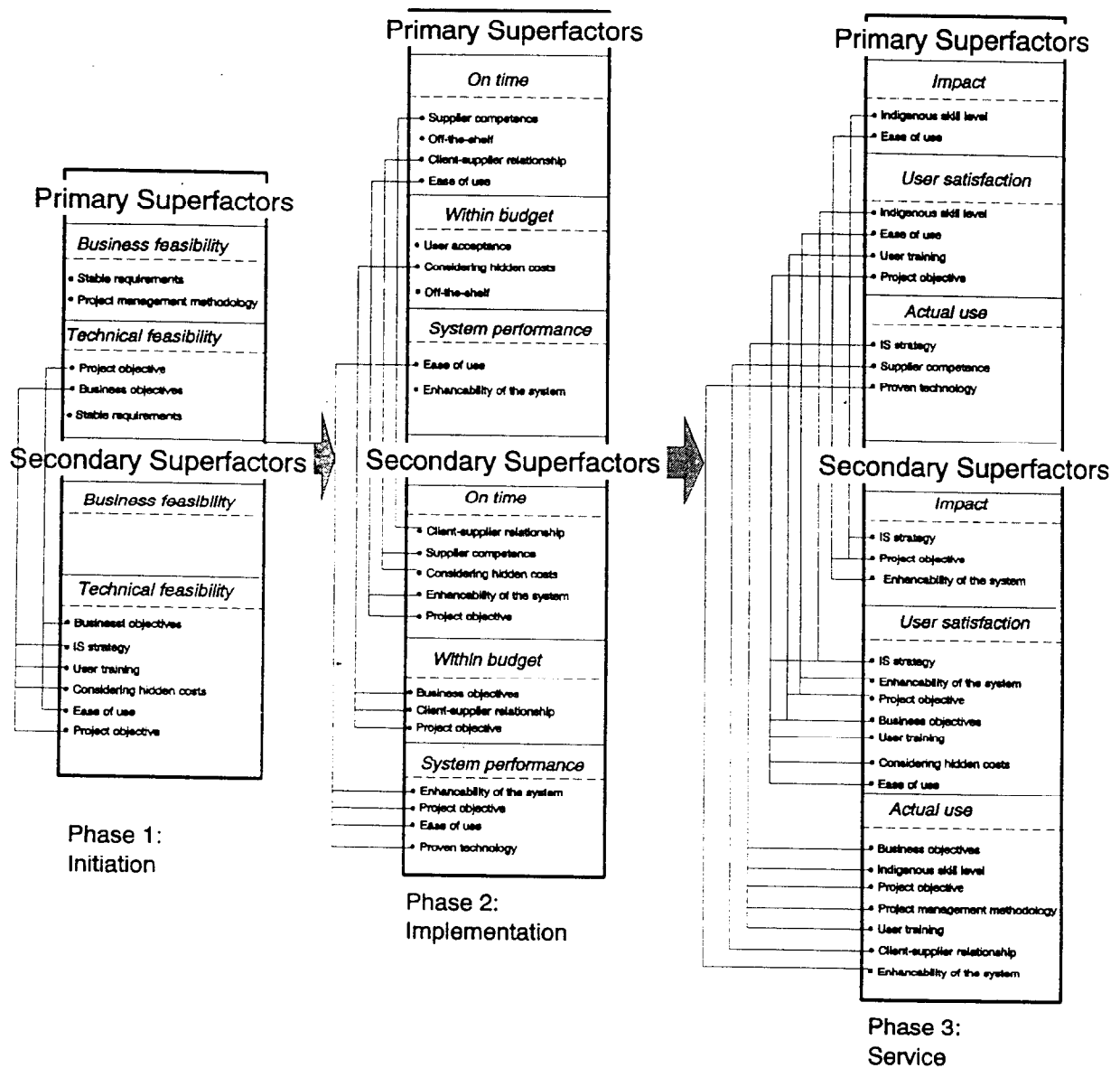


Figure 4. The Success Map. Subordinate factors could be added, but the diagram then becomes too complicated to be useful.

Tailoring to individual projects

It would be possible to draw up a league table of superfactors, though there would be a choice of criteria that could be used. For example one could put **realistic project objective** at the top because it is a superfactor or subordinate factor for seven of the eight success measures, and one could put **user acceptance** at the bottom because it is a factor for only one measure. The objection to a league table is that it would only give the most important factors for a hypothetical project which is the average of the 144 projects studied. Most projects will be quite different from the average.

The crucial point is that projects differ in their requirements. For one project completion within budget will be the highest priority, while for another completion on time

could be vital. Simple probability theory shows that there are 72 possible orderings of priorities as a project passes through the phases of Figure 2. The Success Map of Figure 4 shows how to identify the important superfactors for a particular project once its success measures have been prioritised.

HOW TO APPLY THE FINDINGS OF THE RESEARCH

Our experience of the usefulness of the findings

We re-examined the first of the case studies that were mentioned in the Introduction using the framework described here. For this case we judged that the two most important success measures, in order of priority, were **impact**, and **on time**. We found that only four superfactors were present, which were **clarity of business objectives**, **use of proven technology**, **supplier competence** and **stable user requirements**. None of these were superfactors for the two highest priority measures, and therefore the superfactors present were the wrong ones for this project. No success measures at all were achieved and so the project was a total failure.

Since completing this research one of us has advised on a number of acquisitions and found that the insights gained enabled problems to be quickly identified and that advice could be confidently given on the strengths and weaknesses of projects, and recommendations made on how to improve them.

Respondents who filled in the questionnaire during the research found the experience useful. They commented that the questionnaire would have been valuable to have had as an aide-memoir in the planning stage of their projects, and for post-implementation evaluation. This may have been because most of the questions have one-to-one correspondences with the success factors and success measures, and therefore the questionnaire acts like a check list.

A structured approach to managing acquisitions

We recommend a process consisting of the following four steps.

Step 1. Bring the players together.

Identify individuals from all categories who will be actively involved in or affected by the project. Ask for their participation in this process.

Step 2. Define success for your project.

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 Appendix B. Reconcile the lists and come up with one list which is accepted by all players.

Step 3. Identify the relevant superfactors.

Some success measures will be more important than others in your project, and some may not apply at all, so you can identify which superfactors are important to your particular project and prioritise them. Consult Table 13 or Figure 4, the Success Map, plus your priority list from Step 2.

Step 4. Check for the presence of the factors.

Apply the definitions listed in Appendix B, or a questionnaire similar to ours, to check for the presence of the required success factors for the relevant phase of your project. To be more thorough you can use Appendix C to identify the appropriate subordinate factors as well.

This process should ideally be used before starting on the first phase of an acquisition and before committing to each of the following two phases. Remember that the superfactors for each phase will be different.

If we gave one single piece of advice it would be that organisations embarking on an IT acquisition should pause and consider at the outset how they would define success. In this research few had considered this prior to embarking on their projects.

LIMITATIONS OF THE WORK AND FURTHER RESEARCH

The research was based mainly on data gathered in the public sector in Oman, and its findings have so far only been applied in Oman. It seems likely to us that the findings presented here would generally apply in other environments, but that there could well be important differences. The methodology used, and the terminology and concepts developed could be applied elsewhere fairly quickly. We found that seven interviews are sufficient to identify most, if not all, of the factors. If a similar factor list were identified in another environment, the questionnaire used in Oman could be used in the new environment. If this were not the case, the questionnaire would need to be recompiled. We plan to repeat the work using UK cases.

The process by which organisations and respondents were selected for study was not as random as we would have liked, and IT practitioners may have been over-represented in the survey. Rather more failure cases and cases of extreme success or failure would be useful.

We were puzzled by one finding in the research. We found that success measures 3 to 8 in Table 4 correlated very strongly with the perceived overall success of the projects. This would be expected. However the two initiation phase measures, **business feasibility** and **technical feasibility**, did not correlate at all with overall success. Perhaps success can not be measured at the initiation phase, or perhaps these two are really input factors rather than measures.

We assigned the measures to phases by our own intuition. In further research a way should be found to check this assumption.

In-depth case studies would be valuable. For such research, as many players as possible from all categories should be involved. It would be interesting to ask how each category of player defines success for the same project, and whether the nature of the project predetermines the measures of success. The questionnaire should ask for the degree of importance of each of the 8 success measures to the selected project. To study factors and measures in greater depth they could be operationalised in more detail, by asking several quantitative questions about each factor, rather than just one.

The correlation coefficients found could be embodied in software and used to predict the outcomes of ongoing or projected acquisition projects. This could be done as part of a decision support system with the capability to grow and develop as it was applied to more cases.

ACKNOWLEDGEMENT

This work was supported by the Ministry of Information in the Sultanate of Oman.

REFERENCES

- Adams G, and Schavaneveldt R., Understanding research methods. USA: Longman Inc., 1985.
- Oppenheim, A. N. Questionnaire design, interviewing and attitude measurement. 2nd ed. London: Printer Publisher Ltd, 1966.
- Fruin, David. *Data Analysis, a basic introduction*. National Institute for social work, working paper 11, 1980.
- Guilford, J.P. Fundamental statistics in psychology and education. 4th ed. New York: McGraw-Hill, 1965.

APPENDIX A. DEFINITIONS OF THE SUCCESS FACTORS

These definitions amplify the meanings of the factors listed in Table 3. The definitions were derived from the content analysis of the semi-structured interview statements. The two factors found from the literature are given their original literature definitions.

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.

APPENDIX B. DEFINITIONS OF SUCCESS MEASURES

These were defined by Content Analysis of the original interview statements.

No.	Success 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.

APPENDIX C. SUPERFACTORS AND THEIR RELATED SUBORDINATE FACTORS

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 Feasibility study Realistic project objective	.62 .41 .40
3	Enhancability of the system	Ease of use Open system interconnection Proven technology	.62 .54 .42
4	Off-the-shelf software	(none)	
5	Indigenous skill level	IS strategy IT strategy Technical capabilities of IT staff R&D capabilities User previous experience Previous IT experience Provision of technical training Sufficiency of financial resources	.46 .46 .44 .43 .42 .42 .41 .40
6	Clarity of business objectives	IT strategy IS strategy Defined responsibilities Top management support Feasibility study IT awareness by top management Internal communication Realistic project objective Provision of user training Hidden costs	.53 .52 .50 .48 .48 .48 .47 .46 .44 .41
7	IS strategy	IT strategy Defined responsibilities IT awareness by top management IT standards Clarity of business objectives Data validity Feasibility study Indigenous skill level Technical training Realistic project objective Use of project management methodology R&D capabilities	.78 .58 .57 .55 .52 .52 .48 .46 .46 .45 .41 .41 .40

		Provision of user training	
8	Realistic project objective	IT awareness by top mgt. Feasibility study Defined responsibilities Clarity of business objectives Sufficiency of financial resources IS strategy Provision of technical training IT strategy Top management support Defined user requirements Provision of user training Considering hidden costs Business understanding by IT managers Ease of use	.51 .52 .47 .46 .45 .45 .43 .42 .42 .41 .41 .40 .40 .40
9	Use of project management methodology	Project manager Defined user requirements IT strategy Feasibility study User involvement IT awareness by top management Provision of technical training IS strategy Internal communication Top management support Business understanding by IT managers IT standards	.60 .50 .49 .47 .45 .43 .42 .41 .41 .40 .40 .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	.49 .48 .48 .48 .47 .47 .47 .44 .41 .41

		Realistic project objective	
13	User acceptance	User maturity	.40
14	Client-supplier relationship	Supplier competence	.56
		Contract terms	.50
		Considering hidden costs	.40
15	Supplier competence	Client-supplier relationship	.56
		Contract terms	.45

**CRANFIELD SCHOOL OF MANAGEMENT
WORKING PAPER SERIES
List No 6, 1992**

- SWP 1/92 Mike Sweeney
"How to Perform Simultaneous Process Engineering"
- SWP 2/92 Paul Burns
"The Management of General Practice"
- SWP 3/92 Paul Burns
"Management in General Practice: A Selection of Articles"
- SWP 4/92 Simon Knox & David Walker
"Consumer Involvement with Grocery Brands"
- SWP 5/92 Deborah Helman & Adrian Payne
"Internal Marketing: Myth versus Reality?"
- SWP 6/92 Leslie de Chernatony & Simon Knox
"Brand Price Recall and the Implications for Pricing Research"
- SWP 7/92 Shai Vyakarnam
"Social Responsibility in the UK Top 100 Companies"
- SWP 8/92 Susan Baker, Simon Knox & Leslie de Chernatony
"Product Attributes and Personal Values: A Review of Means-End Theory and Consumer Behaviour"
- SWP 9/92 Mark Jenkins
"Making Sense of Markets: A Proposed Research Agenda"
- SWP 10/92 Mike Sweeney & Ian Oram
"Information Technology for Management Education: The Benefits and Barriers"
- SWP 11/92 Keith Thompson (Silsoe College)
"International Competitiveness and British Industry post-1992. With Special Reference to the Food Industry"
- SWP 12/92 Keith Thompson (Silsoe College)
"The Response of British Supermarket Companies to the Internationalisation of the Retail Grocery Industry"
- SWP 13/92 Richard Kay
"The Metaphors of the Voluntary/Non-Profit Sector Organising"
- SWP 14/92 Robert Brown & Philip Poh
"Aniko Jewellers Private Limited - Case Study and Teaching Notes"
- SWP 15/92 Mark Jenkins & Gerry Johnson
"Representing Managerial Cognition: The Case for an Integrated Approach"
- SWP 16/92 Paul Burns
"Training across Europe: A Survey of Small and Medium-Sized Companies in Five European Countries"
- SWP 17/92 Chris Brewster & Henrik Holt Larsen
"Human Resource Management in Europe - Evidence from Ten Countries"
- SWP 18/92 Lawrence Cummings
"Customer Demand for 'Total Logistics Management' - Myth or Reality?"
- SWP 19/92 Ariane Hegewisch & Irene Bruegel
"Flexibilisation and Part-time Work in Europe"
- SWP 20/92 Kevin Daniels & Andrew Guppy
"Control, Information Seeking Preference, Occupational Stressors and Psychological Well-being"
- SWP 21/92 Kevin Daniels & Andrew Guppy
"Stress and Well-Being in British University Staff"
- SWP 22/92 Colin Armistead & Graham Clark
"The Value Chain in Service Operations Strategy"
- SWP 23/92 David Parker
"Nationalisation, Privatisation, and Agency Status within Government: Testing for the Importance of Ownership"
- SWP 24/92 John Ward
"Assessing and Managing the Risks of IS/IT Investments"
- SWP 25/92 Robert Brown
"Stapleford Park: Case Study and Teaching Notes"
- SWP 26/92 Paul Burns & Jean Harrison
"Management in General Practice - 2"
- SWP 27/92 Paul Burns & Jean Harrison
"Management in General Practice - 3"

SWP 28/92 Kevin Daniels, Leslie de Chernatony & Gerry Johnson
"Theoretical and Methodological Issues concerning Managers' Mental Models of Competitive Industry Structures"

SWP 29/92 Malcolm Harper & Alison Rieple
"Ex-Offenders and Enterprise"

SWP 30/92 Colin Armistead & Graham Clark
"Service Quality: The Role of Capacity Management"

SWP 31/92 Kevin Daniels & Andrew Guppy
"Stress, Social Support and Psychological Well-Being in British Chartered Accountants"

SWP 32/92 Kevin Daniels & Andrew Guppy
"The Dimensionality and Well-Being Correlates of Work Locus of Control"

SWP 33/92 David Ballantyne, Martin Christopher, Adrian Payne and Moira Clark
"The Changing Face of Service Quality Management"

SWP 34/92 Chris Brewster
"Choosing to Adjust: UK and Swedish Expatriates in Sweden and the UK"

SWP 35/92 Robert Brown
"Goldsmiths Fine Foods - Case Study and Teaching Notes"

SWP 36/92 Mike Sweeney
"Strategic Manufacturing Management: Restructuring Wasteful Production to World Class"

SWP 37/92 Andy Bailey & Gerry Johnson
"An Integrated Exploration of Strategic Decision-Making"

SWP 38/92 Chris Brewster
"European Human Resource Management: Reflection of, or Challenge to, the American Concept"

SWP 39/92 Ute Hanel, Kurt Volker, Ariane Hegewisch & Chris Brewster
"Personnel Management in East Germany"

SWP 40/92 Lawrence Cummings
"Logistics goes Global - The Role of Providers and Users"

SWP 41/92 Roger Seaton & Martin Cordey-Hayes
"Interactive Models of Industrial Technology Transfer: A Process Approach"

SWP 42/92 Susan Segal-Horn
"The Logic of International Growth for Service Firms"

SWP 43/92 Mike Sweeney
"Benchmarking for Strategic Manufacturing Management"

SWP 44/92 Paul Burns
"Financing SMEs in Europe: A Five Country Study"

SWP 45/92 Robert Brown
"The Graduate Enterprise Programme - Has it been Worthwhile?"

CRANFIELD WORKING PAPERS List No 7, 1993

SWP 1/93 John Mapes
"The Effect of Limited Production Capacity on Safety Stock Requirements for Periodic Review Inventory Systems"

SWP 2/93 Shai Vyakarnam & Alison Rieple
"Corporate Entrepreneurship: A Review"

SWP 3/93 Cliff Bowman & David Faulkner
"Pushing on a String: Uncertain Outcomes from Intended Competitive Strategies"

SWP 4/93 Susan Baker & Mark Jenkins
"The Role of Values in the Design and Conduct of Management Research: Perspectives on Managerial and Consumer Cognition"

SWP 5/93 Kevin Daniels, Leslie de Chernatony & Gerry Johnson
"Validating a Method for Mapping Managers' Mental Models of Competitive Industry Structures"

SWP 6/93 Kevin Daniels & Andrew Guppy
"Occupational Stress, Social Support, Job Control and Psychological Well-Being"

SWP 7/93 Colin Fletcher, Ruth Higginbotham & Peter Norris
"The Inter-Relationships of Managers' Work Time and Personal Time"

SWP 8/93 Mike Sweeney
"A Framework for the Strategic Management of both Service and Manufacturing Operations"

- SWP 9/93 Colin Armistead & Graham Clark
"The 'Coping' Capacity Management Strategy in Services and the Influence on Quality Performance"
- SWP 10/93 Ariane Hegewisch
"Equal Opportunities Policies and Developments in Human Resource Management: A Comparative European Analysis"
- SWP 11/93 Paula Stanley
"Service to the Courts: The Offender's Perspective"
- SWP 12/93 Mark Jenkins
"Thinking about Growth: A Cognitive Mapping Approach to Understanding Small Business Development"
- SWP 13/93 Mike Clarke
"Metro-Freight: The Automation of Freight Transportation"
- SWP 14/93 John Hailey
"Growing Competitiveness of Corporations from the Developing World: Evidence from the South"
- SWP 15/93 Noeleen Doherty, Shaun Tyson & Claire Viney
"A Positive Policy? Corporate Perspectives on Redundancy and Outplacement"
- SWP 16/93 Shai Vyakarnam
"Business Plans or Plans for Business"
- SWP 17/93 Mark Jenkins, Eric le Cerf & Thomas Cole
"Defining the Market: An Exploration of Marketing Managers' Cognitive Frameworks"
- SWP 18/93 John Hailey
"Localisation and Expatriation: The Continuing Role of Expatriates in Developing Countries"
- SWP 19/93 Kevin Daniels & Andrew Guppy
"Reversing the Occupational Stress Process: Some Consequences of Employee Psychological Well-Being"
- SWP 20/93 Paul Burns, Andrew Myers & Andy Bailey
"Cultural Stereotypes and Barriers to the Single Market"
- SWP 21/93 Terry Lockhart & Andrew Myers
"The Social Charter: Implications for Personnel Managers"
- SWP 22/93 Kevin Daniels, Gerry Johnson & Leslie de Chernatony
"Differences in Cognitive Models of Buyers and Sellers"
- SWP 23/93 Peter Boey & Richard Saw
"Evaluation of Automated Warehousing Policies: Total Systems Approach"
- SWP 24/93 John Hailey
"Training for Entrepreneurs: International Perspectives on the Design of Enterprise Development Programmes"
- SWP 25/93 Tim Denison & Simon Knox
"Pocketing the Change from Loyal Shoppers: The Double Indemnity Effect"
- SWP 26/93 Simon Knox
"Consumers and Grocery Brands: Searching for Attitudes - Behaviour Correspondence at the Category Level"
- SWP 27/93 Simon Knox
"Processing Ideas for Innovation: The Benefits of a Market-Facing Approach"
- SWP 28/93 Joe Nellis
"The Changing Structure and Role of Building Societies in the UK Financial Services Sector"
- SWP 29/93 Kevin Daniels, Gerry Johnson & Leslie de Chernatony
"Similarity or Understanding: Differences in the Cognitive Models of Buyers and Sellers. A Paper outlining Issues in Mapping and Homogeneity"
- SWP 30/93 Habte Selassie & Roy Hill
"The Joint Venture Formation Environment in a Sub-Saharan African Country: A Case Study of Government Policy and Host Partner Capability"
- SWP 31/93 Colin Armistead, Graham Clark and Paula Stanley
"Managing Service Recovery"
- SWP 32/93 Mike Sweeney
"The Strategic Management of International Manufacturing and Sourcing"
- SWP 33/93 Julia Newton
"An Integrated Perspective on Strategic Change"
- SWP 34/93 Robert Brown
"The Graduate Enterprise Programme: Attempting to Measure the Effectiveness of Small Business Training"

CRANFIELD WORKING PAPERS
List No 8, 1994

- SWP 1/94 Keith Goffin
"Repertory Grids in Market Research: An Example"
- SWP 2/94 Mark Jenkins
"A Methodology for Creating and Comparing Strategic Causal Maps"
- SWP 3/94 Simon Knox
"Re-engineering the Brand"
- SWP 4/94 Robert Brown
Encouraging Rural Enterprise in Great Britain
- Britain's "Venturecash" Competition
- SWP 5/94 Andy Bytheway, Bernard Dyer & Ashley Braganza
"Beyond the Value Chain: A New Framework for Business Modelling"
- SWP 6/94 Joe Nellis
"Challenges and Prospects for the European Financial Services Industry"
- SWP 7/94 Keith Thompson, Panagiotis Alekos & Nikolaos Haziris
"Reasoned Action Theory applied to the Prediction of Olive Oil Usage"
- SWP 8/94 Sanjoy Mukherjee & Ashley Braganza
"Core Process Redesign in the Public Sector"
- SWP 9/94 Mike Sweeney
"A Methodology for the Strategic Management of International Manufacturing and Sourcing"
- SWP 10/94 Ariane Hegewisch & Henrik Holt Larsen
"European Developments in Public Sector Human Resource Management"
- SWP 11/94 Valerie Bence
"Telepoint: Lessons in High Technology Product Marketing"
- SWP 12/94 Andy Bytheway
"Seeking Business Improvement: A Systematic Approach"
- SWP 13/94 Chris Edwards & Ashley Braganza
"Classifying and Planning BPR Initiatives: The BPR Web"
- SWP 14/94 Mark Jenkins & Malcolm McDonald
"Defining and Segmenting Markets: Archetypes and Research Agendas"

- SWP 15/94 Chris Edwards & Joe Peppard
"Forging a Link between Business Strategy and Business Re-engineering"

- SWP 16/94 Andrew Myers, Andrew Kakabadse, Colin Gordon & Siobhan Alderson
"Effectiveness of French Management: Analysis of the Behaviour, Attitudes and Business Impact of Top Managers"

- SWP 17/94 Malcolm Harper
Micro-Credit - The Benign Paradox

CRANFIELD WORKING PAPERS
List No 9, 1995

- SWP 1/95 Andy Bytheway
"Information in the Supply Chain: Measuring Supply Chain Performance"
- ~~SWP 2/95 John Ward & Joe Peppard
"Reconciling the IT/Business Relationship: A Troubled Marriage in Need of Guidance"~~
- SWP 3/95 Kevin Daniels, Gerry Johnson, & Leslie de Chernatony
"Collective Frames of Reference, Recognition, and Managers' Mental Models of Competition: A Test of Two Industries"
- SWP 4/95 Alison Rieple
"Staffing as a Lever of Strategic Change - The Influence of Managerial Experience, Behaviour and Values"
- SWP 5/95 Grafton Whyte & Andy Bytheway
"Factors Affecting Information Systems Success"
- SWP 6/95 Andy Bailey & Gerry Johnson
"The Processes of Strategy Development"
- SWP 7/95 Valerie Bence
"The Changing Market for Distribution: Implications for Exel Logistics"
- SWP 8/95 Valerie Bence
"The Evolution of a Distribution Brand: The Case of Exel Logistics"
- SWP 9/95 Andy Bytheway
"A Review of EDI Research"
- SWP 10/95 Andy Bytheway
"A Review of Current Logistics Practice"
- SWP 11/95 Joe Peppard
"Broadening Visions of BPR: The Imperative of Strategic Integration"

SWP 12/95 Simon Knox & David Walker
"Empirical Developments in the Measurement
of Involvement, Brand Loyalty and their
Structural Relationships in Grocery Markets"

SWP 13/95 Ashley Braganza & Andrew Myers
"Issues and Dilemmas Facing Public and
Private Sector Organisations in the Effective
Implementation of BPR"

SWP 14/95 John Mapes
"Compatibility and Trade-Off Between
Performance: An Alternative View"

SWP 15/95 Mike Sweeney & Marek Szwejczewski
"Manufacturing Standards of Performance for
Success"

SWP 16/95 Keith Thompson, Nicholas Thompson &
Roy Hill
"The Role of Attitudinal, Normative and
Control Beliefs in Drink Choice Behaviour"

SWP 17/95 Andy Bytheway
"Information Modelling for Management"

SWP 18/95 Mike Sweeney & Marek Szwejczewski
"Manufacturing Strategy and Performance: A
Study of the UK Engineering Industry"

SWP 19/95 Valerie Bence
"St.James's Hospital and Lucas Engineering
Systems Ltd - A Public/Private Sector
Collaboration in BPR Project A - Elective
Admissions"

SWP 20/95 Valerie Bence
"St.James's Hospital and Lucas Engineering
Systems Ltd - A Public/Private Sector
Collaboration in BPR Project B - The Re-
Organisation of Purchasing and Supplies"

SWP 21/95 Simon Knox & David Walker
"New Empirical Perspectives on Brand
Loyalty: Implications for Segmentation
Strategy and Equity"

CRANFIELD WORKING PAPERS List No 10, 1996

SWP 1/96 Andy Bailey & Gerry Johnson
"Patterns of Strategy Development"

SWP 2/96 Simon Knox & David Walker
"Understanding Consumer Decision Making in
Grocery Markets: New Evidence from the
Fishbein Model"

SWP 3/96 Kim James, Michael Jarrett & Donna Lucas
"Psychological Dynamics and Organisational
Learning: from the Dysfunctional Organisation
to the Healthy Organisation"

SWP 4/96 Mike Sweeney & Marek Szwejczewski
"The Search for Generic Manufacturing
Strategies in the UK Engineering Industry"

SWP 5/96 John Baker
"Agility and Flexibility: What's the
Difference"

SWP 6/96 Stephen Adamson, Noeleen Doherty & Claire
Viney
"30 Years On - What Have We Learned About
Careers?"

SWP 7/96 Keith Goffin, Marek Szwejczewski & Colin
New
"Supplier Base Management: An Empirical
Investigation"

SWP 8/96 Keith Goffin
"Operations Management Teaching on
European MBA Programmes"

SWP 9/96 Janet Price, Ashley Braganza & Oscar Weiss
"The Change Initiative Diamond: A
Framework to Balance Business Process
Redesign with other Change Initiatives"

CRANFIELD WORKING PAPERS List No 11, 1997

SWP 1/97 Helen Peck
"Towards A Framework of Relationship
Marketing: A Research Methodology"

SWP 2/97 Helen Peck
"Towards A Framework of Relationship
Marketing: An Initial Case Study"

SWP 3/97 Chris Edwards & Joe Peppard
"A Critical Issue in Business Process Re-
Engineering: Focusing the Initiative"

SWP 4/97 Joe Peppard and Don Fitzgerald
"The Transfer of Culturally-Grounded
Management Techniques: The Case of
Business Re-Engineering in Germany"

SWP 5/97 Claire Viney & Shaun Tyson
"Aligning HRM with Service Delivery"

SWP 6/97 Andy Bailey & Gerry Johnson
"Logical or Processual? Defining
Incrementalism"

- SWP 7/97 Keith Goffin
“Evaluating Customer Support Requirements
at the Product Design Stage”
- SWP 8/97 Keith Goffin, Colin New & Marek
Szwejcowski
“How Innovative are UK Manufacturing
Companies?”
- SWP 9/97 Kim James
“Beyond Individual Stress Management
Programmes: Towards an Organisational
System Approach”
- SWP 10/97 Mark Hambly & Richard Reeves
“The Application of Foresight in UK Research
and Development”
- SWP 11/97 Leslie Falkingham & Richard Reeves
“Context Analysis - A Technique for
Analysing Research in a Field”
- SWP 12/97 Ali Jawad & Richard Reeves
“Successful Acquisition of IT Systems”