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IT INVESTMENT EVALUATION: WHY HASN'T IT BECOME AN ORGANIZATIONAL ROUTINE?

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Abstract

In this study we attempt to understand why formal evaluations of IT investment projects have not yet become an organizational routine. Using survey data gathered from business and IT managers in Sweden, we tested the research hypotheses about the factors influencing the attitudes and behaviour of managers towards using formal evaluation methods based on the theory of planned behaviour. We found that the intent to use formal evaluation methods in an organization is determined by the attitudes of the managers towards the formal methods, the common beliefs of the organization about the formal methods, and the perceived ability to perform formal evaluations. Interestingly, we found that the attitudes toward formal methods are determined mostly by the perceived usefulness of the methods and not by the perceived ease of use of these methods, suggesting that the decision to use formal methods is most likely based on rational analyses rather than individual preferences. We also found that awareness and self-efficacy contribute to the use of formal methods via influences on organizational beliefs and perceived ability to perform evaluation tasks. These findings provide some interesting managerial implications for advocating the use of formal methods in organizations.

Keywords: IT Investments, Return on Investment, Formal Evaluation Methods.

1 INTRODUCTION

With billions of dollars invested in information technology (IT) projects and related services each year, one would assume that business and IT managers conducted thorough analyses of return on investment (ROI) of these projects before starting and after completion. This is why evaluating the economic payoff of IT investments has been one of the top IT management issues over the last decade (Luftman 1996; Luftman & McLean; 2004; Luftman 2005). Yet studies that surveyed business and IT managers have consistently shown that less than half of the organizations use some sort of formal investment evaluation methods to justify IT projects (Norris, 1996; Lin and Pervan, 2003; Love et al., 2005), and only about 50% of the organizations conduct formal post-implementation evaluation to determine the actual payoff of the IT projects (Seddon et al., 2002).

This raises the fundamental research question of this study: if most business and IT managers believe IT investment evaluation is critical, why do so few of them actually conduct formal evaluations? On the

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

We believe that prior studies on IT investment evaluation have focused largely on the mechanics of evaluation process and ignored the most significant drivers of the process, i.e., the organizational actors who are in charge of initiating and conducting such evaluations. We argue that IT investment evaluation is not simply an issue of methods and mechanisms, but a consequence of interactions between technology, methodology, organizational culture, and human beliefs and attitudes towards the evaluation. That is, it is more a social process than a mechanical or functional process (Jones and Hughes 2001) that requires a social behavioural model to fully understand it. Drawing on the theory of planned behaviour (Ajzen, 1988) and the literature of technology acceptance (Davis 1989; Venkatesh et al. 2003; Pavlou and Fygenson 2006), we posit that the beliefs and attitudes of IT and business managers towards IT investment evaluations, the overall organizational belief about formal evaluation methods, and the individual capabilities and skills of performing formal evaluation methods are the key determinants on whether an organization adopts formal evaluation systems and uses them consistently over time. In the remainder of the paper, we develop our research model and hypotheses based on the extant literature and present the results of structural equation modeling using survey data collected in Sweden.

2 THEORETICAL DEVELOPMENT

Before we elaborate on the theoretical foundations of our research model, it is important to distinguish between the formal evaluation methods and the informal, sometimes politically motivated, evaluation processes used in many organizations. In this study our focus is on the formal evaluation methods, which are defined as methods and processes implemented by an organization for the purpose of justifying the initiation and evaluating the impact of an IT investment at different stages of the project life cycle. Commonly used formal methods include discounted cash flow analysis (ROI, NPV, IRR), cost/benefits analysis, balanced scorecard evaluation, and formal capital budgeting processes.

Recognizing that the adoption and use of formal methods are complex social processes (Jones and Hughes 2001; Serafeimidis and Smithson 2000), we focus our attention on the social theories that help understand and predict human behaviour when faced with new technologies and innovations. One such theory that has gained broad acceptance in the organizational and IS literature is the theory of planned behaviour (TPB) by Ajzen (1988) which evolved from the theory of reasoned action (TRA) (Ajzen and Fishbein 1980). TPB posits that human behaviour on whether or not to perform a certain action is determined by his or her intention to perform the action of interest. This behavioural intention is in turn determined by three antecedents: attitude towards the behaviour (ATB), subjective norm (SN), and perceived behavioural control (PBC). ATB refers to a person's judgment on whether it is good or bad to perform the behaviour of interest; SN is a person's perception of the social pressure to perform or not perform the behaviour in question; and PBC refers to the perceived capability of performing the behaviour (Ajzen, 1988).

To understand the behaviour of the organizational actors, namely the business and IT managers who are in charge of initiating, evaluating, approving, and assessing IT investment projects in organizations, we draw on the TPB to formulate our basic research model and hypotheses. In adapting TPB to the context of IT investment evaluation, one key issue is to identify the antecedents for each of the three first-order constructs (ATB, SN, and PBC) in the TPB model. These antecedents should capture the unique characteristics of the cognitive processes that influence the formulation of the business and IT managers' perceptions on and opinions of the value of implementing formal IT evaluation processes in their organizations. In essence, adopting and implementing a formal IT investment evaluation process is similar to adopting and implementing other technological innovations. From this vantage point of view, we develop the antecedents based on the literature of technology acceptance, with the consideration of

the fact that unlike adopting a new technological innovation, adopting formal IT investment evaluation does not necessarily create additional value to an organization and its benefits could be easily manipulated due to organizational politics. To identify the antecedents, we draw on the technology acceptance model (TAM) (Davis 1989; Venkatesh et al. 2003), computer user behaviour studies (Pavlou and Fygenson, 2005; Hu and Dinev 2005), and IT evaluation literature (Farbey et. 1999; Irani and Love 2001; Lin and Pervan 2003; Love et al. 2005). An extensive literature review yielded an initial set of nine antecedents, including perceived usefulness, perceived ease of use, perceived political benefits, influence from superiors, influence from peers, influence from professional networks, awareness of evaluation methods, perceived controllability believes, and self-efficacy on evaluation methods. However, preliminary screening using exploratory factor analysis found that some of the antecedents were not distinguishable from each other. As a result, only four antecedents are deemed to be independent and discriminative: perceived usefulness, perceived ease of use, awareness of evaluation methods, and self-efficacy on evaluation methods. These four antecedents and the TPB model form our base research model, as shown in Figure 1.

Two of the four antecedents, perceived usefulness and perceived ease of use, were adapted from the TAM literature. TAM assumes that the intention to use and the actual use of technology can be predicted by the usefulness (rational) and the ease of use (cognitive) of the technology. We expect the same to be true for using formal IT evaluation methods and propose that the usefulness and the ease of use of evaluation methods affect the attitude towards evaluation and as a result the intent to use formal evaluation of IT investments. Hence:

> *H1: Perceived usefulness of formal evaluation methods has a positive influence on the attitudes towards using formal evaluation methods.*
>
> *H2a: Perceived ease of use of formal evaluation methods has a positive influence on the attitudes towards using formal evaluation methods.*

In a study of online user purchase behaviour, Pavlou and Fygenson (2006) show that there is a significant positive relationship between perceived ease of use (PEU) and perceived behavioural control (PBC). In the context of this study, since both constructs deal with the user's perception of the difficulties involved in using formal methods, it is reasonable to suspect that users will perceive a higher degree of control over using formal methods that are simple and straightforward, therefore:

> *H2b: Perceived ease of use of formal evaluation methods has a positive influence on the perceived behavioural control over using formal evaluation methods.*

The construct of awareness has been used in IT research as an important predictor of user behaviour towards new technologies (Hu and Dinev 2005; Stafford and Urbaczewski 2004; Goodhue and Straub 1991). Recent development on extending the TPB model to the technology domain has introduced awareness as an important antecedent for the formation of user attitudes, subjective norm, and perceived behaviour control (Hu and Dinev 2005; Dinev and Hart 2005). In a study of user behaviour towards using anti-spyware technologies, Hu and Dinev (2005) find that awareness has significant impacts on user attitudes and subjective norms of social groups. In the context of IT investment evaluation, awareness is about appreciating the needs, impetus, and specificity of the issues, techniques, and processes involved in using formal evaluation methods. Here we propose that managers with greater awareness of different evaluation methods will more likely find a formal method with characteristics that fit well with the evaluation task at hand and the organizational environment. As a result, we expect a more positive attitude towards formal evaluation methods in this case. This leads to:

> *H3a: Awareness of formal evaluation methods has a positive influence on the attitudes towards using certain formal evaluation methods.*

Hu and Dinev (2005) find that awareness has a significant impact on the formation of group norms regarding the use of anti-spyware technologies. This is because when more users are aware of a specific technology, a higher level of communications among the users usually follows, and stronger group norms are formed. In the context of this study, we argue that higher degree of awareness of various evaluation techniques and issues involved in using these techniques among the business and IT managers will more

likely foster an organizational environment in which the use of formal evaluation methods is viewed more favorably. Hence:

H3b: Awareness of formal evaluation methods by individuals has a positive influence on the subjective norms of an organization regarding the use of formal evaluation methods.

According to Ajzen (1988), perceived behavioural control reflects the individual's beliefs regarding access to necessary resources needed to perform the behaviour. When the evaluator is aware of potential evaluation methods, this knowledge of methods facilitates the comprehension of various methods and necessary resources. As a result, greater awareness of evaluation methods should increase the evaluator's set of options and flexibilities when choosing an evaluation method and it is more likely that the evaluator will perceive the use of formal evaluation methods as realistic and practical in his or her specific environment. Thus, we propose:

H3c: Awareness of evaluation methods by individuals has a positive influence on the perceived behavioural control regarding the use of formal evaluation methods.

Research within the field of social learning and computer usage has identified self-efficacy as a key construct in explaining individual behaviour differences (Compeau and Higgins 1995; Venkatesh et al. 2003). Self-efficacy reflects the individual's belief in being capable of successfully executing a certain course of behaviour. Empirical studies have found that self-efficacy influences the choice of engaging in the behaviour, the efforts in performing it, and the persistence shown in accomplishing the behaviour (Bandura 1982). It is thus reasonable to expect that a manager with a low self-efficacy on formal evaluation methods will tend to avoid or reduce the use of formal evaluation methods. We will therefore investigate the following hypothesis:

H4: There is a positive relationship between self-efficacy on evaluation methods and perceived behavioural control regarding the use of formal evaluation methods.

According to the theory of planned behaviour, behavioural intention is formed by attitudes, perceived behavioural control and subjective norms (Ajzen 1988). Numerous prior studies have provided empirical support to these basic relationships in various contexts. Therefore, it is reasonable to believe that the intention to evaluate information systems using formal methods is predictable from attitudes, subjective norms and perceived behavioural control, as TPB suggests. Hence,

H5. There is a positive relationship between attitudes towards using formal evaluation methods and intent to evaluate using formal methods.

H6. There is a positive relationship between subjective norms regarding the use of formal evaluation methods and intent to evaluate using formal methods.

H7. There is a positive relationship between perceived behavioural control regarding formal evaluation methods and intent to evaluate using formal methods.

These hypothesized relationships are shown in Figure 1. In the next section, we describe the process in which a measurement instrument was developed based on this model and data were collected for testing these relationships.

3 RESEARCH METHOD AND DATA

3.1 Development of the Survey Instrument

The measurement items for the TPB constructs - behavioural intention for using formal evaluation methods (ITE), attitudes towards formal evaluation (ATE), subjective norm (SN), perceived behavioural control (PBC), perceived usefulness (PUE), perceived ease of use (PEU), self-efficacy (SEE), and awareness of evaluation methods and techniques (AEM), were all constructed based on extant instruments in the literature. More specifically, ITE, ATE, and SN were adapted from the instruments of Taylor and Todd (1995) and Pavlou and Fygenson (2006), the measures of PBC was based on Koufaris (2002) and Pavlou and Fygenson (2005), PUE and PEU were based on Venkatesh and Davis (1996),

Taylor and Todd (1995), and Koufaris (2002), SEE items were based on Bandura (1986) and Pavlou and Fygenson (2005), and the AEM items were based on Dinev and Hu (2005).

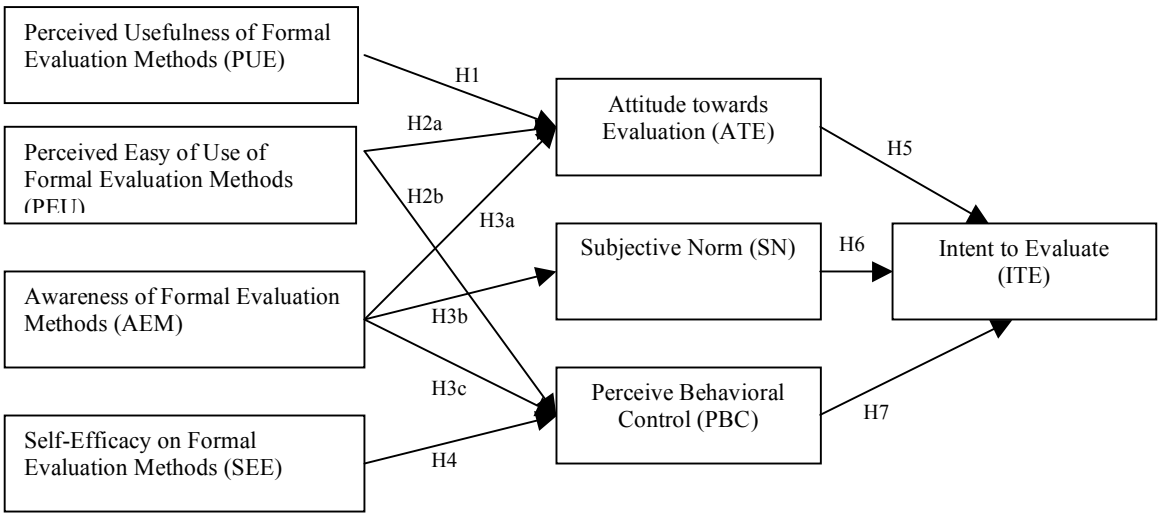

Figure 1: Research Model and Hypotheses

All items were implemented as reflective measures of the latent constructs. Each construct uses at least three items, and some with four, using 7-point Likert scales. 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 of various IT evaluation methods used in their organizations. The original question items were prepared in English for reviewing 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 countries.

The questions were then reviewed in each country by a small number of colleagues and students and modifications were made based on the feedback received. The questionnaire was then pilot tested and refined with the help of 20 half-time students enrolled in the IT management program at the IT-University of Göteborg, Sweden. Apart from studying, these students also held 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 on web survey sites in Sweden, Finland, and Norway respectively. This paper reports the data and results based on the data collected from the survey site in Sweden.

3.2 Survey and Data Collection

In the beginning of May 2005, invitations for participating in the study were e-mailed to members of the "Dataföreningens panel" in Sweden. "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. 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 of which 312 were deemed usable for data analysis, resulting in an effective response rate of 34%.

4 RESULTS AND ANALYSES

4.1 Summary Statistics of Responses

As shown in Table 1, respondents 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. The average size of the organizations was over 5.700 employees with average annual revenue of 3.4 billion SEK and 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 that the total number of responses in each category fluctuated due to missing responses in these categories.

Title	**N**	**%**	**Average Years at Position**			**Education Degree**	
			< 5	**5-15**	**15**	**Non-College**	**College**
CIO	17	5.5	9	7	1	4	13
IT/Manager	60	19.4	32	22	6	20	40
Business Manager	57	18.4	18	23	16	18	39
CFO	7	2.3	3	2	2	3	4
Other	169	54.5	80	60	29	37	132
Total	**310**	**100**	**142**	**114**	**54**	**82**	**228**

Table 1: Profiles of the Survey Respondents – Sweden

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 2: Profiles of the Surveyed Organizations – Sweden

In the online survey, we also included questions that collected data on how the responding organizations used formal evaluation methods, what formal evaluation methods were used, for what type of IT investment projects, and other related information. Table 3 shows some of the summary statistics that shed light on these interesting issues. For example, about one third of all respondents report that their organizations use formal methods for all types of IT investment projects, and another one third indicated that their organizations rarely use any formal methods. This is consistent with the findings of prior surveys with a slight improvement in terms of the use of formal evaluation methods.

In terms of how formal the evaluation process is, about 39% of the respondents indicated that formal techniques and procedures were used while the other 61% reported using informal evaluation methods, such as meetings and managerial decisions. Note that in terms of formal evaluation methods and techniques used, only 22% indicated that commonly known formal methods such as ROI, NPV, IRR, and payback were used while over 51% indicated that Cost/Benefit analysis was used, suggesting the popularity of this particular method.

It should be noted that the percentage numbers are calculated within each category and the number of total responses across categories vary because of 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 not have been affected.

Category	Usage Profile	Frequency	%
Frequency	All IT Projects	98	30.9
	Large Projects Only	57	18.0
	Large & Medium	53	16.7
	Rarely Used	109	34.4
Formality	Using formal techniques and procedures with documentation	77	24.3
	Using formal procedures without specific techniques	47	14.8
	In meetings without formal procedures and specific techniques	92	29.0
	Evaluation is conducted as a managerial decision	101	31.9
Complexity	Only quantitative methods (e.g., ROI, NPV, IRR, C/B) are used	38	12.0
	Only qualitative methods (e.g., case analysis) are used	14	4.4
	Both quantitative and qualitative methods are used	108	34.1
	Decisions are based on experience and managerial discretion	157	49.5
Complete-ness	For before implementation justification only	112	35.3
	For after implementation evaluation only	41	12.9
	For both before and after	164	51.7
Methods	ROI	53	16.7
	NPV, IRR, Payback	19	6.0
	Cost/Benefits	162	51.1
	Balanced Scorecard	23	7.3
	EVA (Economic Value Added)	7	2.2
	Other method	15	4.7
	Combination of methods	8	2.5
	None of the above	30	9.5

Table 3: Usage of IT Investment Evaluation – Sweden

4.2 Assessment of the Measurement Model

To ensure the discriminative validity and reliability of the measurement items of the survey instrument, confirmative factor analysis (CFA) was performed using LISREL 8.0 with each observed variable item restricted to load on its *a priori* factor. All the necessary steps in the measurement model validation and reliability assessment were conducted following the validation heuristics recommended for structural equation modeling by Gefen et al. (2000).

Goodness of Fit Indices	Initial Model	Revised Model	Desired Levels
X^2	661.89	469.24	Smaller
df	271	245	--
X^2/ df	2.44	1.91	< 3.0
GFI	0.86	0.90	> .90
AGFI	0.82	0.86	> .80
Standardized RMR	0.07	0.05	< .05
RMSEA	0.07	0.05	.05 - .08
NFI	0.89	0.91	> .90
CFI	0.93	0.96	> .90
IFI	0.93	0.96	> .90
Number of Latent Variables	8	8	--
Total Number of Items	26	25	--

Table 4: Goodness of Fit Indices of Measurement Model - Sweden

The initial analysis resulted in a converged, proper solution with a low χ^2 per degree of freedom and a good fit as indicated by the listed fit indices in Table 4. However, detailed analysis of the modification indices revealed that dropping one item in the ITE construct could improve the model fit further. We decided to drop this item and, as shown in Table 4, the revised model has better fit indices than the original one.

A measure of internal consistency of the scales is the composite reliability computed in conformance with the formula prescribed by Werts et al. (1974). Compared to Cronbach's alpha which provides a lower bound estimate of internal consistency, composite reliability is a more rigorous estimate for reliability (Chin and Gopal 1995). A composite reliability greater than .5 would indicate that at least 50% of the variance in a measurement is captured by the trait variance and that the variance captured by the measures is greater than that captured by the errors. The recommended values for establishing a tolerable reliability are above .70 (Werts et al. 1974; Gefen et al. 2000) and for strong reliability - above .80 (Koufteros 1999). Cronbach's alpha and other reliability measures were generated using SPSS, and factor loading statistics, average variance extracted (AVE) and the composite reliability statistics were generated or calculated using LISREL, shown in Table 5. It can be seen that all reliability statistics indicate a strong measurement model for this study.

Constructs	**# of Items**	**Mean (STD)**	**Cronbach's Alpha**	**Composite Reliability**	**AVE**	**Loadings (t-stats)**
Attitudes towards Evaluation (ATE)	3	3.57(1.07) 3.59(1.02) 3.69(1.04)	0.90	0.90	0.74	0.89(19.49) 0.89(19.49) 0.80(16.61)
Awareness of Methods (AEM)	4	3.30(1.15) 3.06(1.24) 2.83(1.24) 2.75(1.26)	0.84	0.85	0.50	0.68(12.77) 0.66(11.93) 0.77(14.87) 0.82(16.34)
Intention towards Evaluation (ITE)	2	2.53(1.28) 2.38(1.16)	0.90	0.90	0.82	0.87(17.40) 0.94(19.10)
Perceived Behavioural Controllability (PBC)	3	3.41(1.23) 3.23(1.30) 3.16(1.35)	0.83	0.85	0.67	0.58(10.68) 0.94(19.78) 0.86(17.53)
Perceived Ease of Use (PEU)	3	2.99(0.93) 2.99(0.62) 2.72(0.93)	0.90	0.91	0.76	0.87(19.21) 0.98(23.39) 0.76(15.78)
Perceived Usefulness (PUE)	4	3.76(0.91) 3.76(0.95) 3.41(0.99) 3.54(1.04)	0.88	0.91	0.67	0.78(16.10) 0.88(19.12) 0.80(16.52) 0.77(15.52)
Self-Efficacy (SEE)	3	3.84(1.03) 3.56(1.01) 3.55(1.01)	0.86	0.87	0.69	0.70(13.51) 0.92(19.56) 0.85(17.62)
Subjective Norm (SN)	3	2.62(1.15) 2.74(1.21) 2.81(1.17)	0.92	0.95	0.81	0.91(20.58) 0.89(19.92) 0.87(19.04)

Table 5: Summary of Assessment Statistics of Measurement Model – Sweden

Discriminant validity of the measurement model refers to the extent to which measures of the different model constructs are unique and is generally assessed by testing whether the correlations between pairs of dimensions are significantly different from unity (Anderson and Gerbing 1988). Thus discriminant validity is supported if the correlations between constructs are not equal or close to 1.00 within the 95% confidence intervals (Bagozzi 1991). The highest value of the correlations in this study is .61 between AEM (awareness) and ATE (attitude towards evaluation). The discriminant validity of the measurement can also be verified based on the square root of the AVE of each constructs. According to Fornell and Larcker (1981), the square root of AVE for each construct should be greater than the levels of

correlations involving that construct. As it is shown in Table 6 in bold numbers, this condition is easily satisfied in our model.

	PBC	SEE	AEM	SN	PUE	PEU	ATE	ITE
PBC	**0.82**							
SEE	0.19	**0.83**						
AEM	-0.02	0.24	**0.71**					
SN	-0.35	0.07	0.41	**0.90**				
PUE	-0.16	0.33	0.55	0.39	**0.82**			
PEU	-0.01	0.21	0.45	0.38	0.56	**0.87**		
ATE	-0.06	0.28	0.37	0.27	0.59	0.33	**0.86**	
ITE	0.10	0.12	0.61	0.16	0.37	0.25	0.27	**0.91**

* Bold numbers in the diagonal row are square roots of the AVEs of the constructs

Table 6: Discriminant Validity Measures of Measurement Model – Sweden

4.3 Structural Equation Analysis with LISREL

After confirming the goodness fit, reliability, and discriminant validity of the measurement model, we proceeded to estimate the path coefficients of the structural model (Figure 1) using LISREL and test the research hypotheses. Once again the goodness of fit of the structural model was evaluated first using the indices generated by LISREL. As can be seen in Table 7, all indices are around the borderline of the desirable levels. Though not as good as they were in the measurement model, these values still can be considered satisfactory.

Goodness of Fit Indices	**Revised Model**	**Desired Levels**
X^2	687.68	Smaller
df	259	--
X^2/ df	2.65	< 3.0
GFI	0.86	> .90
AGFI	0.82	> .80
Standardized RMR	0.10	< .05
RMSEA	0.07	.05 - .08
NFI	0.87	> .90
CFI	0.92	> .90
IFI	0.92	> .90
Number of Latent Variables	8	--
Total Number of Items	25	--

Table 7: Goodness of Fit Indices of Structural Model - Sweden

The estimated path coefficients for the hypothesized relationships in the research model are presented in Figure 2. Bold numbers indicating the estimates are statistically significant at the 0.05 level. The results clearly confirmed the relationships hypothesized by the theory of planned behaviour (TPB). That is, all three hypotheses based on TPB (H5, H6, and H7) were supported by the data at the .05 significant level. This is a strong endorsement to the robustness of the theory and an indication that TPB can be used to predicate the behaviour of IT and business managers regarding the use of formal evaluation methods and techniques for IT investments. The results suggest that positive attitudes towards using formal methods (ATE), a favorable organizational or professional environment for using formal evaluation (SN), and

adequate skills and knowledge about formal evaluation methods and techniques (PBC) can indeed lead to increased use of formal evaluation methods for IT investment projects.

On the other hand, the antecedents we have identified produced mixed results. On the positive side, hypotheses H1, H3b, and H4 are supported, suggesting that perceived usefulness (PUE), awareness (AEM), and self-efficacy (SEE) of formal evaluation methods and techniques indeed play significant roles in influencing the intentions of managers towards using formal methods. More interestingly, perceived ease of use (PEU) was found to have no statistical effect on the behavioural intentions of the managers towards using formal methods. Coupled with the other results, this seems to suggest that the decisions to use formal methods are based on rational analysis rather than individual preferences: if it is deemed useful, then it is likely to be used regardless whether it is easy or difficult to use. Interestingly, this is consistent with the findings of Love et al. (2005) and Ballentine and Stray (1999) who concluded that "unable to quantify (or identify) financial benefits" is one of the top inhibitors for using formal methods. The logic is that if an organization could not determine or identify the financial benefits of an IT investment project, the formal evaluation methods, which are almost invariantly designed for determining financial payoff of the investments, would be deemed as less useful and thus unlikely to be used.

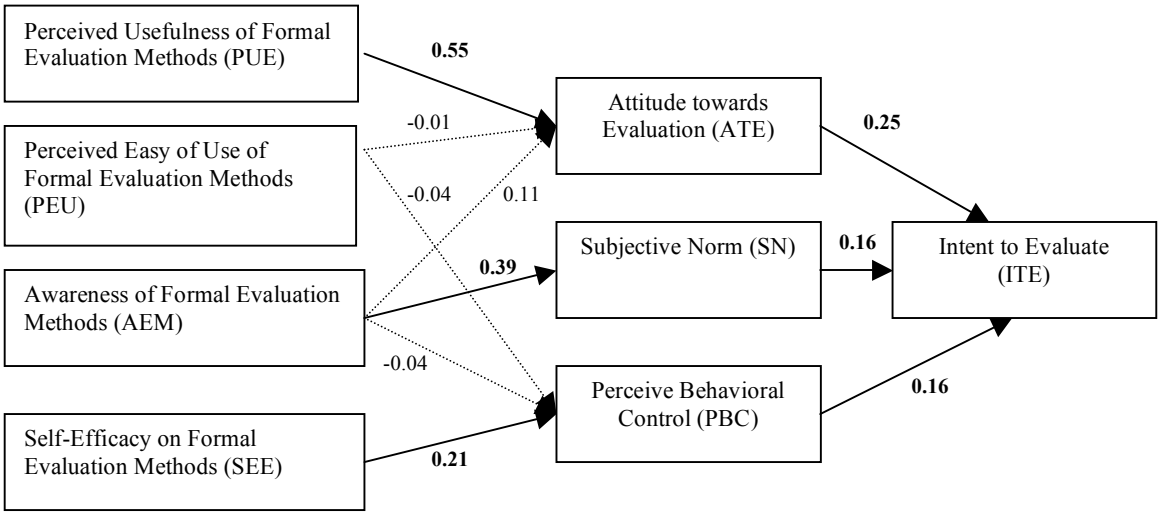

Figure 2. Standardized Estimated Path Coefficients (Bold links are significant at .05 level)

This result is also consistent with the insignificant relationship (H3a) between awareness (AEM) and attitude (ATE). If the attitudes formed are mostly based on the perceived usefulness, then just being aware of formal evaluation methods and techniques does not necessarily lead to the formation of positive attitudes. The same is true about the relationship (H3c) between awareness (AEM) and perceived controllability (PBC). Being aware of formal evaluation methods might not automatically increase the confidence of managers in their ability to use or not use the methods. However, given the variety of formal evaluation methods with different levels of complexity (Love et al., 2005; Ballentine and Stray, 1999; Farbey et al., 1999), if more managers are made aware of certain methods and the benefits of these methods, it would create a favorable environment in an organization for using such methods, as suggested in hypothesis H3b and confirmed by the structural model.

5 CONCLUSIONS

In this study we developed a structural research model based on the theory of planned behaviour (Ajzen, 1988) in an attempt to understand why using formal evaluation methods for IT investment projects has not yet become an organizational routine in a significant number of organizations across industries. Using survey data gathered from business and IT managers in Sweden, we tested the reliability and

validity of the measurement instrument first and then the research hypotheses about factors influencing the attitudes and behaviour of managers towards using formal evaluation methods for IT investment projects. The main findings can be summarized as follows. First, the intention to use formal evaluation methods in an organization is determined by the attitudes of the managers towards formal methods, the common beliefs of the organization about formal methods, and the perceived ability to perform formal evaluation. Second, the attitudes toward formal methods are determined mostly by the perceived usefulness of formal methods and not by the perceived ease of use of the formal methods, suggesting that the decision to use formal methods is most likely based on rational analysis rather than convenience. Third, unlike the findings in other studies, awareness did not play a central role in the intent to use formal methods, but it was found to have a significant effect on the formation of organizational norms about formal methods. Finally, as shown in many other studies, self-efficacy indeed had a significant effect on the perceived behavioural control.

These findings provide some interesting insights into why some organizations have adopted formal methods extensively while others have ignored them, and offer some practical implications for improving the use of formal methods in organizations. Overall, the data suggest that if managers in an organization are aware of certain evaluation methods and consider them to be useful, it is more likely that these methods will be used even if they are complex and difficult. The key inhibitor to using formal methods seems to be doubts about their usefulness. This suggests that to advocate the use of formal methods in an organization, the proponents must focus on introducing managers to various formal methods, convincing managers about the usefulness of these methods, and improving the overall attitudes of the organization towards formal evaluation methods and techniques. However, we have only performed preliminary analyses using structural equation modeling techniques. In future studies, it will be interesting to explore the effects of control variables such as industry and company size on the hypothesized relationships. It is also possible to explore the moderating effects of other factors such as the level of absorptive capacity and the role of IT in the organization on the hypothesized relationships.

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