International Journal of Managing Projects in Business

The appraisal of ICT and non-ICT capital projects: A study of the current practices of large UK organisations

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Abstract

Purpose – The purpose of this paper is to identify current practice in respect of the appraisal of both information communication technology (ICT) and non-ICT capital investments, and to elicit the opinions of senior executives on the various issues concerning such investment practices.

Design/methodology/approach – Empirical research based on data from a postal questionnaire, designed around a factual and attitudinal survey.

Findings – This research presents evidence of the financial and risk assessment models used by practitioners in the appraisal of both ICT and non-ICT capital projects. It shows that there was no significant difference between ICT and non-ICT appraisals in this respect. It does, however, show that there are significant differences between the two types of projects in respect to other important appraisal/evaluation issues. It also uncovers important issues regarding ICT globalisation, project champions, post audits and appraisal teams.

Research limitations/implications – This research does not identify the approach adopted, or the models used, to appraise strategic issues. This is an area for future research.

Practical implications – This research presents data that will assist both practitioners and academics in a greater understanding of the appraisal of both ICT and non-ICT projects, which will pave the way to better decision making in the future.

Originality/value – It is believed that this is possibly the only survey to simultaneously address the appraisal issues concerning both ICT and non-ICT projects.

Keywords Project management, Investment appraisal, Capital projects, Management accounting, Information technology, Communication technologies, United Kingdom

Paper type Research paper

Introduction

As companies become more and more reliant on information communication technology (ICT) systems to aid good decision-making, a regular review of their information technology (IT) requirements is inevitable. The appraisal of such investments is not, however, without its problems (Doherty *et al.*, 2012; Gunasekaran *et al.*, 2001; Apostolopoulos and Pramataris, 1997). Arguments have been raised that the traditional methods of financial appraisal are inadequate because ICT investments differ, in many respects, from non-ICT capital investments (Lefley, 2008). Peacock and Tanniru (2005), also highlight the inadequacy of traditional economic models to appraise IT capital projects. The literature shows that some companies now tend to use a greater number of appraisal techniques than in the past, but there is no consensus on the actual combination (Ballantine and Stray, 1998). The literature also shows that individual appraisal models on their own are now inappropriate and a more hybrid approach is required, one that includes both economic

International Journal of Managing Projects in Business
Vol. 6 No. 3, 2013
pp. 505-533

1753-8378
DOI 10.1108/IJMPB-04-2012-0010

and strategic dimensions of choice (Lefley, 2008; Heemstra and Kusters, 2004; Anandarajan and Wen, 1999; Small and Chen, 1997). As a result of the perceived failure of some of the traditional methods of capital investment appraisal, managers sometimes base their decisions on "acts of faith" or, as some researchers' report, use less sophisticated financial models to evaluate what must be regarded as sophisticated IT projects (Graham and Harvey, 2001). Serafeimidis and Smithson (2000) argue that the positivist approach to the evaluation of IT projects that makes excessive emphasis on accounting aspects may no longer be relevant and that a more "interpretive" approach should be adopted. Sophisticated investments, such as investments in ICT, may require a more sophisticated approach in their appraisal, with the use of a larger diversity of financial, strategic, and risk assessment models.

The importance of investing in ICT projects, even in the current economic climate, should not be underestimated. In a recent report by Oxford Economics (2011a), concern is expressed that European investment in ICT has declined in recent years compared to the expenditure made by US organisations. Since 1991, Europe's stock of ICT capital as a percentage of GDP "has fallen to around two-thirds of the level in the US". The report also states that, "ICT investment and productivity growth are closely linked, and European countries are lagging other parts of the world in both". The report goes on to argue that:

> By raising its ICT investment, Europe could see significant economic growth and an "ICT Dividend" from accompanying productivity growth. If by 2020 Europe built its ICT capital stock to the same relative level as the US, EU GDP would increase by 5%, equivalent to about €760 billion at today's prices.

In the last 20 years or so, we have seen a greater move to a global economy with many UK companies having branches or subsidiaries overseas. Some UK companies are controlled by overseas parent companies. This globalisation has resulted in the need for a wider use of ICT to increase competitiveness, gain competitive advantages, and reduce costs. More efficient and effective communication results in better decision-making. Gunasekaran *et al.* (2001) argue that, "advances in IT have enabled new competitors to enter existing markets more readily, which has stimulated and strengthened the paradigm of global competitiveness". Senior executives widely believe that "the current world recession has accelerated the transition to a digital marketplace where emerging economies will increasingly become the centre of gravity [...] creating a new global playing field" (Oxford Economics, 2011b, p. 29).

In both theory and practice, the term "ICT evaluation" has a multitude of meanings. In this paper we use the term "appraisal" to refer to the initial process of project justification (the procedure prior to the investment decision), while the term "evaluation" relates to an ongoing post investment exercise; a post-implementation review of achieved benefits (Farbey *et al.*, 1999). Much of the academic debate over the past two decades on information systems (IS)/IT or ICT capital investment has been focused on either post investment evaluation or the development and critical examination of appraisal/evaluation methods.

This paper reports on research into current ICT and non-ICT appraisal practices of major organisations trading in the UK and aims to address some of the myths regarding such practices. It is only by knowing what is actually taking place in industry, and understanding the perceptions of practitioners, that academics can pursue purposeful research leading to better decision-making.

Research methodology

Several important issues concerning the investment in ICT projects have been raised and it is the aim of this research to address some of those issues. The objective of the current research is the identification of current practice in respect of the appraisal of both ICT and non-ICT capital investments, and to elicit the opinions of senior executives, in particular those directly involved in the appraisal of ICT capital projects, on the various issues concerning such investment practices. The following areas of research investigation were selected because of their special significance:

- Types of ICT projects appraised and current investment levels.
- Formal appraisal of ICT and non-ICT capital projects with respect to financial, risk, and strategic factors.
- Differences, if any, between the appraisal of ICT and non-ICT projects.
- Post audit (evaluation) of capital projects.
- The role of project champions and their influence at the project selection stage.
- Opinions on various issues relating to the appraisal of ICT and non-ICT projects.

Our research is empirical, in that it reports on what is actually done, and uses exploratory descriptive analysis to interpret the findings.

Survey

A postal questionnaire, designed around a factual and attitudinal survey, was selected as the appropriate research methodology, in order to obtain a wide range of data from a diversity of organisations (Ward *et al.*, 1996). An attitudinal and ranking aspect to the survey was adopted, as strictly factual surveys about the extent to which particular techniques are used in investment appraisal do not necessarily reflect the importance attached by management to the use of the techniques. The questionnaire mainly consisted of closed questions. It is believed that this is possibly the only survey to simultaneously address the appraisal issues concerning both ICT and non-ICT projects. Although Ballantine and Stray (1999) reported on information systems/technology and other capital investment practices, their research was based on two surveys addressed to different individuals within the same organisation but conducted sequentially. The current survey was addressed to a single named individual within each organisation, soliciting information on both ICT and non-ICT pre-investment appraisals and post audit evaluations.

Questionnaire design

The questionnaire was divided into four parts (composed of 37 specific questions and nine statements requiring an expressed opinion) together with a brief introduction by the researcher and the prominent display of the participating university's logo. The prominent display of university affiliation was made to highlight the academic importance of the research as distinct from a "commercial/trade" survey.

Part 1 of the survey (which consisted of questions 1-17) was aimed at identifying important characteristics of the respondents and their organisations, with respect to the respondent's position within the organisation and length of service, business sector, turnover, overseas connections. It was also aimed at identifying the type of ICT investments made in the last ten years, and the investment appraisal and post audit policies of each organisation with regard to ICT and non-ICT projects.

Part 2 of the survey (which consisted of questions 18-29) related to questions concerning the most recent ICT project appraised by the organisation of which the respondent was familiar. This part of the survey was aimed at identifying the size of project, team involvement, departmental and/or project champion influences, formal assessment of financial costs and benefits, project specific risk, and strategic aspects of the project.

Part 3 of the survey (which consisted of questions 30-37) related to questions concerning the most recent non-ICT project appraised by the organisation of which the respondent was familiar. This part of the survey was again aimed at identifying the size of project, team involvement, departmental influence, formal assessment of financial costs and benefits, project specific risk, and strategic aspects of the project.

Part 4 of the survey consisted of a number of statements on a wide range of topics relating to the appraisal of ICT projects and investment appraisals in general. Respondents were asked to agree or disagree with each statement based on their own experience and in so far as, it may reflect their organisation's investment policies. A Likert-type scale of 1-4 was used. The possible responses offered were, "strongly agree" and "agree" for a positive response and "disagree" and "strongly disagree" reflecting a negative response. It was decided to use a four-point scale to avoid the possible tendency for some respondents' to take a middle line approach. In this way, they would be forced to "come off the fence" and give a positive or negative answer. Support for an "even" (without a centre point) scale is given in the literature (Ho and Pike, 1998; Lefley and Sarkis, 1997).

Pilot survey

A pilot survey was undertaken during January/August 2011, which involved a number of prototype questionnaires. Ten senior executives and ten academics were asked to comment on the design and layout of these questionnaires. The final questionnaire was selected because of its relevance, apparent ease of completion, and the visual importance of its design. Although the size of the questionnaire was deemed by some to be "too long", it was our opinion that to reduce it further would have left out some important aspects of the research. We did appreciate, however, that this may result in a lower response rate than what may have been achieved if a much shorter questionnaire had been adopted.

Target sample and sample size

The questionnaire was addressed to the largest (by turnover) 500 UK trading organisations from a list prepared by County Data Publishing Ltd The list, which originally included 600 organisations, was edited by removing duplications, etc. until the top 500 was arrived at; this then became the target sample (also referred to in the literature as the sampling frame, see for example, Ballantine and Stray, 1999; Lefley and Sarkis, 1997). Our focus was aimed at large organisations, rather than medium to small, as we perceived larger organisations to have a higher level of investment in both ICT and non-ICT capital projects, and that their appraisal procedures would be more sophisticated and well established. Our research is therefore restricted to the 500 organisations that constitute our target sample. The factual and attitudinal postal survey was conducted during September/November 2011. The questionnaire was addressed to named financial directors ($n = 424$) or, where the name of the financial director was not disclosed (and could not be obtained from other sources), it was addressed to named CEO's/MD's ($n = 76$). By addressing the survey to named senior

executives (who it was believed would have intimate knowledge of their organisation's investment appraisal policies and practices) within the organisation, it was hoped that a good response rate would be achieved and duplication of responses from an organisation would be avoided (Ward *et al.*, 1996).

Survey results and discussion

Response and sample size

Of the 500 questionnaires sent out, 31 were returned "gone away/address unknown". Of these, it was possible to re-send 12 to named FD's or CEO's. One questionnaire was returned uncompleted; four were returned spoilt and unusable; one was returned with the comment, "unable to participate on this occasion"; a letter was received, "not policy of company to complete questionnaires"; while, four were returned marked, "please remove Mr [. . .] from your database". This gave a net target sample of 470 of which 71 valid responses were received, giving a net response rate of 15.1 per cent. This response rate was deemed acceptable, considering the current economic global recession and the strategic nature of the questionnaire, and is in line with, for example, Cotton and Schinski (1999), who achieved a response rate of 16 per cent. The number of usable responses was greater than that of Ward *et al.* (1996) who achieved a usable response of 60, and Ballantine and Stray (1999), who achieved a usable response of 56 in the second stage of their research. Some of the respondents took time to add important comments to their questionnaire replies. Some of these comments are reported later in the paper.

Details of those 42 respondents who requested a copy of the report from this research, together with the "stated" senior management level of the respondents, confirms that they were senior executives of their respective organisations and would have the depth of knowledge required to answer the questionnaire. The possibility of non-informed bias was therefore minimal.

Non-response bias, however, as with all postal surveys, may present a problem if one is of the opinion, for example, that the non-respondents are those that do not appraise their capital projects in any robust manner and have deliberately chosen not to reveal such matters by not completing the questionnaire. We do not necessarily support this view, especially as the organisation classifications of the respondents mirrors the 500 target sample, but we do accept that the research results may have some limitations in terms of drawing general conclusions.

Survey results part 1

This part of the survey solicited information on the important characteristics of the respondents and their organisations with respect to the respondent's position within the organisation and their length of service, and the organisation's business sector, turnover, overseas connections, the type of ICT investments made in the last ten years, and the investment appraisal and post audit policies of each organisation with regard to ICT and non-ICT projects.

Respondents' characteristics (Table I). The 71 respondents consisted of, financial directors/chief financial officers ($n = 45$); chief executive officers/managing directors ($n = 7$); and IT/administration senior executives ($n = 19$). It is interesting to note that some of the addressed recipients passed on the questionnaire to senior IT executives for completion. Of the 71 respondents, 70 stated that they held positions at the corporate/senior manager level, with one stating that they were at middle management level.

The analysis of the individual respondent's average length of service with their present employer is shown in Table I. This shows that, on average, CEO/MDs have the lowest length of service with their current employer at 4.9 years (median 5) compared with FD/CFO's who averaged 9.2 years (median 8), and IT/admin who averaged 11.6 years (median 8). This, to some extent, confirms the view that CEO's are engaged from outside the company, rather than promoted from within, and stay in the position for a relatively short period of time. The relative short period of service among chief executive officers/managing directors, is well documented in the literature. Lefley and Sarkis (1997) found that executives that only stay in a particular job for a short period of time tend to favour short-term projects in order to enhance their career prospects. Such short-term projects bring short-term gains and are generally perceived to be less risky. This can only be detrimental to the appraisal of ICT projects, which are generally regarded as long-term investments. The longer service, as shown by this research, of finance, IT, and administrative executives, may suggest that there is a tendency to train and promote such executives from within.

Organisational characteristics. A business sector analysis shows a wide range of business activities (Figure 1), with the largest sector being, "non-food manufacturing and processing" ($n = 15$), closely followed by, "financial, banks, insurance, and business services" ($n = 12$). "Constructions and materials", "food manufacturing and processing", and "telecommunications, technology hardware and software", were in the mid-range at $n = 7$. The remaining business sectors were at the lower end of the scale. This wide range

	n	Average	Median	Maximum	Minimum	σ
All (71)	71	9.423	8	39	2	6.422
FD/CFO	45	9.222	8	35	4	5.009
CEO/MD	7	4.857	5	7	3	1.345
IT/admin	19	11.579	8	39	2	9.24

Note: $n = 71$

Table I.
Length of respondents service with current employer (years)

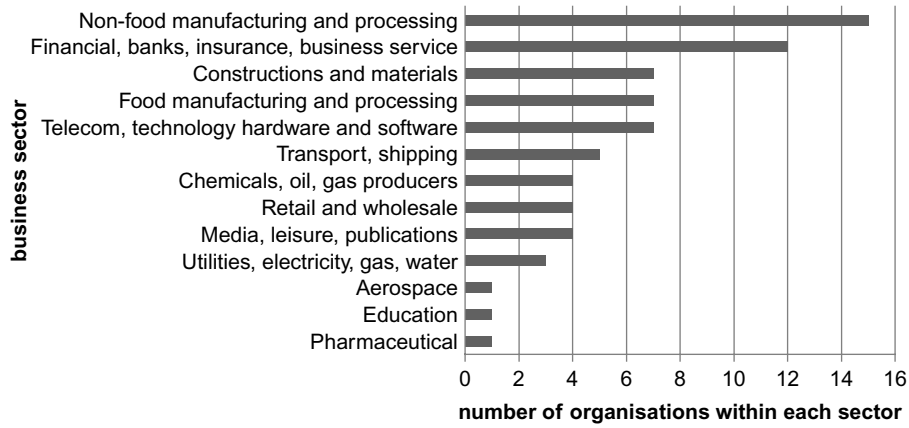


Figure 1.
Business sector analysis

of business activities in the responding firms reflects the diversity of the initially selected target sample of the 500 organisations.

Overseas connections. 57 (80 per cent) organisations have overseas branches or associated companies; 17 of these stated that their investment appraisal policy was influenced by an overseas parent company. This confirms the increasing global nature of many UK trading organisations. This globalisation is said to have resulted in the need for a wider use of ICT to increase competitiveness, gain competitive advantages, and reduce costs. We would argue that in order to survive in this expanding global business environment, organisations not only need to continuingly update their products, but they also need to continuingly review their ICT needs in order to combat increased global competition. Globalisation, therefore, emphasises the growing importance of ICT investment.

Turnover. All of the organisations stated that they had an annual turnover in excess of £500 million, which confirms that the survey relates to "large" UK trading organisations and that the responses, in this respect, are representative of the target sample.

Types of ICT projects appraised in last ten years. Figure 2, clearly shows that the organisations that took part in this research were well versed with the appraisal of ICT capital projects. All responding organisations had appraised departmental/functional stand-alone ICT systems in the past ten years, while 63 (88.7 per cent) had appraised UK inter-organisational systems, 49 (69 per cent) inter-organisational systems involving overseas networks. 69 (97.2 per cent) organisations had appraised, either, UK or overseas inter-organisational network systems, and 34 (47.9 per cent) supply-chain systems. The importance of investing in ICT supply-chain systems is given in Hvolby and Trienekens (2002).

Formal appraisal of ICT and non-ICT capital projects. Heemstra and Kusters (2004) have highlighted the lack of formal guidelines for appraising ICT projects. Here we must state that in this section and what follows, we adopt the framework of Heemstra

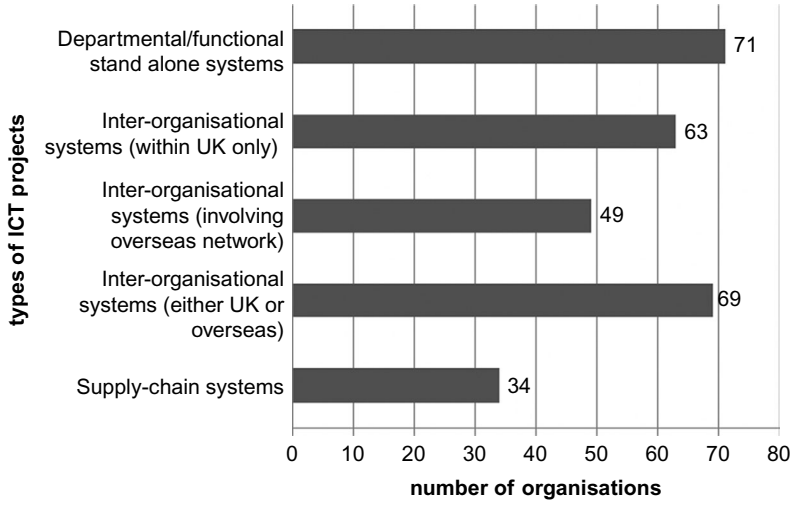


Figure 2.
Types of ICT projects appraised in last ten years

Note: $n = 71$

and Kusters (2004) in distinguishing between formal and informal assessment. Our current research shows (Table II) that 47 (66.2 per cent) of the responding organisations have clearly defined procedures (e.g. written guidelines produced internally by the organisation) for appraising ICT capital projects, while 50 (70.4 per cent) have clearly defined procedures for appraising non-ICT projects. 46 organisations (64.8 per cent) have clearly defined procedures for both types of projects, of which 31 (43.7 per cent) of these organisations stated that the procedures were the same for both types of projects, with 15 (21.1 per cent) stating that their procedures differed between the two. This shows that there is no significant difference in the fact that organisations have clearly defined appraisal procedures for both ICT and non-ICT capital projects, but in some cases there is a difference in the detail of the procedures between the two types of projects.

Only 24 (33.8 per cent) of the responding organisations conducted a formal investment appraisal of all ICT projects. The remaining 47 (66.2 per cent) gave one or more of the reasons set out in Table III for not carrying out a formal appraisal. The figures indicate that project value and size is the most important factor as to whether a formal appraisal is undertaken or not, confirming views expressed in the literature. This also indicates that a formal capital investment appraisal may not be relevant for all ICT investments (Ballantine *et al.*, 1996). Concern, however, must be expressed over the level of some of the other reasons given, especially, "insufficient time and choice", "operational urgency", and "mandatory projects" as a valid reason for not appraising investments.

Only 18 (25.4 per cent) of the responding organisations conducted a formal investment appraisal of all non-ICT projects. The remaining 53 (74.6 per cent) gave one or more

Use of formal procedures in respect of	Number	%
ICT projects	47	66.2
Non-ICT projects	50	70.4
Both ICT and non-ICT projects *	46	64.8
Same procedures for ICT and non-ICT projects *	31	43.7
Different procedures for ICT and non-ICT projects *	15	21.1

Table II.
Formal appraisal

Notes: Formal appraisal refers to clearly defined procedures, e.g. written, internally produced, investment appraisal guidelines; $n = 71$

Reason	ICT projects ($n = 47$) Number	%	Non-ICT projects ($n = 53$) Number	%
Project value and size	43	91.5	49	92.5
Operational urgency *	17	36.2	9	17.0
Insufficient time and choice *	13	27.7	6	11.3
Mandatory projects	12	25.5	13	24.5
Replacement projects **	4	8.5	24	45.3
Other "not corporate policy to review all projects"	0	0	1	1.9

Table III.
Reasons given for not carrying out a formal appraisal of all ICT and non-ICT projects

Note: Significantly different between ICT and non-ICT at: *5 and **0.1 per cent levels

of the reasons itemised in Table III for not carrying out a formal investment appraisal. The figures again indicate that project value and size is the most important factor as to whether a formal appraisal is undertaken or not, with "replacement projects" coming second followed by "mandatory projects". Concern must again be expressed over the level of some of the reasons given as a valid basis for not appraising all capital investments.

Statistically significant differences between some of the reasons given for ICT and non-ICT projects were observed and are noted in Table III. "Operational urgency" and "insufficient time" are two of the reasons, which are more prevalent with respect to ICT projects, while "replacement projects" is more prevalent with respect to non-ICT projects.

66 per cent of organisations do not conduct a formal appraisal of all ICT projects, and almost 75 per cent with respect to non-ICT projects. In some respects, the reasons given for non-appraisal between ICT and non-ICT projects differ. Although the main reason given in both cases is, "project value and size", the reasons of, "insufficient time and choice" and "operational urgency", are more prevalent with respect to ICT projects, and "replacement projects", is more common with respect to non-ICT projects. Farbey *et al.* (1992) found that a large number organisations did not have a formal procedure for appraising IT projects but relied on "act of faith", "got to do", and "complying with corporate strategy". Ballantine *et al.* (1996) report that their findings suggested, "a fairly widespread lack of formal procedures despite the fact that evaluations of IS/IT investments are still undertaken". It now seems that this situation may, to some extent, have changed.

Having identified that project value and size is the main reason for not formally appraising some ICT capital projects, it is therefore of interest to note that, of those organisations that do not formally appraise all ICT projects, the lowest capital value of the ICT project assessed was £180,000. While no general conclusion can be reached, the cut-off value for this company must be less than £180,000. It is also interesting to note that only four (33 per cent) out of the 12, "financial, banks, insurance, business service" sector, and one (14 per cent) out of the seven, "construction and materials" sector give the reason for not formally appraise all ICT projects as a result of value and size of project.

With respect to non-ICT capital projects, it is also of interest to note that, of those organisations that do not formally appraise all non-ICT projects, the lowest capital value of the non-ICT project assessed was £150,000. While, again, no general conclusion can be reached, the cut-off value for this company must be less than £150,000. It is also interesting to note that seven (58 per cent) out of the 12, "financial, banks, insurance, business service" sector, and two (29 per cent) out of the seven, "construction and materials" sector give the reason for not formally appraising all non-ICT projects as a result of value and size of project.

Post audit. 47 (66.2 per cent) organisations conducted a post audit on some capital projects, while only one organisation conducted a post audit on all projects, leaving 23 (32.4 per cent) stating that they did not conduct post audits. Although Lefley (2008) recently concluded that post audits of projects may not be that common in practice, this current research presents a contrary view, in that post audits may be more common than originally thought. Farbey *et al.* (1992) also found that, "few organisations had carried out an *ex post* evaluation", of IT projects. However, Ward *et al.* (1996) found that a large number (72 per cent) of their respondents conducted a formal post-implementation review with respect to IS/IT projects.

This research, however, highlights the difficulty in conducting post audits on ICT projects, which may account for almost 33 per cent of respondents not conducting post audits. One respondent commented:

> An issue is the difficulty of applying post investment appraisal to ICT projects. As ever, the major problem with PIA is establishing a meaningful performance baseline that would have pertained had the investment not been made, but this is all the more difficult with ICT projects as they frequently involve major business change.

17 respondents stated that the post audit revealed "significant" factors, which, in their opinion, should have been known at the pre-investment (appraisal) stage. Factors identified include, flawed data in business case, level of risk, constraints on supplier and business capacity, estimated costs/overspend ($n = 8$), not all benefits materialised ($n = 2$), delay, detailed business requirements, supplier specification error, and requirement changes during implementation. An interesting comment made by one of the respondents was:

> The £120 m non-ICT investment was for new automated plant and machinery – planned benefits from this were only partially realised because the production planning and control processes were not streamlined to take account of the new automated capacity.

22 stated that the post audit did not reveal any significant factor that should have been known at the appraisal stage, while nine of the respondents stated that they did not know.

Six of the respondents stated that there were factors revealed in the post audit that, in their opinion, could not have been known at the pre-investment (appraisal) stage. These factors included Lehman's crash, technology interactions, complexity of business change, unforeseen change in market, change in tax legislation, and level of informal business processes that led to underestimating contractor resource requirements. 30 stated that the post audit did not reveal any significant factor that could not have been known at the appraisal stage, while 12 of the respondents stated that they did not know.

Survey results parts 2 and 3

The following responses relate to the most recent ICT and non-ICT projects (of which the respondent was familiar) appraised by the responding organisations.

Project capital cost. The approximate capital cost of the various ICT projects ($n = 71$) recently appraised showed an average cost of £3,875,450, with the largest project cost being £69.9 million and the lowest cost being £85,000 (the policy of this organisation was to formally appraise all capital projects, it is also of interest to note that the value of this organisation's non-ICT investment was £650,000). With respect to non-ICT projects, four of the respondents (all of whom were IT executives) did not answer this part of the survey. The approximate capital cost of the various non-ICT projects ($n = 67$) showed an average cost of £4,856,970 with the largest project cost being £120 million and the lowest cost being £130,000 (the policy of this organisation was to formally appraise all capital projects; it is also of interest to note that the value of this organisation's ICT investment was £250,000). Because of the large variation in project size, the results have been presented for three separate groups.

The capital cost of six (8 per cent) ICT projects ranged from £10 to £70 million (Figure 3) with a median of £15.75 million and an average of £25.7 million (it is clear that the "average" has been distorted by the cost of the largest project). The capital cost of four (6 per cent) non-ICT projects ranged from £12.5 to £120 million with a median

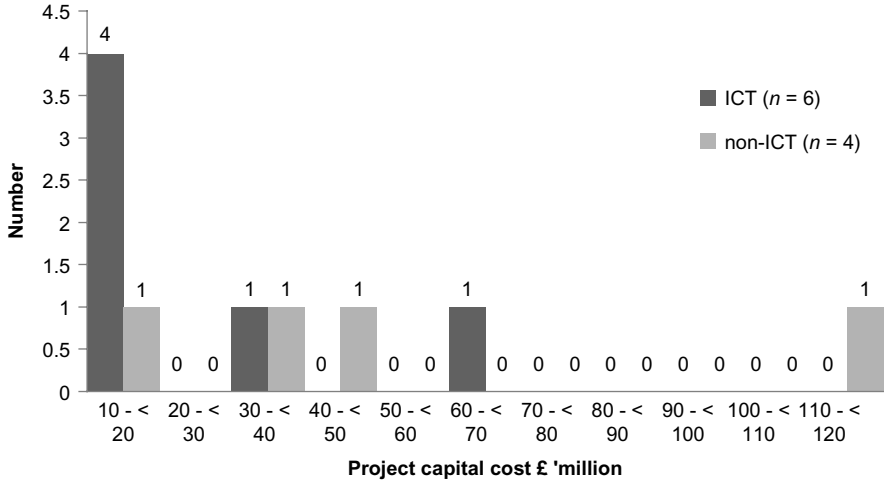


Figure 3.
Capital cost of all projects above £10 million

of £35 million and an average of £50.6 million (again, it is clear that the "average" has been distorted by the cost of the largest project). The respondent who reported the £120 million project stated that it was for, "new automated plant and machinery".

35 (49 per cent) ICT projects ranged from £1.2 to £8 million (Figure 4), with a median of £2.5 million and an average of £3 million. 39 (58 per cent) non-ICT projects ranged from £1 to £8 million, with a median of £2 million and an average of £2.9 million.

30 (42 per cent) ICT projects had a capital cost of under £1 million, with a median of £510,000 and an average of £513,900 (Figure 5). 24 (36 per cent) non-ICT projects had a capital cost of under £1 million, with a median of £313,500 and an average of £433,208.

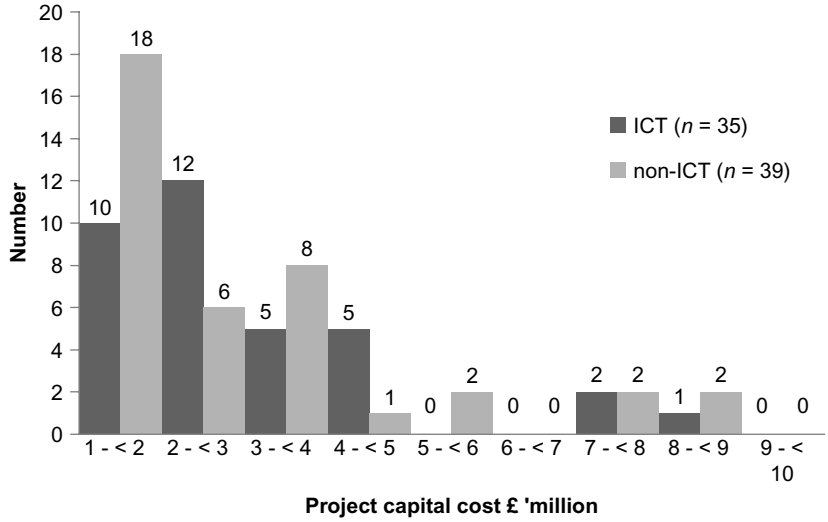


Figure 4.
Capital cost of all projects between £1 and £10 million

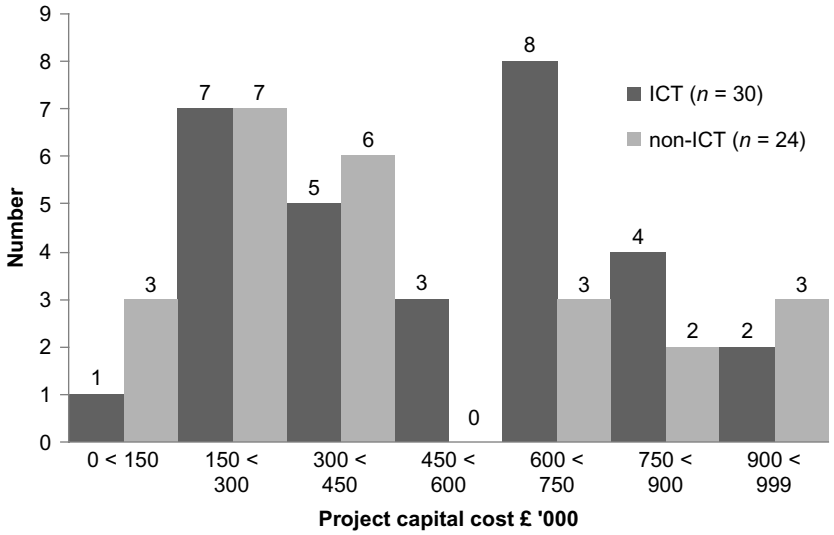


Figure 5.
Capital cost of all projects under £1 million

The median value of all ICT projects was £1.62 million, with an average of £3.875 million. The median value of all non-ICT projects was £1.45 million, with an average of £4.85 million. There was no significant difference between the costs of ICT and non-ICT projects. The wide range in capital values with respect to both ICT and non-ICT projects seems to suggest that the "most recent" project was selected and not just the most "significant" project.

Appraisal teams. 64 (90 per cent) of ICT projects were evaluated by an investment appraisal team, with 59 (83.1 per cent) of the respondents being part of those teams. 58 (86.6 per cent) of non-ICT projects were evaluated by an investment appraisal team, with 42 (62.7 per cent) of the respondents being part of these teams.

The importance of a team approach to the appraisal of ICT capital projects has been highlighted in the literature (Lefley, 2008). A team approach is well recognised for stimulating commitment and achieving more optimal decisions than an individualistic managerial approach. Small groups are natural structures and superb agencies for solving problems (Hyde, 1986). While the composition of the investment appraisal team is important in respect to the members' varied managerial disciplines, it is also essential to appreciate that their other demographic characteristics (basic social attributes such as age, sex, educational standard, length of service, etc.) may be equally important and may well account for the fact that some teams will be more efficient than others (Hambrick, 1994; Priem, 1990). It is therefore encouraging to report that some organisations have adopted what academics prescribe in respect of the use of appraisal teams. This research also shows that these teams are not always made up of the same individuals. At least 11 of the ICT project teams included IT specialists, indicating that demographic characteristics may play an important role in team composition: IT specialists being included in the team because of their expertise and knowledge of ICT.

Our research shows that, with respect to non-ICT projects, IT professionals' may not always be part of the appraisal team or in fact have detailed knowledge

of such investments. A strong team culture with respect to the appraisal of both ICT and non-ICT projects is evidenced by this research.

Departmental influence (Table IV). With respect to ICT projects ($n = 72$, one respondent stated that two departments – IT and finance – had equal influence), in the respondents' opinion, the following departments had the greatest influence at the project feasibility/appraisal stage: IT department ($n = 43$), finance and accounting ($n = 14$), corporate management ($n = 11$), sales and marketing ($n = 2$), operations, and distribution. As the various projects relate to ICT investments, then it is reasonable to expect that the IT department would have a significant influence in the early stages of project selection. This is confirmed by the current research; but it is also noticed that finance still has an important influence at this stage of the investment appraisal process. With respect to ICT projects, it may be that the IT department initiates the proposal, and/or would have a significant contribution to make to the project's operational effectiveness.

With respect to non-ICT projects ($n = 68$, one respondent stated that two departments – finance and corporate management – had equal influence), in the respondents' opinion, the following departments had the greatest influence at the project feasibility/appraisal stage: finance and accounting ($n = 28$), corporate management ($n = 20$), sales and marketing ($n = 6$), operations ($n = 2$), supply chain ($n = 2$), production ($n = 2$), logistics, legal, editorial, strategy and planning, technical, merchandise procurement, estates, and product design. It appears that both finance and corporate management have the greatest influence at the project selection stage of non-ICT projects.

Statistically significant differences with respect to some of the "departments", stated as having a greater influence at the project evaluation stage, between ICT and non-ICT projects were observed and are noted in Table IV. "IT" department is shown

Department	ICT projects ($n = 72$) Number	%	Non-ICT projects ($n = 68$) Number	%
IT***	43	59.7	0	0
Finance and accounting**	14	19.4	28	41.1
Corporate management*	11	15.3	20	29.4
Sales and marketing	2	2.8	6	8.8
Operations	1	1.4	2	2.9
Distribution	1	1.4	0	0
Supply chain	0	0	2	2.9
Production	0	0	2	2.9
Logistics	0	0	1	1.5
Legal	0	0	1	1.5
Editorial	0	0	1	1.5
Strategy and planning	0	0	1	1.5
Technical	0	0	1	1.5
Merchandise procurement	0	0	1	1.5
Estates	0	0	1	1.5
Product design	0	0	1	1.5

Notes: Significantly different between ICT and non-ICT at: *5, **1, and ***0.1 per cent levels; ICT ($n = 72$), one respondent stated that two departments – IT and finance – had equal influence, while; non-ICT ($n = 68$), one respondent stated that two departments – finance and corporate management – had equal influence

Table IV.
Departmental influence

to have a greater influence with respect to ICT projects, while "finance and accounting" and "corporate management" have a greater influence with respect to non-ICT projects.

The literature shows that both financial and corporate management play a dominant part in project selection. With finance concerned with financial viability and liquidity, and corporate management wishing to select projects that they favour, for whatever reason. The conflict between accountants and other disciplines (for example, engineers, operational managers, and marketing) is well documented in the literature, yet it is still seen here that accountants have the greatest influence at the project selection stage with respect to non-ICT projects. We would argue that this is to some extent the result of the underlying premise of the economic models used in project appraisals. We would also argue that conventional accounting, with its basic concepts of conservatism and prudence, together with the financial philosophy of adding a risk premium to cover lack of knowledge on the risks in a particular project, results in high hurdle rates, with the inevitable rejection of projects, which may otherwise be viable.

Project champion. A project champion is a person who is dedicated to seeing a project successfully completed and while it is advantageous to have such a person involved at the implementation stage, such a person can unduly bias project selection (Lefley, 2006) in a way that is epitomised by the optimism bias theory. Optimism bias theory argues that there is a systematic tendency for managers to be over-optimistic about the outcome of planned events. This includes over-estimating the probability of positive events and under-estimating the probability of negative events (Lefley, 2006). Farbey *et al.* (1992) argue that project champions have, "a major influence in getting the project accepted". This research shows that the respondents are familiar with the term "project champion".

With respect to the ICT project recently appraised, 55 (77.5 per cent) of the respondents stated that such a person was involved at the project appraisal stage. Of these respondents, 14 acknowledged that they were the project champion. 17 of the respondents believed that the project champion had too much influence on project selection, suggesting that an undue influence may have occurred. Four of the respondents, who accepted that they were the project champion, actually stated that they had too much influence at the project selection stage.

Farbey *et al.* (1992) found that the appraisal of IT projects relied heavily on a project champion to the extent that a large number of projects would not have gone ahead without their support. They also found that, "it was up to the champion to do whatever he or she thought necessary to gain approval". We do not advocated that a project champion should be excluded from the appraisal team; we only suggest that any over-enthusiasm on their part for the project should be monitored and taken into account. It is important to include the project champion, who is usually the project's proposer, in the team to elicit factual data and loyal commitment to the implementation of the project.

Formal/informal assessment (Table V). With respect to ICT projects, all of the respondents ($n = 71$) stated that a formal financial review of costs and benefits was undertaken, while 42 (59.2 per cent) stated that they formally considered project specific risk, and 37 (52.1 per cent) formally considered the strategic aspects of the project. 26 (36.6 per cent), informally considered project specific risk and 30 (42.3 per cent) informally considered strategic aspects.

67 respondents reported on non-ICT projects. With respect to these projects, 65 (97 per cent) respondents stated that a formal financial review of costs and benefits

	ICT projects ($n = 71$) Number	%	Non-ICT projects ($n = 67$) Number	%
Formal assessment				
Finance	71	100.0	65	97.0
Risk*	42	59.2	28	41.8
Strategic factors**	37	52.1	20	29.8
Informal assessment				
Finance	0	0	0	0
Risk	26	36.6	25	37.3
Strategic factors	30	42.3	30	44.8
Formal and informal assessment				
Finance	71	100.0	65	97.0
Risk**	68	95.8	53	79.1
Strategic factors**	67	94.4	50	74.6

Note: Significantly different between ICT and non-ICT at: *5 and **1 per cent levels

Table V. Formal/informal assessment of finance, risk, and strategic factors

was undertaken, while 28 (41.8 per cent) stated that they formally considered project specific risk and 20 (29.8 per cent) formally considered the strategic aspects of the project. 25 (37.3 per cent) informally considered project specific risk and 30 (44.8 per cent) informally considered strategic aspects.

Statistically significant differences with respect to the assessment of "risk" and "strategic factors", between ICT and non-ICT projects, are noted in Table V. Both "risk" and "strategic factors" are seen to be more prevalent with respect to "formal" assessment of ICT projects then non-ICT projects.

The above figures clearly show that a greater number of organisations formally assess both risk and strategic factors for ICT projects than for non-ICT projects.

This confirms that, in many cases, a multi-approach to project appraisal is being adopted, confirming the viewpoint of Small and Chen (1997). Most, if not all, conventional financial justifications models do not adequately capture the full potential of investing in ICT, a complete appraisal must consider the strategic benefits of the technology and the risk implications of investing in such projects. Evidence from this current research suggests that a large number of organisations appreciate the complexity of ICT investment appraisal and do not just rely on financial models. To this end, it appears that many practitioners have taken on board the views of academics.

Financial appraisal models. With respect to ICT projects (Table VI), the payback (PB) model of investment appraisal continues to be the one most favoured by organisations, with 62 (87 per cent) companies using one of either of the two versions (discounted or non-discounted). This supports the earlier findings of Lefley and Sarkis (1997) who reported that the PB was the most frequently used model of investment appraisal in respect of new technology projects. The terms "discounted payback" (DPB) was introduced into the literature by Rappaport (1965). For a full review and synthesis of the PB method of investment appraisal, see, Lefley (1996).

Although the net present value (NPV) is seen to be preferred to the internal rate of return (IRR), when one takes into account the use of the modified internal rate of return (MIRR), the IRR/MIRR is seen to be considered as of greater preference, with 22 ranking it first compared to only 18 with respect to the NPV. The relative "importance" of these

Model (in order of perceived importance)	Number	Rank 1st	2nd	3rd	4th	
Payback discounted/conventional (no company used both)[a]	62	25	21	15	1	3.129
IRR/MIRR[a]	47	22	14	9	2	2.419
NPV	50	18	17	11	4	2.403
IRR	40	20	12	7	1	2.113
DPB (using discounted figures)	37	14	12	10	1	1.823
Payback (conventional/non-discounted figures)	25	11	9	5	0	1.306
ROI/ARR	26	6	14	4	2	1.226
PI	12	0	1	6	5	0.323
MIRR	7	2	2	2	1	0.306

Notes: [a]The description refers to a combination of related models; $n = 71$

Table VI.
Financial models used in appraising the most recent ICT project

two models is, however, almost identical. In its basic form, the NPV of a project is the sum of all the net discounted cash flows (DCFs) during the life of the project less the present value of the cost of the project. The IRR model uses the same net cash flows as the NPV model but expresses the result as a percentage yield. The IRR of a project is the discount rate, which reduces the stream of net returns from the project to a present value of zero. Previous research reports have shown that overall the IRR is more popular among practitioners than the NPV (Gregory *et al.*, 1999). Managers' appear to be more comfortable with the IRR, being able to base their decisions on a percentage figure rather than an absolute NPV figure (Evans and Forbes, 1993). Collier and Gregory (1995) argue that one of the reasons for the popularity of the IRR over the NPV may be that it is easier to communicate to non-financial managers. A somewhat rare earlier report of the shift from the use of the IRR to the NPV model is given in Farragher *et al.* (1999).

26 organisations use the return on investment/accounting rate of return (ROI/ARR). This is less than that reported in an earlier study by Ballantine and Stray (1998). Nine of those organisations who apply the NPV also calculated the profitability index (PI) (NPV divided by initial cost of investment), while three of those organisation that used the PI did not rank the NPV.

Financial models continue to be widely used in the appraisal of ICT projects, confirming the previous results in Ballantine and Stray (1998). We are also of the view that they will continue to be used in the appraisal of such projects, despite the general criticisms, in the IT literature, against their use.

With respect to non-ICT projects, the PB model continues to be the one most favoured, with 60 (90 per cent) companies using one of either of the two versions (discounted or non-discounted) (Table VII). Although the NPV is seen again to be preferred to the IRR, again when one takes into account the use of the MIRR, the IRR/MIRR is seen to be considered as of greater preference, with 23 ranking it first compared to only 17 with respect to the NPV. The relative "importance" of the IRR/MIRR against the NPV is also seen to be greater. 22 organisations use the ROI/ARR. Ten of those organisations who apply the NPV also calculated the PI, while one of those organisations that used the PI did not rank the NPV. Two organisations did not use any financial model with respect to non-ICT projects but relied solely on corporate management judgement – strategic assessment, while one organisation stated that if the NPV was negative they would take other factors into account.

Model (in order of perceived importance)	Number	Rank 1st	2nd	3rd	4th	
Payback discounted/conventional (no company used both)[a]	60	22	21	15	2	3.050
IRR/MIRR[a]	44	23	11	9	1	2.400
NPV	45	17	15	11	2	2.283
IRR	38	21	10	7	0	2.133
DPB (using discounted figures)	36	11	12	11	2	1.733
Payback (conventional/non-discounted figures)	24	11	9	4	0	1.317
ROI/ARR	22	4	13	3	2	1.050
PI	11	0	0	5	6	0.267
MIRR	6	2	1	2	1	0.267
Other: if NPV is negative then take other factors into account	1	0	1	0	0	0.050

Notes: [a]The description refers to a combination of related models; 67 respondents reported on non-ICT projects; two organisations did not use any financial model but relied solely on corporate management judgement (strategic assessment); $n = 67$

Table VII. Financial models used in appraising the most recent non-ICT project

Influences on the DCF discount rate. With respect to the latest ICT project, organisations that used any of the five discounting financial models (NPV, IRR, MIRR, DPB, or PI) ($n = 60$), took one or more of the factors shown in Table VIII into account when arriving at the discount rate (cost of capital) used. The discount rate used in DCF calculations by 48 organisations (80 per cent of those that used a DCF model) was influence by the opportunity cost of capital. There is general support in the literature for the use of the "opportunity cost of capital" as the discount rate (Davis and Pointon, 1994). Other influences included taxation, project-specific risk, inflation, and organisational risk. We would argue, however, that including an allowance for inflation must be taken with care, as the effect of inflation is sometimes ignored in the forecasted cashflows. Two organisations stated that they arbitrarily increased the cost of the project, to take into account project risk, rather than adjust the discount rate.

Sophisticated financial appraisal models are perceived to be those that use DCF figures. In this respect, as 84.5 per cent use one or more of these models, it may be

Factor	ICT projects ($n = 60$) Number	%	Non-ICT projects ($n = 56$) Number	%
Opportunity cost of capital	48	80.0	41	73.2
Taxation	21	35.0	18	32.1
Project-specific risk	18	30.0	16	28.6
Inflation	16	26.7	16	28.6
Organisational risk	9	15.0	11	19.6
Other: increase costs by 15 per cent	1	1.7	0	0
Other: contingency cost increase	1	1.7	1	1.8

Notes: With respect to ICT projects ($n = 71$), 60 (84.5 per cent) organisation used one or more of the DCF models; with respect to non-ICT projects ($n = 67$), 56 (83.5 per cent) organisation used one or more of the DCF models

Table VIII. Factors taken into account when determining the discount rate

determined that the responding organisations take a sophisticated approach to the financial appraisal of ICT projects.

With respect to the latest non-ICT project, organisations that used any of the DCF models ($n = 56$), took one or more of the factors shown in Table VIII into account when arriving at the discount rate used. The discount rate used in DCF calculations by 41 (73.2 per cent of those organisations that used a DCF model) organisations was again influenced by their opportunity cost of capital. Other influences included taxation, project-specific risk, inflation, and organisational risk. One organisation arbitrarily increased the cost of the project rather than adjust the discount rate.

This research highlights some of the factors, considered by organisations, as having an influence on the "cost of capital" and the determination of their discount rate, with the opportunity cost of capital being most favoured with respect to both ICT and non-ICT project appraisal.

In line with the accounting literature, the cost of capital forms the basis on which the discount rate is arrived at which is used in the NPV, it is also used as the "threshold" rate in IRR calculations. There is continuing debate, however, over the "cost of capital" with perceptions differing widely within and between "industry" and the "City" (Gregory *et al.*, 1999).

Risk analysis (Table IX). Risk analysis may be considered from two viewpoints:

(1) Methods used to identify and assess the level of perceived project risk.

(2) The way this risk can be taken into account.

There are, however:

(3) Some organisations that either do not adjust for risk or treat risk as a separate issue.

Method	Number ICT ($n = 71$)	Non-ICT ($n = 67$)
Risk assessment (ICT: 38 (53.5 per cent) organisations) (non-ICT: 33 (49.3 per cent))		
Sensitivity analysis	28	25
Payback	20	19
Probability analysis (i.e. decision trees)	1	1
Option theory	1	1
Taking risk into account (ICT: 43 (60.6 per cent) organisations) (non-ICT: 40 (59.7 per cent))		
Adjust discount rate used	25	26
Adjust hurdle rate (IRR)	25	25
Adjust required payback period	21	18
Capital asset pricing model	5	4
Certainty-equivalent approach	2	2
Build in contingency	1	1
Risk log and mitigation	1	1
Do not adjust for risk and/or treat risk as a separate issue (ICT: 23 (32.4 per cent) organisations) (non-ICT: 23 (34.3 per cent))		
Do not adjust for risk	18	18
Treat risk as a separate issue	6	6

Table IX.
Methods used to assess and/or take account of risk

Notes: It appears that a greater number of organisations take project risk into account (ICT: $n = 43$; non-ICT: $n = 40$) than those that formally assess risk (ICT: $n = 38$; non-ICT: $n = 33$)

(1) Methods used to identify and assess the level of perceived project risk. With respect to ICT projects, 38 (53.9 per cent) organisations used one or more methods to identify and assess the level of perceived project risk. The most popular method of assessing project risk, used by 28 organisations, is shown to be "sensitivity analysis". A sensitivity analysis approach to the assessment of project risk seeks to identify how sensitive project appraisal measures (such as NPV and IRR) might be impacted upon by possible estimation errors of the gross revenue and the various cost items as well as the cost of capital. This technique will highlight those projects, which through only a small deviation in cashflows from those forecasted, produce a high variance in the calculated rate of return. Such projects are said to be highly sensitive.

There is support in the literature for the use of sensitivity analysis (Anandarajan and Wen, 1999). Lefley (1997), however, argues that the identification of project risk is not merely a function of the sensitivity or influence on the financial data, but involves a much more detailed analysis of the reasons for risk. Hillier (1963) argues that sensitivity analysis may be quite limited and its conclusions tend to suffer from a lack of conciseness, precision, and comprehensiveness, but it does remain a useful tool of risk analysis, provided that management are aware of its limitations.

The second most popular method, used by 20 organisations, is shown to be the "payback". It is argued that the uncertainty of estimating future cashflows increases with time; the longer the project time the greater the difficulty in estimating cashflows in the later years. This uncertainty in itself creates a risk in that the ultimate benefits expected from the project may not materialise. To some extent, this risk is identified by the level of the payback period, shorter payback periods indicating a lower risk, while longer payback periods indicate a higher risk. It is generally accepted that the payback method only measurers "time risk" and does not reflect the overall significance of project risk.

Probability analysis (i.e. decision trees) and option theory appear to have limited uses, with only one organisation using one or other of these methods.

With respect to non-ICT projects, 33 (49.3 per cent) organisations, from a sample of 67, used one or more methods to identify and assess the level of perceived project risk. The most popular method of assessing project risk, used by 25 organisations, is again shown to be "sensitivity analysis". The second most popular method, used by 19 organisations, is shown to be the "payback". Again, probability analysis (i.e. decision trees) and option theory appear to have limited uses, with only one organisation using one or other of these methods.

(2) The various ways project risk is taken into account. With respect to ICT projects, 43 (60.6 per cent) organisations used one or more methods to take risk into account. The three most popular methods for taking risk into account were:

(1) adjusting the discount rate used for the NPV;

(2) adjusting the hurdle rate with respect to the IRR; or

(3) adjusting the required payback period.

While some academics argue that these are the correct approaches, others argue that such approaches merely make it more difficult to accept a project.

The most popular method of dealing with risk is to place a more stringent requirement on the customary financial criteria for investment appraisal by expecting a higher rate of return, using a higher discount rate, or shortening the required payback period above those that would have been used for less risky investments

(Lefley and Sarkis, 1997). Anandarajan and Wen (1999) support the view that risk adjusted discount rates are inappropriate in the appraisal of IT projects. While we have no evidence to indicate on what basis the discount rate was adjusted, respondents comments would suggest that it might be done in an arbitrary way.

Other methods include the capital asset pricing model (CAPM), the certainty-equivalent (C-E) approach, to build in a contingency allowance, or risk log and mitigation. The CAPM takes into account organisational risk but may not include project specific risk.

With respect to non-ICT projects, 40 (59.7 per cent) organisations used one or more methods to take risk into account. Again, the three most popular methods for taking risk into account were:

(1) adjusting the hurdle rate with respect to the IRR;

(2) adjusting the discount rate used for the NPV; or

(3) adjusting the required payback period.

Other methods include the CAPM, the C-E approach, to build in a contingency allowance, or risk log and mitigation.

(3) Some organisations either do not adjust for risk or treat risk as a separate issue. With respect to both ICT and non-ICT projects, 18 organisations do not adjust for risk, while six organisations treated risk as a separate issue. This supports the view of Baldwin (1959) who, over 50 years ago, argued that project risk should be assessed independently of financial appraisal, and "the rate-of-return figure should remain inviolate and should be complemented by a secondary factor indicative of the risk, thereby keeping sight of both economic effect and risk". This, however, is not the general view of academics, who argue that the discount rate should incorporate a risk factor.

The figures in Table IX show that a greater number of organisations, in respect of both ICT and non-ICT projects, take project risk into account than formally assess risk. This suggests that subjective judgement plays a large part in the risk assessment process for many organisations. The figures clearly show that there is no real difference, between ICT and non-ICT projects, in the way organisations treat project risk.

Other factors considered during the investment appraisal stage. The factors shown in Table X were considered by the responding organisations at the appraisal stage of the most recent ICT and non-ICT capital projects. The main factor considered, with respect to ICT projects, was improvement to management information offered by the project ($n = 66$, 93 per cent). This was followed by the strategic importance of the project ($n = 59$, 81.1 per cent). Improved operational efficiency ($n = 49$, 69 per cent) was also seen as an

Factor	ICT ($n = 71$) Number	%	Non-ICT ($n = 67$) Number	%
Improved management information***	66	93.0	0	0
Strategic importance of the project*	59	83.1	43	64.2
Improved operational efficiency**	49	69.0	61	91.0
Competitive advantage offered by the project	28	39.4	27	40.3
Legal/government requirements	14	19.7	15	22.4

Note: Significantly different between ICT and non-ICT at: *5, **1, and ***0.1 per cent levels

Table X.
Other factors considered during the project selection stage

important factor. Two other factors that were considered, but deemed to be not as important, were "competitive advantage offered by the project" and "legal/government requirements".

The main factor considered, with respect to non-ICT projects, was improved operational efficiency offered by the project ($n = 61$, 91 per cent). This was followed by the strategic importance of the project ($n = 43$, 64.2 per cent). Two other factors that were considered, but deemed to be not as important, were "competitive advantage offered by the project" and "legal/government requirements".

Statistically significant differences between some of the "other factors" considered during the project selection stage with respect to ICT and non-ICT projects are noted in Table X. "Improved management information" and "strategic importance" are rated higher with respect to ICT projects, while "improved operational efficiency" is rated higher with respect to non-ICT projects.

This research shows that "improved management information" is clearly important with respect to ICT projects, while "improved operational efficiency" is more important with respect to non-ICT projects. Although "strategic issues" are also seen to be important with respect to both types of projects (having been placed second in both cases), such issues appear to be relatively more important with respect to ICT projects.

This research confirms that some organisations rely on other, more strategic, factors in addition to the financial appraisal with respect to both ICT and non-ICT projects.

Survey results part 4

This part of the survey consisted of a number of statements on a wide range of topics relating to the appraisal of ICT projects and investment appraisal in general. This paper reports on some of those statements. Respondents were asked to agree or disagree with each statement based on their own experience and in so far as it may reflect their organisation's investment policies. The possible responses offered were. "Strongly agree" and "agree" for a positive response and "disagree" and "strongly disagree" reflecting a negative response.

The PB model of investment appraisal has been the subject of considerable comment and criticism in the literature (Lefley, 1996). An important concern of the PB model is the fact that it encourages a short-term view. This concern is especially relevant with respect to the appraisal of ICT projects, which are of a long-term nature. There is support (mean 2.7606) for the statement, "The Payback model of financial appraisal encourages a short-term view" (Figure 6). Of the 44 respondents who supported the statement that the PB model encouraged a short-term culture, 39 (89 per cent) of these respondents also reported that they used the PB model in their appraisal of ICT capital projects. The use of the PB model may result from the fact that managers' are under both external and internal pressure to produce short-term results. The preoccupation with short-term results may influence some managers to sacrifice crucial new technology investments with substantial long-term benefits in order to show impressive short-term results (Lefley and Sarkis, 1997).

The overall disagreement (mean 1.9155) with the statement, "The 'Payback' model of financial appraisal is unsuitable for evaluating investments in ICT", clearly indicates that the respondents are of the opinion that the PB is suitable for the appraisal of ICT projects (Figure 7) even though, or possibly because, they accept that it encourages a short-term business culture. The overall negative response to this

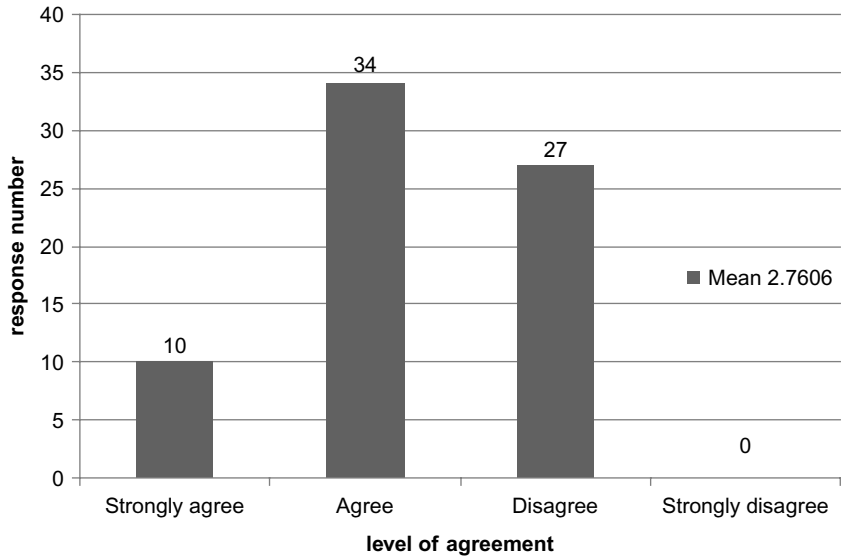


Figure 6.
Statement: the "payback" model of financial appraisal encourages a short-term view

Note: $n = 71$

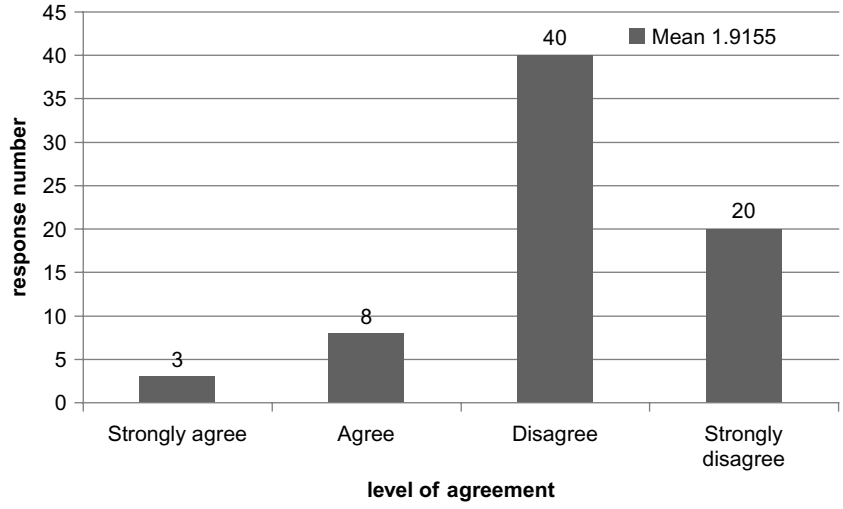


Figure 7.
Statement: the "payback" model of financial appraisal is unsuitable for evaluating investments in ICT

Note: $n = 71$

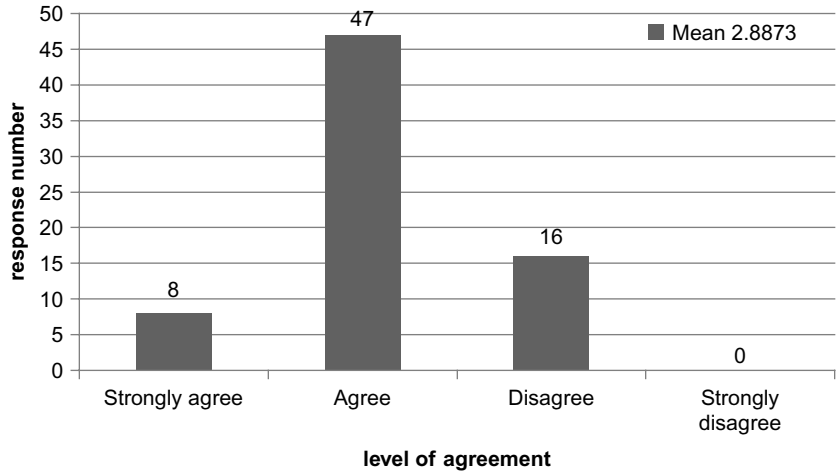
statement indicates, to some extent, that the respondents have given serious thought to the various statements and not just "agreed" with them all. Support for the PB is also confirmed, earlier in the paper, by the large number (87 per cent) of respondents who use the PB/DPB models in the appraisal of ICT projects. This support is contrary to academic opinion, which highlights the many defects of the PB model.

There appears to be some conflict between academics on the one hand who develop theoretical models and practitioners who demand models that are more pragmatic. Trahan and Gitman (1995) concluded from their survey of chief financial officers that, "sophisticated financial decision-making techniques are not practical – they have unrealistic assumptions, cannot be explained to top management and are difficult to apply". Anandarajan and Wen (1999) state:

> [...] researchers have attempted to develop evaluation measures for examining the effectiveness of IT. Some of these measures, however, though having academic value, have the problems of being esoteric and difficult to operationalize.

This conflict is highlighted by the strong agreement (mean 2.8873) with the statement; "Many of the appraisal models available to assess capital projects are too theoretical and difficult to apply in the real world" (Figure 8). 55 (77 per cent) respondents agreed with the statement of which eight "strongly agreed". The above view is also supported by a comment made by one of the respondents, "conventional appraisal techniques are widely regarded as being inadequate for ICT projects, but there is no consensus on alternative techniques". The second part of this comment reinforces the need for a consensus on "alternative techniques".

The argument for a more pragmatic approach to the appraisal of capital assets is further highlighted by the overwhelming support (mean 3.2254) for the statement, "A single practical (pragmatic) appraisal model that links together, finance, project-specific risk, and strategic issues would make the evaluation of ICT projects more meaningful" (Figure 9). 70 (99 per cent) respondents agreed with the statement of which 17 "strongly agreed". The strategic appraisal and justification of ICT projects goes beyond the standard ROI and other short-term financial models. The more complete appraisal of these projects requires the incorporation and consideration of strategic, operational, and economic factors. Elements of project risk also need to be considered. An example of a pragmatic solution to this problem is given in Lefley (2008), Heemstra and Kusters (2004), and Gunasekaran *et al.* (2001). One of the respondents, however, comments:



Note: $n = 71$

Figure 8.
Statement: many of the appraisal models available to assess capital projects are too theoretical and difficult to apply in the real world

> In my experience the only successful way of appraising major ICT projects is as part of the business planning round, building both costs and benefits into the business model and appraising the business plan as a whole rather than ICT projects individually. This of course depends on management having the vision to see the necessity of the ICT investment as a key enabler of the overall business plan!

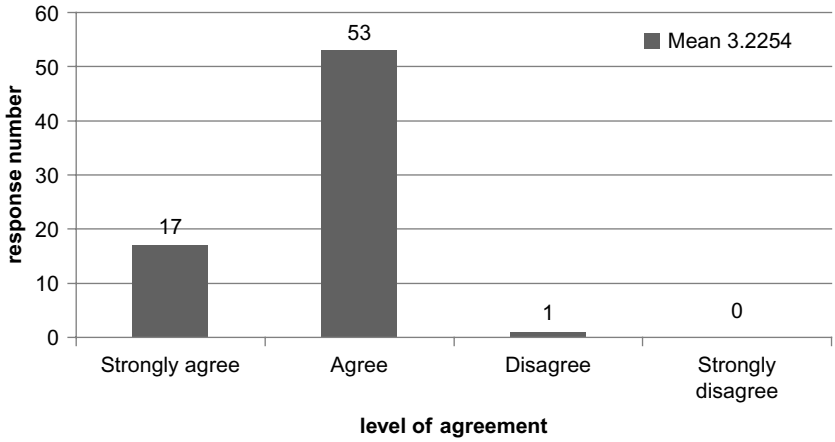
We would argue that appraising the "business plan" would benefit from a "pragmatic" appraisal model.

The fast pace of economic and technical change currently being experienced by many organisations is seen to be making it more difficult to appraise capital projects. This is evidenced by the very strong support (mean 3.1549) for the statement, "Today's capital projects are more difficult to evaluate because of the faster rate of economic and technical change now being experienced by many organisations" (Figure 10). 66 (93 per cent) respondents agreed with the statement of which 16 "strongly agreed". This reinforces the view put forward by Mohanty and Deshmukh (1998), that the decision-making process has become strategic because of, "the accelerating change in the environment of contemporary organisations". The strong agreement to this statement also infers that investment appraisal difficulties and problems are not just restricted to ICT projects but relate to all capital projects.

Conclusion

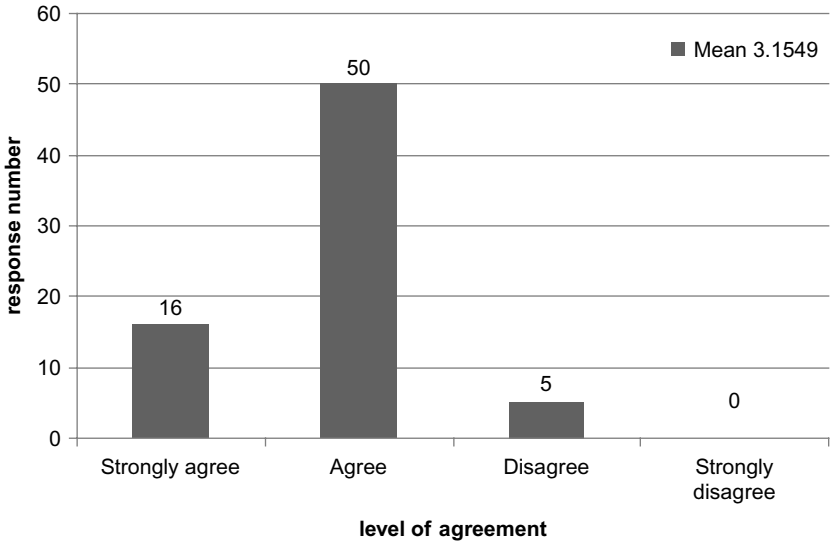
This research points to a continuing globalisation and the increasing need for ICT as a result. It also supports the premise that the most senior executives only stay in a particular job for a short period of time. Concern over the possible undue influence of a project champion during the project selection stage is also highlighted. It also appears that many practitioners believe that the existing investment appraisal models are too academic and are not practical – they have unrealistic assumptions, cannot be explained to top management and are difficult to apply.

Earlier research showed that post audits were not that common in practice. This current research, however, presents a contrary view claiming that post audits may be more common than originally thought. The importance of post audits is also recognised,



Note: $n = 71$

Figure 9.
Statement: a single practical (pragmatic) appraisal model that links together, finance, project-specific risk, and strategic issues would make the evaluation of ICT projects more meaningful



Note: $n = 71$

Figure 10.
Statement: today's capital projects are more difficult to evaluate because of the faster rate of economic and technical change now being experienced by many organisations

in that significant factors, which should have been known at the investment selection stage, are shown to have been revealed through a post audit. In addition, important factors, which possibly could not have been known at the pre-selection stage, were also identified. In the main, the factors identified point to deficiencies in the financial models used especially in the identification of costs and benefits. This may also reflect over optimism on the part of the appraisal team members and give further support to the optimism bias theory, which we have referred to earlier in the paper. This is an area that would benefit from a follow-on research study.

There is strong evidence to indicate that as a result of its ranking and popularity, PB is an important model used in the financial appraisal and risk assessment stages of capital investment procedures of both ICT and non-ICT projects. This is despite the concern expressed in the literature over the inappropriateness of the PB model in the appraisal of capital projects, especially new technology projects. The ROI/ARR holds some support, especially with respect to ICT projects, but evidence suggests that its popularity may be less than previously reported. It was expected that as ICT investments are classed as sophisticated, then sophisticated financial models would be used in its appraisal. However, the sophisticated DCF models appear to be unsuitable, or less preferred by management, in the appraisal of ICT projects with managers looking more to the unsophisticated PB model. There is a general belief, shown in the literature, that the non-sophisticated models such as PB support the sophisticated IRR/NPV models of investment appraisal. This research, however, suggests the reverse in that the IRR/NPV act in a supportive role to the PB. This research also shows that the NPV and IRR are favoured to the same extent, with possibly the IRR/MIRR showing only a slight preference.

There is strong support also for the use of capital investment appraisal teams and that the make-up of these teams does not always consist of the same individuals. There is conformation that the appraisal of ICT capital projects involves, in many instances,

IT specialists, which is what one would have expected. It is also shown that, with respect to non-ICT projects, IT specialists may not be part of the appraisal team.

Only half of organisation attempt to identify and assess the level of perceived project risk, with sensitivity analysis being the most favoured model followed by the "payback", while a greater number take risk into account. Probability analysis and option theory appear to have limited uses, while the CAPM and the C-E approach are less used than originally thought. There appears to be no significant difference between either ICT or non-ICT project appraisals in this respect. The evidence suggests that some companies are taking risk into account without formally assessing its level and importance. Some organisations are treating risk as a separate issue or do not make any adjustments for risk. Those that do make some adjustments for risk in the appraisal models used are making it more difficult to accept such projects.

The present rate of economic and technological change makes it more difficult to appraise most capital projects, not just ICT investments. It is essential to evaluate the financial, risk, and strategic aspects of all investments. Specific technical aspects of ICT should also be considered, as is the case with many other projects. This research confirms that organisations are, however, now taking a more sophisticated approach to investment appraisal in general, and not just relying on financial appraisal models – a more formal strategic and risk assessment is being undertaken.

This research presents evidence of the formal financial and risk assessment models used in the appraisal of both ICT and non-ICT capital projects. It shows that, based on the "rankings" of the financial models used and the usage of risk assessment models, there was no significant difference between ICT and non-ICT appraisals. Although this paper identifies that both a formal and informal assessment of strategic factors are undertaken, it does not identify, in any great detail, the approach adopted, or the models used, by the various organisations to the appraisal of strategic issues. The way strategic issues are taken into account is, therefore, an area for future research, especially the identification of the "formal" models used and the "informal" approaches adopted. It may be that strategic issues are perceived to more important than the financial and project specific risk issues.

The extensive nature of our survey has allowed us, not only to conclude (as far as our sample is concerned) that there is no significant difference between the financial and risk models used to appraise ICT and non-ICT projects, but to explore many other important issues regarding the appraisal and post investment evaluation of such projects. Because of this wider investigation, we are able to conclude that there are significant differences between the two types of projects in respect to other important appraisal/evaluation issues. Some of these issues relate to, for example, reasons given for not carrying out a formal appraisal of all ICT and non-ICT projects; departmental influence; formal/informal assessment of risk and strategic factors; the important of other factors considered during the project selection stage. These issues would benefit from a further in-depth study. This research has therefore been enriched by the wider aspects explored and the discovery of many important issues, and as a result we believe it is an important contribution to the literature in this field. We also believe that this research presents statistical results that will assist both practitioners and academics in a greater understanding of the appraisal of both ICT and non-ICT projects that will pave the way to better decision-making in the future.

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