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Petri Hallikainen

Helsinki School of Economics- Finland

Qing Hu

Florida Atlantic University- USA

Elisabeth Frisk

IT University of Göteborg- Sweden

Tero Päivärinta

Agder University College- Norway

Tom Eikebrokk

Agder University College- Norway

See next page for additional authors

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Authors

Petri Hallikainen, Qing Hu, Elisabeth Frisk, Tero Päivärinta, Tom Eikebrokk, and Antti Nurmi

The Use of Formal IT Investment Evaluation Methods in Organizations: A Survey of European Countries

Petri Hallikainen

Helsinki School of Economics, Finland
petri.hallikainen@hse.fi

Qing Hu

Florida Atlantic University, USA
qhu@fau.edu

Elisabeth Frisk

IT University of Göteborg, Sweden
Elisabeth@ituniv.se

Tero Päivärinta

Agder University College, Norway
Tero.Paivarinta@hia.no

Tom Roar Eikebrokk

Agder University College, Norway
Tom.Eikebrokk@hia.no

Antti Nurmi

Helsinki School of Economics, Finland
antti.nurmi@hse.fi

ABSTRACT

IT investment evaluation has been the subject of many academic studies and often rated as one of the top concerns of IT managers. While many studies have focused on the issue of how to evaluate IT projects, we are more interested in understanding why formal IT evaluation methods and techniques are used or not used in various organizations. In this paper, we present the preliminary findings of a large scale, multi-country survey on the usage of formal IT evaluation methods in organizations. Our results show that, despite the fact that most IT managers consider IT investment evaluation as a critical issue in IT management, only about one third of IT investment projects are subjected to some formal evaluation processes. What is even more interesting is that only about 10% of the organizations surveyed claim to use formal quantitative evaluation methods such as ROI, NPV, IRR, or C/B, while over half of the organizations report that their IT investment decisions are made based on experience and manager discretion. We find that the managers' perception about the usefulness of and attitudes toward formal evaluation methods and techniques correspond well to the percentage of usage in each of the three countries we surveyed. Our findings provide an update to the state of the art of IT investment evaluation usage in organizations and raise some interesting questions for future research.

Keywords

IT Investment, IT Evaluation, Formal Evaluation Methods, IT Value

INTRODUCTION

As the global economy moves further into the digital age, organizations of all kinds are increasingly relying on information technology (IT) for routine operations. They are also investing heavily in developing or acquiring information systems (IS) hoping to create or sustain competitive advantages in the global market. With trillions of dollars spent on IT/IS products and services each year world wide (Steinert-Threlkeld, 2002; WITSA, 2002), academics and practitioners alike have to wonder whether such investments actually accomplished their intended objectives. Thus it is not surprising that evaluating the economic payoff of IT investments have been one of the top IT management issues over the last couple of decades (Luftman 1996; Luftman 2005), especially during the economic down turn after the Internet bubble burst in early 2000. Yet studies that surveyed business and IT managers had consistently shown that less than half of the organizations use some sort of formal evaluation methods to justify the initial IT budgets (Lin and Pervan, 2003; Love, Irani and Edwards, 2005; Norris, 1996), and only about 50% of the organizations conduct formal post-implementation evaluation to determine the actual payoff of these projects (Seddon, Graeser and Willcocks, 2002).

This raises an interesting question: why do most business and IT managers believe IT investment evaluation is critical yet few of them actually conduct formal evaluations? On the surface, the answer seems to be the lack of widely accepted IT investment evaluation methodologies and frameworks, due to the high complexity of some evaluation schemes, the low reliability of others such as the discounted cash flow (DCF), the questionable utility of the micro-economics based methods,

as well as the difficulties managers often encounter when attempting to identify or quantify the financial benefits of IT investment projects (Ballentine and Stray 1999; Love et al. 2005). However, these reasons cannot explain why some organizations have adopted and implemented rigorous evaluation processes, as the surveys mentioned above also suggested.

We believe that, in order to answer this question, we must first determine what IT managers in various organizations are actually doing when it comes to IT investment evaluation and then understand why they are doing it in the particular ways. Even though there has been a steady stream of research in the IS literature on the subject of IT investment evaluation (Irani and Love, 2002), large scale and systematic surveys of organizations across countries in terms of what evaluation techniques are used, how they are used, and why or why not they are used have been rare. Prior studies usually either have small sample size or are from single country (e.g., Bacon, 1992; Ballentine and Stray, 1999; Lin and Pervan, 2003; Sangster, 1993; Tam, 1992). This paper presents the result of a large scale survey of organizations in three European countries with a focus on the first objective: the state of the art of IT investment evaluation in organizations. The findings of this paper fill a gap in the literature with information on what IT investment evaluation methods and techniques are used and how they are used with survey data from 427 organizations. The findings of this study also provide directions for future research on why certain methods and techniques are used and what types of organizations are most likely to use formal evaluation methods and techniques.

RESEARCH BACKGROUND

Scholars and practitioners have long recognized the importance of and the difficulties in justifying (ex-ante) and evaluating (ex-post) IT investment projects of various types in a variety of organizations. Even though IT has become the lifeline of most, if not all, organizations and firms in all industries are spending heavily on IT products and services (Hu and Quan, 2006), the effort of determining the exact benefits of these IT investments is often a futile and frustrating exercise (Irani and Love, 2001). The convoluted landscape of IT evaluations methods and techniques (see Irani and Love 2002 for a summary) has only exacerbated the difficulties. Yet, surveys have consistently shown that, despite the difficulties in and lack of standard methods and techniques for IT investment evaluations, a significant percentage of organizations have been using these methods and techniques for their ex-ante and ex-post evaluations. In one of the earliest studies, Bacon (1992) surveyed companies in USA, Britain, Australia, and New Zealand and found that while over 75% of the companies surveyed reported that discounted cash flow (DCF) techniques were used for evaluating IT investments, these criteria were applied to only about 40% of the projects. However, managers viewed financial criteria, such as Net Present Value (NPV), were not as critical as managerial criteria, such as supporting explicit business objectives when considering IT project decisions. In a survey of IT managers in the US companies, Tam (1992) found similar results. Although financial evaluation criteria were often used by over 50% of the firms, they often had minor impact on the decision making process regarding the initiation and termination of IT projects. Managers viewed strategic value as the most important criterion in evaluating IT investment projects. In the companies where financial evaluation criteria were used, managers often preferred the simpler ones, such as payback period, to the more complex ones, such as DCF indicators.

However, in more recent studies, the attitudes of IT managers toward using formal financial criteria for evaluating IT investment projects seem to become more positive and higher percentage of organizations started using some form of formal evaluation methods. In their survey of Australian companies, Lin and Pervan (2003) found that most managers believed that IT provides cost savings, process efficiency, and competitive advantages for their organizations. The majority of responding firms used some sort of benefit management processes to monitor the implementation of IT projects and about one third of these firms used formal evaluation methods. Similarly, a survey by Ballentine and Stray (1999) found widespread use of formal and DCF based evaluation methods in IT investment evaluation processes and that there was little evidence to suggest that the extent and nature of problems associated with IT projects are any different from those with other capital projects, other than the difficulties in interpreting results (more widespread for IT projects) and calculating the cost of capital (for other capital investments).

Yet many of these studies were based on small sample sizes and single countries, and some of them are quite out of date. It is unclear whether these trends have continued and are widespread. In the remainder of this paper, we describe a survey conducted in 2005 with a total sample size of 427 organizations in three European countries. By presenting the statistics of the survey, we hope not only to provide an updated picture of what organizations are doing today in terms of their IT investment evaluation practices, but also shed some new lights onto the old issue of IT investment evaluation, and provide some foundations for future research.

RESEARCH METHOD AND DATA

Development of the Survey Instrument

The survey instrument used in this study was developed as part of a collaboration project among researchers in Sweden, Finland, Norway, and USA. The main objectives of the project are to determine how formal IT investment evaluation methods and techniques are used in organizations in various countries and to understand why they are used in certain organizations but not in others. The survey instrument was developed from a theoretical model which is based on the theory of planned behavior (TPB) (Ajzen, 1988). However, in addition to the items related to the constructs in the research model, a number of questions were included to collect data about the demographics of the respondents as well as the extent to which various formal IT evaluation methods are used in their organizations. In this paper, we report the results mainly from this part of the survey. The original question items were prepared in English and were reviewed by the members of the research team. After a number of iterations, they were finalized and translated into Swedish, Finnish, and Norwegian for use in these three countries.

The questions were then reviewed in each country with a small number of colleagues and students and modifications were made based on the feedbacks received. The questionnaire was then pilot tested and refined with the help of 20 part-time students enrolled in the IT management program at the IT University of Göteborg, Sweden. Apart from studying, these students also hold similar positions in their respective organizations as those to whom the survey was intended. The subjects in the pilot group had a minimum of 5 years working experience. This procedure enhanced the relevance and accuracy of the questionnaire. After the pilot test, the questionnaire was refined again and items deemed to be irrelevant, redundant, or vague were modified or replaced. The entire questionnaire was then posted to online web survey sites with native languages for Sweden, Finland, and Norway respectively.

Survey Data Collection

After the survey instrument was made available in three countries in their native languages, solicitation for participate the survey began simultaneously in all three countries in May, 2005. In Sweden, invitations for participating in the study were e-mailed to members of the "Dataföreningens Panel." "Dataföreningen" is an independent organization directed towards the working with professionals in the industries with special interest in IT-related areas. The organization has approximately 30,000 members across Sweden. A special group of members of the organization, "Dataföreningens Panel," consists of 2,765 members with different occupations related to IT. We sent out email invitations to approximately 1,332 members identified as managers, CIOs, IT-strategists, consultants and project leaders. After the initial round, three reminders were sent during a period of four weeks. Approximately 421 e-mails were returned for various reasons (i.e. the addresses were no longer relevant, the respondents had changed occupation, or the respondents were no longer relevant for the survey), which reduced the actual population of respondents to 911. In the end, a total of 320 responses were collected from the web site and of which 312 were deemed usable for data analysis, resulting an effective response rate of 34%.

In Norway, the first round of invitations to participate in the study were e-mailed to a random sample of Norwegian companies drawn by the National Bureau of Statistics from their database of private and public companies with e-mail addresses and more than 50 employees. The e-mails were addressed to the IT-managers of these companies. This first round sample included 255 companies. In addition, invitations to participate were sent to IT-managers of 130 member firms of two regional branches of the Norwegian Computer Society (Dataforeningen). In august 2005, a second round was initiated, and invitations to participate were e-mailed to IT-managers in 45 companies employing former students of an IT department in a Norwegian university. Altogether, 65 e-mails were returned for various reasons (incorrect addresses, persons no longer employed, etc.), resulting in a final sample of 380 companies. From these, 42 usable responses were returned, resulting in an effective response rate of 12%. In the third round we phoned or e-mailed directly to 60 of the previously contacted companies in our region or who had otherwise an established contact with our institute and invited each individual IT-manager to take part in the survey, resulting in 21 additional responses and bringing the total response rate up to 17%.

In Finland, the survey was carried out as a two-staged online survey. In the first stage in May 2005, we contacted the Finnish Association for Information Technology (Tietotekniikan liitto) which is a non-profit association for people and companies interested in IT-related areas. Email invitations to participate in the survey were sent to 272 members of this association. After the first email we received only 16 responses. In late May 2005 we sent a reminder, after which we received 24 additional responses, resulting in a total of 40 responses. The response rate of the first round of the survey was about 15%. In August 2005 we approached the alumni of the Helsinki School of Economics for additional responses. We sent invitations to participate in the survey to managers and directors that had IT-related jobs. The communication with them was carried out by

the alumni relations coordinator and the researchers did not get the contact information of the target group. The second round of the survey resulted in 12 new responses and this left us with 52 total responses from Finland.

RESULTS AND DISCUSSIONS

Summary Statistics of Responses

Respondents in Sweden were from a cross section of industries and held a variety of titles. About one quarter was identified as CIOs or IT managers and over half chose other job titles. Service and manufacturing made up the majority of the industries (Table 1). The average size of the organizations is over 5700 employees and with average annual revenue of 3.4 billion SEK and an IT budget of over 101 million SEK. It is reasonable to infer that the majority of the survey respondents were from medium to large industrial organizations. Note the total number of responses in each categories fluctuate due to missing responses in these categories.

Industry	N	%	Annual Revenue (x1000 SEK; N=212)	IT Budget (x1000 SEK; N=150)	# of Employees (N=292)
Financial	16	5.1	942500 (n=4)	25000 (n=1)	5349 (n=15)
Manufacturing	32	10.2	8489704 (n=27)	139232 (n=24)	5518 (n=31)
Retail	5	1.6	163500 (n=4)	11677 (n=3)	293 (n=4)
Services	192	61.5	1808485 (n=131)	47563 (n=82)	5552 (n=179)
Transportation	2	0.6	5850000 (n=2)	180000 (n=2)	3500 (n=2)
Utility	6	1.9	12547500 (n=4)	49066 (n=3)	449 (n=6)
Other	59	18.9	4829362 (n=40)	213031 (n=35)	7426 (n=55)
Total	312	100	3422745 (n=212)	101767 (n=150)	5700 (n=292)

Table 1. Profiles of the Surveyed Organizations – Sweden

Industry	N	%	Annual Revenue (x1000 EUR; N=51)	IT Budget (x1000 EUR; N=51)	# of Employees (N=51)
Financial	3	5.7	37500	24500	237
Manufacturing	8	15.4	5789750	138406	11700
Retail	6	11.5	456750	71208	5400
Services	23	44.2	3206981	66936	15626
Transportation	2	3.8	857500	41000	5250
Utility	0	0	0	0	0
Other	10	19.2	671444	35800	2085
Total	52	100	2748044	63407	9951

Table 2. Profiles of the Surveyed Organizations – Finland

In the data set from Finland around 60% of the respondents were CIOs or IT managers. With respect to the different industries, the largest group of firms is from service, followed by manufacturing and retail (Table 2). There is one very large service firm in the Finnish data set, which makes the average number of employees very large. Without this firm the average number of employees in the service firms is 2700 and the total average is 4264. Overall, the organizations in the data set are relatively large, with around 40% of them having more than 1000 employees. The average annual revenue for the organizations is around 2.7 billion EUR and average IT budget around 63 million EUR.

In the Norwegian data set a majority of the respondents (60%) are CIOs. Almost half of the organizations are from the public sector (the “other” category), around 20% from the service sector and 18% from manufacturing (Table 3). The average annual revenue of these firms is 240 million EUR, average IT budget around 3.9 million EUR and the average number of

employees is 1108. Thus, the Norwegian organizations in this data set are somewhat smaller than the ones in the Swedish and Finnish data sets.

Industry	N	%	Annual Revenue (x1000 EUR; N=63)	IT Budget (x1000 EUR; N=63)	# of Employees (N=63)
Financial	4	6.8	500000	3191	206
Manufacturing	11	18.6	652100	12476	3175
Retail	2	3.4	1139375	18750	825
Services	12	20.3	83760	2155	248
Transportation	0	0.0	0	0	0
Utility	2	3.4	406250	9375	850
Other	28	47.5	76919	807	831
Total	59	100.0	240982	3950	1108

Table 3. Profiles of the Surveyed Organizations – Norway

Results on the Use of Formal IT Evaluation

In the online survey, we included questions that collected data on how organizations used formal evaluation methods and for what type of IT investment projects and other related information. Table 4 shows some of the summary statistics that shed lights on these interesting issues. For example, about one third of the respondents in Sweden and Finland reported that their organizations use formal methods for all types of IT investment projects, but in Norway formal methods are used for all IT projects only in 19% of the organizations. On the other hand, more than one third of the Swedish and Norwegian companies indicated that their organizations rarely use any formal methods, whereas the methods are rarely used only in about 6% of Finnish companies. This gives us reason to infer that managers in Finland have more favorable attitudes toward the use of formal evaluation methods than those in the other two countries.

In terms of how formal the evaluation process is, about half of the Swedish and about 63% of the Norwegian firms reported that the decisions on IT projects are based on experience and managerial discretion, whereas this was true only in about 20% of Finnish firms. It is also interesting to note that none of the Finnish firms indicated that they use only qualitative methods, but almost 70% of them indicated that they use a combination of quantitative and qualitative methods.

With respect to evaluating IT investments over their life-cycle, it is interesting to note that around 63% of the Norwegian firms reported that they conduct evaluations both before and after IT implementation. Therefore, in Norway, organizations do conduct IT evaluations rather regularly, but they do not apply formal methods for that purpose as often as, for example, their counterparts in Finland.

It should be noted that the percentage numbers are calculated within each category and the number of total responses across categories vary due to missing responses on certain questions. As a result, the percentages may not be compared across categories. The missing responses made the percentages less accurate but the overall distribution should have not been affected.

Furthermore, we asked the respondents to determine their overall attitudes toward applying formal evaluation methods for IT investment evaluations in three areas based on a 5-point Likert scale: 1) formal methods perceived as negative vs. positive 2) formal methods perceived as useless vs. useful, and 3) formal methods perceived as destructive vs. constructive. The results are shown in Table 5. The respondents in Finland seem to have the most positive attitudes towards formal methods and they also perceive formal methods as rather useful. We may infer from the results that the attitudes towards the use of formal methods in Norway seem to be considerably less favorable than in Finland. The t-tests show that the means between Sweden and Finland and between Norway and Finland are all statistically different from each other. One reason for the difference could be that the organizations in the Norwegian data set are relatively small and it may be that smaller organizations don't use formal IT evaluations as frequently as larger ones. There could as well be some country-specific issues that might explain the results and finding the reasons for these differences is one of the most interesting future research paths for us.

Category	Usage Profile	Sweden	Norway	Finland
Frequency	All IT Projects	30.9	19.0	33.3
	Large Projects Only	18.0	19.0	21.6
	Large & Medium	16.7	25.4	39.2
	Rarely Used	34.4	36.5	5.9
Complexity	Only quantitative methods (e.g., ROI, NPV, IRR, C/B) are used	12.0	3.2	9.8
	Only qualitative methods (e.g., case analysis) are used	4.4	1.6	0.0
	Both quantitative and qualitative methods are used	34.1	32.3	68.6
	Decisions are based on experience and managerial discretion	49.5	62.9	21.6
Completeness	For before implementation justification only	35.3	30.6	41.2
	For after implementation evaluation only	12.9	6.5	2.0
	For both before and after	51.7	62.9	56.9

Table 4. Usage of IT Investment Evaluation – comparison of three countries

It is also interesting to note that the differences in the managers' perception on the usefulness of and attitudes toward formal evaluation methods among the three countries correspond well with the actual usage of these methods in these countries, as shown in Table 4. For example, Finnish managers seem to have the most positive attitudes and perception about formal evaluation methods among all three countries, and Finnish firms also have the highest percentage of usage of formal methods in all three categories (frequency, complexity, and completeness). They are followed by Swedish managers and then Norwegian managers. This order is consistent with the order of formal evaluation methods usage as shown in Table 4. However, this observation is only intuitive and future statistical analyses will be needed to substantiate such relationship. On the other hand, this observation is also consistent with the theory of planned behavior (Ajzen, 1988) which predicts that attitudes determine behavioral intention and eventually the behavior.

Perception of formal methods	Sweden		Norway		Finland	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Positive attitude towards formal methods	3.69	1.062	3.51	.766	4.04	.747
Perceived usefulness of formal methods	3.71	1.010	3.49	.924	4.10	.806
Formal methods perceived as constructive	3.70	.919	3.48	.698	3.96	.692

Table 5. Perception of formal IT evaluation methods – comparison of three countries

We also asked the respondents how they perceive the role of IT in their organization based on a 5-point Likert scale (1-disagree, 3-neutral, and 5-agree) about various statements of IT in their organization. This is because Bassellier, Reich and Benbasat (2001) identified the role of IT in the organization in their research model as one of the factors that affect the intention for proactive behavior, such as applying formal IT evaluation methods, towards IS projects. Schein (1989) developed a typology of IT vision in organizations and introduced the following categories: "automate", "informatize up/down", and "transform". In a previous study, Cross, Earl and Sampler (1997) examined the organizational and IT

transformation process at the British Petroleum and found that, as a result of the transformation, the systems analysts were given new kind of responsibilities and formal cost benefit analyses were required for all projects. We could thus expect that there would be visible effects on the organizational norms and culture regarding IT evaluation in organizations where transformational role of IT dominates.

Table 6 shows that in Norway and Finland the respondents often perceived the role of IT to be informative, whereas in Sweden the role of IT was often perceived as automating business processes. It is worth noticing that Norway has the highest average for both informate and transform roles of IT, thus we may infer that IT-enabled changes seem to be the most transformational in Norway. However, the changes have not resulted in an increased use of formal methods, but rather the organizations in Norway rely on managerial knowledge and experience in evaluation and they do conduct evaluations both before and after IT implementations (see Table 4), which is important for learning. In Finland, the respondents often identified the role of IT to be informative and they seemed to have the most favorable attitudes toward using formal IT evaluation methods. We believe that this phenomenon may be attributed to the factor that IT investments of informative type are easily imitated by others and are not supposed to create any sustainable competitive advantage. In this kind of situation there is a greater need to provide sound financial justifications for the IT investments and this might explain the favorable attitudes towards formal methods and their higher degree of usage in Finland. The results for Sweden are somewhat surprising, since one might expect that in organizations with the vision to automate the IT projects would typically involve costs and benefits that would be rather easily quantifiable and this would favor the use of quantitative methods for evaluation, yet about half of the Swedish companies said they use managerial decisions for evaluation. It should be noted that the percentage of companies using only quantitative methods was highest in Sweden. Moreover, about 13% of Swedish firms said they conduct evaluations only after IT implementation.

Role of IT in the organization	Sweden		Norway		Finland	
	Mean	Std. deviation	Mean	Std. deviation	Mean	Std. deviation
Automate	3.75	1.178	3.56	1.196	3.55	1.222
Informate up/down	3.11	1.085	4.19	.807	3.94	1.103
Transform	3.10	1.201	3.43	1.103	3.16	.987

Table 6. Role of IT in the organization – comparison of the three countries

CONCLUSIONS

The survey conducted in the study shows interesting results on the use of formal IT evaluation methods in organizations. Overall, the usage of quantitative methods is rather low and in about half of the companies IT decisions are made based on managerial discretion, which is in line with the findings of previous studies. More interestingly, we found that the managers' attitudes towards the use of formal methods well correspond with the actual usage of the methods. Furthermore, we found rather clear differences between the three countries studied, which can be attributed to differences in the culture and industrial structure of the countries as well as the difference in organization sizes in the samples of each country. For example, we found that while both Norwegian and Finnish managers view IT as informative, their attitudes toward and level of usage of formal evaluation methods are quite different. Finnish managers seem to have the most favorable attitudes towards formal evaluation methods and the highest degree of use of formal methods, while Norwegian managers seem to have least favorable attitudes toward and the lowest level of usage of formal evaluation methods.

There are various avenues for future research. First, more sophisticated statistical analyses could be used to ascertain the complex relationships among the variables that influence the managers' attitudes toward formal evaluations methods and their actual use. Second, future studies could investigate more closely the differences between the three countries not only in terms of industry structure and firm size but also in terms of cultural differences at organization and individual levels. And finally, it will be interesting to study in depth the contextual factors, such as the strategic role of IT in the organization, IT governance structure, competitiveness of the industry, and the overall financial strength of the firm to find out how they affect the use of formal IT evaluation methods.

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