An Empirical Study of the Impact of Information Technology Intensity in Strategic Investment Decisions

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ABSTRACT *This paper focuses on two issues of the management of strategic information technology investment decisions (SITIDs). First, it examines the outcomes of strategic investment decisions (SIDs) according to the extent of IT intensity in the investment project (termed IT-ness). Second, IT-ness is assessed in relation to a number of dimensions, including decision formulating process, evaluation process and decision content. Empirical testing is based on a sample of 80 SIDs from Taiwanese enterprises. The results show that IT-ness is negatively associated with the effectiveness of SIDs and several constructs in the decision process. The implications of this for the evaluation and management of SITIDs, and an agenda for further research into the effectiveness of SITIDs, are discussed.*

Introduction

The strategic potential of information technology (IT) is well recognized and IT is now of significant importance in capital investment.[1] Numerous cases of successful information systems have been reported and cited as a basis for encouraging the strategic use of IT. In contrast, other cases, such as the computer-aided despatch system of the London Ambulance Service, have been failures.[2] Here, Hougham identifies "the single most important factor was the inadequacy of the organisation to control such large and technically complex operations". Hochstrasser and Griffiths[3] show that only 31% of companies report that the introduction of IT is very successful. These experiences reveal the importance of managing strategic information technology investment decisions (SITIDs) effectively. However, much research reports the difficulties involved in evaluating IT projects[4] Further, evaluation represents only a part of the whole investment decision process. It is insufficient to manage strategic IT investment decisions only through evaluation activities. Weill and Olson[5] suggest that "the first step in managing IT investment is to know exactly what that investment is". It is, therefore, necessary to clarify understanding of the nature of SITIDs.

SITIDs form part of corporate strategic investment decisions (SIDs). It is not clear whether SITIDs are different from other SIDs and whether IT involvement impacts upon the outcomes of SIDs. Much prior research concerns either SITIDs or SIDs. However, Simon[6] indicates that decisions may lie along a continuum. From this perspective, SIDs may involve different degrees of IT involvement (IT-ness) and these

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0953-7325/98/030325-15

different degrees are an important dimension of the continuum. Management may use different processes in order to make different types of decision.[7] Further, Mohr[8] argues that the link between decision process and decision outcome is so intimate that "the process is itself an outcome".

This research investigates if different degrees of IT involvement lead to different processes which, in turn, lead to different outcomes. If that is the case, then it is important to know what constructs are changed because of IT involvement, so that these differences can be taken into account in the evaluation and management of SITIDs. So far, little work has explored the distinguishing constructs between higher IT-ness SIDs and lower IT-ness SIDs. This paper explores the distinguishing variables of SIDs in relation to different degrees of IT involvement and examines the linkage of IT involvement and the effectiveness of SIDs. It uses survey data gathered from Taiwainese manufacturers to test the nature of IT involvement.

Theory and Hypotheses

The Effectiveness of Decisions

Research relating to effectiveness can be categorized into two groups. The first is concerned with organizational effectiveness, and focuses on the relationship between investment decisions and organizational performance. For example, some empirical studies investigate the relationship between strategic investment announcements and stock price.[9] They focus on the relationship between announcements and decisions, not the outcomes of these decisions. Although organizations announce their strategic investment plans, and the stock market usually reacts positively, the outcomes are unknown. The current work belongs to the second group, which focuses on decision effectiveness. Here, effectiveness compares actual performance against planned, whether original or subsequently chosen, target outputs, outcomes and policy objectives.[10] Accordingly, this study defines effectiveness as the objectives-attainment of decisions.

IT-ness

This research employs the concept of IT intensity as a dimension of strategic investments, termed 'IT-ness'. The concept of IT intensity is similar to, but also somewhat different from, the concept of information intensity. Information intensity may be defined as the degree to which information is present in the product or service of a business.[11] The degree to which IT is present in an investment decision reflects the IT level of intensity of that decision. Here, it is assumed that the higher the IT-ness, the more important IT is to the whole investment. Accordingly, in a strategic investment decision, a high level of IT-ness characterizes a strategic IT investment decision. These are often more difficult than many other investment decisions,[12] and because of the high failure rate of IT investment projects,[13] this study expects that a higher IT involvement in a SID is likely to be associated with the reduced effectiveness of SIDs.

- Hypothesis 1: The higher the IT-ness, the lower the effectiveness of SIDs.

Decision Process

Many researchers focus on the decision process.[14] The strategic decision process involves several characteristics, including comprehensiveness, the extent of rationality activity, participation/involvement, duration and type of conflict.[15] Comprehensiveness is a

measure of rationality and is defined as the extent to which the organization attempts to be exhaustive or inclusive in making and integrating strategic decisions.[16] This should include such elements as the extent of formal meetings, the assignment of primary responsibility, information-seeking and analytical activities, the systematic use of external sources, the involvement of stakeholders, the use of specialised consultants, the extensiveness of historical data reviewed, the functional expertise of people involved[17] and the extent of informal interaction.[18]

The political nature of organizational decision-making is also widely discussed.[19] Hickson *et al.* define politicality as the degree to which influence is exerted through a decision-making process upon the outcome. The decision set of interests involving interest groups brings politicality into decision-making. It is evident from the data that strategic decision-making is not simply a matter of explicating alternatives and choosing between them on the basis of readily available criteria which have been agreed upon in advance as appropriate by all decision participants.[20]

The evaluation process can be seen as part of the overall decision process but it is particularly important for investment decisions. The evaluation problem of IT is really one of alignment, and organizations that are aware of IT's new role have usually made efforts to incorporate IT in their strategic thinking.[21] Thus, strategic considerations are critical to the evaluation process. Six constructs may be identified: duration, involvement, interaction, influence of stakeholders, strategic consideration, accuracy of information. Since IT-ness is a novel concept and there is little extant literature, the prediction of the relationships between IT-ness and the constructs is tentative at best. Hypothesis 1 shows the IT is negatively associated with effectiveness of SIDs. This hypothesis implies that IT-ness will promote negative factors and detract from positive factors in SIDs. Accordingly, this study predicts IT-ness is negatively associated with duration, interaction, involvement, accuracy of information and strategic consideration and positively associated with stakeholders' influence.

- Hypothesis 2: The higher the IT-ness, the lower the duration of SIDs.
- Hypothesis 3: The higher the IT-ness, the lower the interaction of SIDs.
- Hypothesis 4: The higher the IT-ness, the lower the involvement of SIDs.
- Hypothesis 5: The higher the IT-ness, the higher the stakeholders' influence on SIDs.
- Hypothesis 6: The higher the IT-ness, the lower the accuracy of information on SIDs.
- Hypothesis 7: The higher the IT-ness, the lower the strategic considerations of SIDs.

Decision Content

The decision content refers to the particular decision under investigation. Much previous research has focused on decision content.[22] A strategic decision is characterized by novelty, and complexity is a major characteristic of strategic decision-making.[23] Complexity relates to the number and variety of factors in the decision unit's environment that impinge on its decision-making behaviour.[24] Constructs that contribute to the complexity of decision-making include rarity and importance.[25] Rarity is the source of the problem of uncertainty performance of a decision,[26] the importance of a decision depends on whether it has a significant impact on the firm as a whole and its long-term performance,[27] and whether the decision is necessary for the firm's survival. Accordingly, two constructs, rarity and importance, are employed to test IT-ness. Because of IT investment's poor performance, this study predicts that IT-ness is negatively associated with the importance of decisions and positively associated with the rarity of decision.

- Hypothesis 8: The higher the IT-ness, the lower the importance of SIDs.

- Hypothesis 9: The higher the IT-ness, the higher the rarity of SIDs.

Method

Investigating the issues presented above involved empirical work undertaken in Taiwan manufacturing industries. The constructs were operationalized in the form of a questionnaire. In order to increase the expected response rate, judgement sampling was used. Experts in two professional associations, the Chinese Association for Industrial Technology Advancement and the Chinese Productivity Centre, helped to select organizations seen to be representative of the population. A postal questionnaire and a reference letter from the experts were sent directly to named individuals in the selected organizations. The respondents were at a management level and involved in investment decision processes. The unit of analysis here is a single SID, since it is the complexity and politicality which are at issue, rather than the organization itself.[28] Respondents were asked to evaluate propositions based on a strategic investment project developed and implemented in the last five years of which they had experience. A total of 270 organizations were selected, of which 94 responded. Of these, 80 were valid for further analysis.

Measures

The variables, their operationalization and the sources of variables are presented in Tables 1 to 5. Most variables are measured by a seven-point interval scale with semantic differential in two extremes. IT-ness is measured by the ratio of IT spending to the total investment. The measure of decision effectiveness is unavoidably subjective. A multi-objective function is used to decide the effectiveness of SIDs, as follows:

$$\text{Effectiveness} = \frac{\sum_{1}^{j}(I_j^* A_j)}{n}$$

where I_j is the perceived importance for the ith objectives, A_j is the extent to which objects are achieved and n is the total number of different objectives which respondents seek to attain.

Data Analysis

This study conducts a principal components factor analysis with varimax rotation to assess convergence within and divergence between scales. Items composing the various power scales are factor analyzed to assess their convergent and discriminant validity. The reliability of each of the study measures is estimated by computing Cronbach's alpha; scale items with low inter-item correlations are eliminated. Table 6 shows the results of factor analysis. All items demonstrate very high convergent and discriminant validity by loading strongly on the factors they are designed to measure and weakly on other factors, with the exception of three items: opposition of interested units, negotiation and disagreement, which was designed to measure stakeholders' influence. Opposition of interested units loads on the involvement construct. It is not clear whether this loading represents a lack of discriminant validity or a substantive relationship between stakeholders' influence and involvement. Similarly, the other two, negotiation and disagreement, load on the rarity construct. Again, it is not clear whether this loading represents a lack of discriminant validity or a substantive relationship between stakeholders'

Table 1. The content of strategic investments[29]

Activities	Mean	SD	Size	Corr. with IT-ness
Rarity				
Rarity: Frequency with which a similar project recurs	4.291	1.650	79	−0.07 (0.527)
Importance of decision				
Radical: How radical the consequences are if the project changes things	4.859	1.402	78	−0.15 (0.176)
Seriousness: How serious the consequences are if the project goes wrong	4.937	1.636	79	0.09 (0.401)
Endurance: How far ahead people looked when making the decision	5.747	1.344	79	−0.02 (0.845)
Urgency: How urgent the decision was	5.165	1.400	79	−0.13 (0.223)
Precursiveness: Decision likely to impact on subsequent decisions	5.342	1.376	79	−0.16 (0.153)
Openness: Decision influenced by previous decisions	4.231	1.562	78	−0.15 (0.163)

Table 2. The formulation process of strategic investments[30]

Activities	Mean	SD	Size	Corr. with IT-ness
Duration construct				
Time to become a formal proposal	3.986	1.612	73	−0.10 (0.390)
Time from formal proposal to implementation	3.700	1.521	80	0.30 (0.791)
Process interrupted by delay	3.329	1.474	79	−0.09 (0.424)
Interaction constructs				
Level in hierarchy involved in this project	5.823	1.567	79	−0.21 (0.054)*
Formal meetings required	4.650	1.773	80	−0.20 (0.062)*
Quality of communications of informal meetings	4.938	1.426	80	−0.13 (0.230)
Scope for involvement in formal meetings	4.316	1.590	79	−0.11 (0.332)
Discussions held outside formal meetings	4.924	1.575	79	−0.11 (0.298)
Areas of disagreement about project	3.557	1.465	78	0.10 (0.354)
Scope for negotiation about the project	4.077	1.457	78	0.02 (0.821)
Organization's involvement constructs				
Number of internal departments involved	4.190	1.755	79	−0.11 (0.303)
Number of external organizations involved	3.566	1.746	76	−0.22 (0.047)**
Stakeholders' interest				
Weight of influence exerted by interested units	4.684	1.549	79	0.07 (0.520)
Total pressure uneven across interested units	3.759	1.407	79	0.17 (0.134)
How far the interested units that exerted influence did so in opposite directions	2.692	1.231	78	0.032 (0.78)

Table 3. Strategic consideration in the evaluation process[31]

Strategic variables	Mean	SD	Sample size	Corr. with IT-ness
Consistency with business strategy	5.228	1.467	79	−0.17 (0.127)
Growth rate of market related to project	5.372	1.478	78	−0.23 (0.036)**
Competitive position of company	5.679	1.372	78	−0.22 (0.046)**
Performance of company	5.785	1.058	79	−0.10 (0.342)

Table 4. Accuracy, importance and sources of information in helping in the evaluation process[32]

Information	Accuracy of information				Perceived importance of Information			
	Mean	SD	Size	Corr. with IT-ness	Mean	SD	Size	Corr. With IT-ness
Cost of investment	5.303	1.276	76	− 0.09 (0.407)	5.500	1.172	76	− 0.18 (0.106)†
Cash flow at end of each subsequent period	5.154	1.218	78	− 0.04 (0.703)	5.197	1.286	76	− 0.303 (0.008)***
Project duration	4.863	1.475	73	− 0.13 (0.239)	5.514	1.999	72	− 0.262 (0.026)**
Cost of capital	5.299	1.236	77	− 0.23 (0.041)**	5.513	1.378	74	− 0.38 (0.001)***
The NPV of cash flow	4.629	1.299	70	− 0.21 (0.069)*	4.826	1.414	69	− 0.15 (0.190)
The payback period	4.151	1.622	73	− 0.22 (0.051)*	5.300	1.301	70	− 0.19 (0.107)†
ARR	4.253	1.434	75	− 0.22 (0.050)*	5.319	1.254	72	− 0.13 (0.258)
Profit	4.542	1.404	72	− 0.19 (0.095)*	5.521	1.237	73	− 0.23 (0.042)**
Productive	5.013	1.511	75	− 0.27 (0.018)*	5.712	1.264	73	− 0.05 (0.683)
Intangible costs	4.189	1.532	74	− 0.14 (0.210)	4.586	1.429	70	− 0.19 (0.105)†
Intangible benefit	4.685	1.615	73	− 0.16 (0.160)	5.070	1.407	71	− 0.30 (0.009)***

Table 5. Strategic objectives perceived as important and attained

Strategic objectives	Perceived importance				Extent to which objectives achieved			
	Mean	SD	Size	Corr. with IT-ness	Mean	SD	Size	Corr. With IT-ness
Increase profit	5.513	1.375	78	−0.278 (0.014)**	4.456	1.457	79	−0.10 (0.372)
Increase sales	5.519	1.405	80	−0.34 (0.002)***	4.468	1.431	79	−0.11 (0.321)
Increased market share	5.418	1.346	79	−0.42 (0.000)***	4.400	1.393	80	−0.16 (0.147)
Improve quality	5.163	1.418	80	0.03 (0.741)	4.494	1.329	79	−0.05 (0.640)
Enhance return on investment	5.200	1.354	80	−0.30 (0.006)***	4.438	1.452	80	−0.07 (0.501)
Improve corporation's image	5.487	1.181	78	−0.09 (0.407)	4.939	1.215	79	−0.00 (0.828)
Reduce cost	5.363	1.512	80	−0.09 (0.406)	4.563	1.422	80	−0.21 (0.055)*
Keep market position	5.557	1.366	79	−0.30 (0.006)***	4.582	1.447	79	−0.21 (0.053)*
Develop new business	5.474	1.509	78	−0.19 (0.079)*	4.550	1.574	80	−0.04 (0.704)
Facilitate new ways of management	5.038	1.550	78	0.06 (0.569)	4.545	1.465	77	−0.10 (0.347)
Gain competitive advantage	5.886	1.143	79	−0.20 (0.070)*	4.696	1.514	79	−0.12 (0.275)
Meet government regulations	4.273	1.826	77	−0.06 (0.597)	4.416	1.533	77	−0.09 (0.399)

Table 6. Factor analysis (varimax rotation)

	Factor loadings							
Questionnaire items	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
(1) *Duration*								
Gestation time	0.79							
Process time	0.77							
Delay	0.60							
(2) *Interaction*								
Scope		0.75						
Informal		0.73						
Quality		0.66						
Formal		0.66						
Hierarchy		0.42						
(3) *Involvement*								
Internal			0.68					
External			0.62					
(4) *Stakeholder's influence*								
Pressure of interest				0.75				
Influence of interest				0.61				
Opposition of interest*			0.63					
Negotiation*								0.65
Disag'ment*					− 0.41			0.49
(5) *Info accuracy*								
Payback					0.72			
ARR					0.72			
Productivity					0.70			
Cost					0.69			
Intangible cost					0.69			
Time					0.67			
Intangible benefit					0.63			
Capital					0.63			
NPV					0.61			
Cash					0.61			
Profit				0.45	0.58			
(6) *Strategic considerations*								
Performance						0.74		
Strategic consistency						0.68		
Competition						0.59		
Growth of market						0.50		
(7) *Importance*								
Urgent							0.65	
Impact						0.47	0.58	
Look ahead							0.54	
Influence							0.53	
Radical							0.51	0.43
Serious							0.51	
(8) *Rarity*								
Rarity								− 0.79

Factor loadings of less than 0.40 are omitted. *Withdraw from further analysis.

Table 7. Reliability estimates and intercorrelations among constructs

	Mean	SD	Alpha	1	2	3	4	5	6	7	8	9	10
(1) IT-ness	38.56	38.02		1.00									
(2) Effectiveness	24.93	9.05		− 0.22*	1.00								
				(0.049)									
(3) Duration	3.69	1.22	0.68*	− 0.06	− 0.07	1.00							
				(0.595)	(0.535)								
(4) Interation	4.92	1.13	0.76	− 0.22*	0.36	0.08	1.00						
				(0.048)	(0.001)	(0.468)							
(5) Involvement	3.90	1.53	0.74	− 0.19	0.27	0.22	0.31	1.00					
				(0.092)	(0.016)	(0.058)	(0.005)						
(6) Stakeholder's influence	4.21	1.18	0.45*	0.14	− 0.01	− 0.01	0.15	0.21	1.00				
				(0.201)	(0.001)	(0.917)	(0.169)	(0.060)					
(7) Info accuracy	4.68	0.97	0.89	− 0.27	0.69	− 0.10	0.37	0.28	0.26	1.00			
				(0.014)	(0.000)	(0.397)	(0.001)	(0.010)	(0.16)				
(8) Strategic consideration	5.48	1.02	0.77	− 0.27	0.55	− 0.20	0.37	0.16	0.21	0.58	1.00		
				(0.014)	(0.000)	(0.087)	(0.001)	(0.158)	(0.53)	(0.000)			
(9) Importance	5.04	1.00	0.77	− 0.15	0.43	− 0.24	0.35	0.49	0.60	1.00			
				(0.178)	(0.000)	(0.208)	(0.000)	(0.030)	(0.01)	(0.000)	(0.000)		
(10) Rarity	3.71	1.64		0.07	− 0.27	0.03	− 0.12	− 0.16	− 0.24	− 0.19	− 0.17	− 0.26	1.00
				(0.51)	(0.014)	(0.784)	(0.280)	(0.145)	(0.031)	(0.090)	(0.1222)	(0.17)	

Alpha value lower than 0.70 withdrawn from further study.

Table 8. Constructs different test in term of IT-ness and effectiveness

Objectives	Type of investment: (1) Both effectiveness and IT-ness are high (n = 14)	(2) Effectiveness is low but IT-ness is high (n = 21)	(3) Effectiveness is high but IT-ness is low (n = 26)	(4) Both effectiveness and IT-ness are low (n = 19)	F	Duncan results
Interaction	4.80 (0.99)	4.61 (1.24)	5.38 (1.00)	4.71 (1.15)	2.3123 (0.0828)	(3) > (2)
Accuracy of information	5.08 (1.08)	4.01 (0.81)	5.17 (0.68)	4.45 (0.92)	8.5887 (0.0001)	(1) > (2),(4) (3) > (2),(4)
Strategic consideration	5.82 (1.08)	4.73 (1.11)	5.98 (0.79)	5.39 (0.80)	7.4321 (0.0002)	(1) > (2) (3) > (2) (4) > (2)

No two groups are significantly different at the 0.05 level.

influence and rarity of decisions. To avoid any possible confounding, however, these three item in stakeholders' influence are eliminated from further analysis.

Table 7 presents the means, standard deviations, correlations and Cronbach's alphas of proposed constructs. Cronbach's alpha is a commonly used measure of reliability of a set of two or more construct indicators. According to Hair *et al.*,[33] a commonly used threshold value for acceptable reliability is 0.70. Two constructs —duration of project and stakeholders' influence—which have alpha value lower than 0.70 are withdrawn because of the potential unreliable of the instruments. Cronbach's alpha values for the other six constructs which have two or more indicators range from 0.74 to 0.89, suggesting the instruments are reliable.

Accordingly, only six constructs are tested in this section. Under the 0.05 level, the current study finds IT-ness is negatively associated with effective of SIDs, interaction, strategic consideration and accuracy of information. Accordingly, hypotheses 1, 3, 6 and 7 are supported, hypotheses 4, 8 and 9 are not supported and hypotheses 2 and 5 are not tested because of possible unreliability of instrument design.

In order to provide more in-depth discussion of the results of the hypotheses, a further test constructs difference in term of IT-ness and effectiveness to bridge the relationship between IT-ness, effectiveness and the proposed constructs. Both effectiveness and IT-ness are separated into higher and lower clusters. A project with IT involved more than 50% is classed as high IT-ness; otherwise it is considered low IT-ness. A score of effectiveness higher than 25 is considered high effectiveness; otherwise it belongs to low effectiveness. Accordingly, four groups are classified and Table 8 shows the results of the one-way ANOVA analysis and Duncan test. The ANOVA shows that interaction, accuracy of information, strategic considerations and the importance of decision are significantly different in the four groups of investment projects. The following discussion is mainly based on results of the hypotheses testing and Table 8.

Discussion

The Degree of IT-ness is Negatively Associated with the Effectiveness of SIDs

The higher the IT-ness, the lower the effectiveness of SIDs. This is the most interesting result, since no past research has explored this issue. This assumption of the linkage between IT-ness and effectiveness of SIDs is supported. This result may explain why so many studies report the failure of IT investments. From a theoretical standpoint, the implication of the findings is that managers need to pay special attention to the problematic nature of IT-ness in SIDs.

The Higher the Level of IT Involvement in an SID, the Lower the Level of Interaction in the Investment Project Formulating Process

IT involvement is negatively associated with the extent of interaction. One possible explanation is that managers' lack of knowledge and experience of IT leads to low involvement in the project, especially for high-level managers. Decision-makers' computer knowledge, experience and educational levels are closely associated with alienated beliefs and attitudes to IT.[34] Higher IT-ness leads to a more technically-oriented project. Without IT knowledge and experience, managers cannot discuss the project deeply. These results complement Willcocks's assertion that management now faces a Catch-22 situation with IT investment.[35] They know how important IT is, but they do not know how to manage IT projects. The result means that in order to manage the effectiveness

of SIDs, it is necessary to focus not only on the evaluation activities but on the formulation process as well. Table 8 shows that involvement in group 3 (high effectiveness but low IT) is significantly higher than involvement in group 2 (high IT and low effectiveness), but not higher than group 1 (high IT and high effectiveness). From a managerial perspective, this finding suggests that increases of interaction in a project formulating process will improve the outcome of the investment project.

The Higher the Level of IT Involvement in an SID, the Fewer the Strategic Considerations

Probably, IT alone will not provide sustainable competitive advantage. However, this confirms that there are different views on the relationship between IT and corporate strategies.[36] It also agrees with Powell's[37] view of 'the vicious circle of IT investment', which indicates the problem of alignment of IT and business strategy. The vicious circle may lead to sub-optimal decisions. Table 8 shows that the strategic considerations in group 1, 3, 4 are significantly higher than group 2. Even group 4 are higher than group 2. The finding shows, for all SIDs, that only those investments which involved high IT involvement lack strategic consideration. Although this does not show that an increase in strategic consideration will definitely increase the effectiveness of SIDs, it is beneficial to increase strategic consideration in order to pursue a better outcome.

The Higher the Levels of IT Involvement, the Lower the Accuracy of Information

This finding supports Freeman and Hobbs,[38] who find a high incidence of managers ignoring reject signals given by capital budgeting techniques, and identify senior management's preference for qualitative information and IT investment as an 'act of faith'.[39] This suggests that high uncertainty in information leads to limited use of these techniques. In Table 8, the accuracy of information in groups 1 and 3 is significantly higher than in groups 2 and 4. Clearly, the higher accuracy of information, the higher the effectiveness, no matter the degree of IT-ness.

This paper sheds some light on this. The two evaluation-related constructs are highly correlated. That is, from an IT investment perspective, the alignment of information technology and business strategy is problematic if there is a lack of appropriate information for evaluation. However, evaluation of IT investments is problematic if there is a lack of alignment of IT and business strategy. To improve the effectiveness of IT investment, management needs to increase the alignment of IT and business strategy and accuracy of information for evaluation simultaneously. The interaction is also correlated with the two evaluation-related constructs. From a practical perspective, Ballantine *et al.*[40] indicate that firms do attempt to evaluate their IT investments by using financial criteria. However, recent research highlights that evaluation is a social and political process, not simply an economic justification,[41] and increasingly employs the concept of contextualism in the discussion of IS/IT evaluation.[42] The findings of this paper confirm this trend.

Towards an Agenda for Further Research

This paper finds a negative correlation between IT involvement and the effectiveness of SIDs. In the linkage between IT-ness and the effectiveness of SIDs, the precise roles of decision process and content are not clear. In the social sciences, moderators and mediators have long been identified as two functions of third variables. Baron and Kenny explain these functions as follows: "the moderator function of third variables, which partitions a focal independent variable into subgroups that establish its domains of

maximal effectiveness in regard to a given dependent variables, and the mediator function of a third variable, which represents the generative mechanism through which the focal independent variable is able to influence the dependent variable of interest".[43]

As discussed, the impact of IT-ness on the effectiveness of SIDs is through the decision process. Accordingly, the process constructs should have a mediating effect on the linkage. Greater IT involvement will lead to a more technical-oriented project which has a different impact upon the effectiveness of SIDs. The decision content, therefore, can also have a mediating effect between the linkage of IT involvement and the effectiveness of SIDs. As part of the decision context, the organizational investment context has an impact on the outcome of investment. Therefore, the context constructs should act as covariances which impact upon the effectiveness of SIDs. Decision context, decision content and decision process may involve many constructs and some of them may not be related to IT involvement. Further research needs to test this.

From another perspective, the findings here also provide guidelines to inform discussion on evaluation approaches. How do the distinguishing variables impact upon evaluation approaches? Do these differences require a reappraisal of evaluation? What is the nature of this reappraisal? By mapping these findings to the characteristics of evaluation approaches, further research should offer a basis for developing a new/improved evaluation approach which is more suited to the evaluation of SITIDs.

Conclusions

This paper presents part of a wider study on the nature and process of SITIDs. The primary finding is that IT involvement impacts on certain aspects of the decision process and the effectiveness of SIDs. From a theoretical standpoint, the obvious implication is that IT involvement does matter. The identification of IT involvement as one dimension of the continuum nature of SIDs is an important contribution. The results show the existence of a linkage between IT involvement and the effectiveness of SIDs. Besides the effectiveness of SIDs, this paper also reveals that several important constructs in the decision process vary according to different degrees of IT involvement. These distinguishing construct may have contributed to the lower effectiveness of SITIDs and the problematic nature of SITIDs.

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