Environmental scanning and investment decision quality

Information processing perspective

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Abstract

Purpose – Previous studies on scanning behavior have focused mainly on decisions relating to the choice of corporate strategies, leaving strategic investment decisions largely understudied. This paper aims to bridge the gap not just by examining strategic investment decisions but also by investigating the role of information processing capacity in enhancing the relationship between the extent of scanning behavior and the quality of the investment decision.

Design/methodology/approach – Cross-sectional data are collected through a survey and analyzed by means of factor analysis and hierarchical regression analysis.

Findings – Quality of decision is positively and significantly related to the extent of economic and competition information and the formality of method used to scan competition information. However, the extent of scanning for technology is contingent upon information processing capacity in order to affect the quality of the investment decision. Similarly, the method of scanning for economy, technology and competition information would depend on the information processing capacity to bring about a quality decision.

Research limitations/implications – Use of convenience sampling may restrict the generalizability of the findings.

Practical implications – As more economy and competition data are scanned, this would improve the quality of decision making, but for technology scanning the data have to be processed further before they can bring about changes in decision quality. For technology-related matters, firms should be investing in the information processing capacity to produce quality decisions.

Originality/value – This study uses the decision as its unit of analysis to avoid having to average out the effects of making good and bad decisions often associated with a decision maker.

Keywords Decision making, Information science, Competitors

Paper type Research paper

Introduction

The quality of an investment decision is directly related to firm performance. Bad investment decision quality could force firms to become non-profitable and eventually force them out of business. In turn, firm performance is influenced by the extent of scanning activities carried out (Daft and Weick, 1984; Hambrick, 1981; Venkatraman, 1989). Environmental scanning is a primary step towards establishing organizational goals (Dess and Davis, 1984). More successful firms tend to engage in more and broader scanning activities than less successful ones (Daft *et al.*, 1988). However, there is also evidence indicating that Chief Executive Officers vary their scanning emphases on different domains based on their perceived environmental uncertainty (Garg *et al.*, 2003).

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Much research has focused on scanning activities and its impact on firm performance (Beal, 2000; Daft and Weick, 1984; Ebrahimi, 2000; Elenkov, 1997; McGee and Sawyerr, 2003; Garg *et al.*, 2003; Suh *et al.*, 2004; Yunggar, 2005). While confirming the relationship between scanning activities and firm performance, these studies provide little guidance as to how the use of this information leads to better investment quality decision. Arguably, the extent of scanning activities alone would not be a sufficient condition to improve decision quality. The data gathered would have to be processed for it to be meaningful and be able to assist in a decision. This study intends to bridge the gap by examining the impact of environmental scanning as an input to the strategic decision-making process to investment decision quality. Specifically, this study examines the role of information processing capacity in enhancing the quality of investment decision with the scanning activities. While a study of this nature typically analyzes the issue from an individual decision maker's perspective, this study offers to examine the issue using the decision as a unit of analysis. The advantage of using this approach is that it eliminates the averaging effect of some good and some bad decisions made by the decision maker, thus enhancing understanding of the decision-making.

The findings of the study indicate that the extent of environmental scanning for economy and competition data is directly affecting investment decision quality. However, for technology data this relationship is contingent upon the capacity to process the data into useful information. At the same time it is shown that information processing capacity also directly influences the quality of decision while maintaining the moderating role for the extent of scanning for technology information and method of scanning for all types of data.

Literature review

Environmental scanning is the activity by which organizations collect information about their environment (Goshal, 1987). Scanning is used for a variety of strategic purposes ranging from reducing uncertainty in the environment to developing effective response strategies to improve firm performance. Organizations differ in their modes of scanning depending on management's beliefs about the analyzability of the external environment and the extent to which the organization intrudes into the environment to understand it (Daft and Weick, 1984). The level of knowledge and information available about the environment is also equally important in choosing the scanning approach (Choo, 2001). An organization engages in an active approach when it allocates substantial resources for information search, testing and/or manipulating the environment. Conversely, an organization that interprets environment based on available information is said to be engaging in a passive approach.

The data gathered has to be processed into meaningful information before it can assist decision-making. The current literature suggests at least two competing ways to explain how managers process information. The first school of thought believes that managers process information in an intuitive manner and/or using tacit knowledge (Mintzberg, 1988), while another research stream suggests that managers deliberately seek out and sift through enormous amounts of data to look for new information to make effective decisions (Thompson *et al.*, 1993). It is acknowledged that strategic decision-making involves rational data gathering that includes environmental scanning. Environmental scanning assesses the internal strengths and weaknesses of an organization in relation to the external opportunities and threats it faces (Abels, 2002).

While there have been numerous studies investigating environmental scanning and strategic decision making, most of the past research is descriptive in nature and more concerned with the scanning behavior of managers (McGee and Sawyerr, 2003; Elenkov, 1997; Kumar *et al.*, 2001; Subramaniam *et al.*, 1994; Daft and Weick, 1984). This study takes on a slightly different perspective in that it uses the investment decision as a unit of analysis instead of the usual individual decision maker. The focus is therefore not on how managers' scanning behavior is related to their performance, but rather on how the scanning behavior resulted in a quality decision. We define quality decisions to be those that have met the objectives set forth for the decision. The choice of using the decision as a unit of analysis would overcome the problem of having to average the decision made by an individual decision maker. The averaging process is required because an individual decision maker would have made numerous decisions with varying level of scanning carried out and with different associated performance.

Scanning in this study is conceptualized by looking at the extent, method, and sources of scanning and relates it to the decision quality. Scanning refers to the scope and amount of environmental information gathered using either formal or informal methods or from external, internal, personal or impersonal sources. This study follows previous studies by combining some common measures for scanning (Beal, 2000; Ebrahimi, 2000; Hambrick, 1981; May *et al.*, 2000; Sawyerr *et al.*, 2000).

A core contribution of this study is the inclusion of information processing capacity (IPC) as a potential moderator of scanning-decision quality relationship. Arguably, the extent of scanning would only give rise to better decision quality if there is capacity to translate the data into useful information. The capacity to translate data is a function of one's experience, knowledge and skill and of the decision support systems in place. The role of information processing capacity is firmly grounded in the information processing perspective as initiated by Galbraith (1973).

Hypotheses and methodology

Hypotheses

There is sufficient evidence to indicate that organizations that engage in more environmental scanning perform more successfully than those that do not (e.g. Beal, 2000; Choo, 2001; Daft *et al.*, 1988; Hambrick, 1981; Subramaniam *et al.* 1994). *A priori*, one would expect that the more a manager scans the environment for information, the more timely information will be made available to capture recent or changing trend(s). This timely information will be useful for the organization to identify problems and opportunities, and therefore the organization would be able to make better quality decisions.

At the decision level one can therefore expect that a greater amount of environmental scanning when making a particular decision will positively influence the performance of the decision; it only enhances the richness and diversity of information used in making the decision. Therefore it is hypothesized that:

H1. The greater the extent of environmental scanning the better the quality of the investment decision

Most researchers agree that the environmental scanning process should be conducted on a continuous basis and proposed that formal scanning units be constructed to collect strategic information about the environment. Therefore, one would expect that formal methods of scanning will give rise to quality decisions as formal methods allow for a systematic capture of information, and subsequently result in better analysis. This result is because organizations usually make available their skills and other necessary resources as part of the routines within formal methods. This approach arguably creates a culture of putting value on information, and thus an internal environment of information enhancement. Better analysis of information would translate into better decisions being made. Therefore it is hypothesized that:

H2. Investment decisions that rely more on formal methods of environmental scanning will have better quality than those that rely more on informal methods.

There appears to be a general agreement in the literature (e.g. Aguilar, 1967; Churchill and Lewis, 1993; Elenkov, 1997; Keegan, 1974) on the importance of external and personal sources over internal and impersonal sources in obtaining external information. Internal information is usually known to decision makers, while external information enriches that body of information. Since external information tends to be more strategic, it avoids the "status quo" kind of decisions that rely solely on internal information.

H3a. Investment decisions that utilize more external sources of information will have better quality than investment decisions that utilize more internal sources.

As for personal versus impersonal information, personal information is more tacit when compared to impersonal information. This tacit characteristic may provide unique information that is not readily available to everyone, and therefore it provides for competitive advantage over those not privy to it. Thus, personal information is of greater value due to its rarity, and the difficulty of replicating it. Therefore, it is hypothesized that:

H3b. Investment decisions that utilize more personal sources of information will have better quality than investment decisions that utilize more impersonal sources.

Finally, the present study hypothesizes that IPC moderates the impact of scanning activities on the quality of the decision. This conjecture is based on the argument that information without a proper analysis would not result in a desired outcome, i.e. quality decision. Information is said to have diminishing returns, with the value of information decreasing with amount (Simon, 1987). There is a possibility that the relationship between decision quality and amount of information is U-shaped, whereby the initial impact of information is very high and decreases with additional information gathered and the impact would increases if there is enough information processing capacity available (Simon, 1987). An information "overload" situation could arise when the organization does not have the capacity to process the data, consequently leading to inaction or confusion.

The notion of information processing capacity rests on the organization's capacity to process the data and translate it into useful information to assist decision making. The greater the capacity, the higher will be the cutoff point before it runs into the information overload problem, and the greater the diversity of information that forms the basis for the decisions made. All these would lead to better or quality decisions. This argument is translated into the following hypothesis:

H4. The extent of information processing capacity will enhance the impact of environmental scanning on the quality of investment decision.

Methodology

The study utilizes an investment decision as the unit of analysis to enhance its internal validity. The advantage of using this approach is that it focuses on a specific decision, i.e. investment decision. The approach will measure the associated scanning behavior and quality (desired outcome) pertaining to that decision only. In this manner, the quality decision can be directly linked to the scanning behavior without the inherent bias of making numerous decisions with varying degrees of scanning behavior and with differential performance usually associated with a decision maker (manager).

Environmental scanning is measured by the amount of scanning conducted, the method of scanning (formal and informal) utilized, and the sources of information (impersonal and personal and external and internal) used. The majority of the items measuring the extent of environmental scanning are adopted from past literature (Choo, 2001, Hambrick, 1981; Walters *et al.*, 2003) and assessed on a five-point Likert-type scale. The respondents are asked to select an investment decision they made or were involved in, within the last two years. Based on that investment decision, the respondents would answer questions relating to extent of environmental scanning (on amount, method, and sources of information) they undertook covering sectors including regulatory, political, economic, technology, socio-cultural, competition and industry. Areas covered by questions included changes in industry regulations, trends affecting demands for firms' products and services, and major changes in products or policies offered by competitive firms.

Arguably, the extent of environmental scanning would not necessarily translate into better decisions, as the impact of quantity and quality of scanning activities varies according to contextual situations. This study contends that the data scanned would have to be processed intelligently before useful information (knowledge) to aid decision-making is provided. IPC is conceptualized as a function of skill, decision experience, and level of knowledge of the people involved as well as the extent of decision support system used. A similar five-point scale ranging from 1 (very low) to 5 (very high) is devised for the respondent to rate their information processing capacity pertaining to that investment decision.

We define a quality investment decision to be one that meets (or contributes to the achievement) the objectives of the organization and one that gives rise to positive outcomes for the decision maker. Respondents are asked to evaluate the perceived outcome of the investment decision that they chose, i.e. whether the decision met its objectives, on a five-point scale. The quality of decision is assessed from various dimensions such as improvement in products/services, cost efficiency, timeliness, profitability, productivity, and production time. Since the objectives of a decision vary from one decision to another, respondents are asked to rank the importance of achieving each of the listed objectives and rate the extent to which each listed objectives are met. The decision quality index (DQI) is calculated based on the following formula:

$$\text{DQI} = \frac{\sum(\text{importance of objective } i \times \text{achievement of objective } i)}{\sum \text{importance of objective } i}$$

$$= \frac{\sum(\text{importance of objective } i \times \text{achievement of objective } i)}{55}$$

The DQI is a weighted sum of the achieved objectives, where the weights are represented by the importance attached to the each of the objectives. We measure the importance (rank 1 to 10) by forming the weights attached to each of the quality items. Since the weights add up to 55 ($10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1 = 55$), the denominator is set at the same value.

According to Wood (1986), complex tasks require significantly more processing of information cues than simple tasks. Similarly, the decision situation (time pressure, irreversibility and significance of decisions) could also impact the performance of decision (Mahmood, 2001). As the nature of the decision could affect the quality of the decision, we include decision complexity as a control variable.

Since the population of the study is investment decisions, it is not easily identified. The most feasibly appropriate sampling method is convenience sampling. These samples were generated primarily through personal contacts and networking. Whilst acknowledging the shortcoming usually associated with non-random sampling, such as the ability for the findings to be generalized, the study nevertheless made a deliberate attempt to ensure sufficient representation from all industries and executives in the sample by making personal contacts. Convenience sampling is commonly used in many fields such as marketing and strategic management studies when the population and sampling frame are not easily identified (e.g. Jaworski and Kohli, 1993). According to McGrath (2001), the major advantage of using personal contacts is that the respondents are genuinely interested in the results and are committed to making sure the responses (data) are accurate.

Findings and discussion

Descriptive analysis

A total of 345 questionnaires were distributed, with 118 returned as useable responses, for which the profile of the respondents and their selected decision is as summarized in Table I. A response is considered as useable if all sections of the questionnaires are filled in, with exceptions for some background information such as the amount of sales generated. In other words, a response would is not included if there are missing responses pertaining to the factors under examination, with an exception for general information. When the variables are analyzed using principal component analysis, the 16 items on extent of scanning are factored into three major dimensions:

(1) technology information;

(2) economic/financial information; and

(3) competition information.

The technology sector relates to items such as technology advancement, new concepts in technology and technology information related to product/service enhancement; the economic/financial sector relates to information about cash and investment techniques, internal budgeting, expenses and cost information; and competition information

Table I.
Respondents, decision and companies profile

Characteristics ($n = 118$)	Frequency	Percentage
Years of employment in the current firm		
1-5 years	40	33.9
6-10 years	40	33.9
11-15 years	17	14.4
More than 15 years	21	17.8
Years in the current industry		
1-5 years	20	16.9
6-10 years	38	32.2
11-15 years	22	18.6
More than 15 years	38	32.2
Years in current position		
1-5 years	77	65.3
6-10 years	29	24.6
11-15 years	12	10.2
Current position		
CEO	39	33.1
General/senior manager	33	28.0
Manager	46	39.0
Education level		
Doctorate/Master's	38	32.2
Bachelor's	69	58.5
Diploma or lower	11	9.3
Field of study/expertise		
Management/business/economics	65	55.1
IT/engineering/science/mathematics	31	26.3
Law/education/others	17	14.4
Industry		
Services	76	64.4
Manufacturing	42	35.6
Years in operations		
1-5 years	14	11.9
6-10 years	29	24.6
11-15 years	22	18.6
More than 15 years	53	44.9
Size of company (number of employees)		
1-50	40	33.9
51-500	35	29.7
More than 500	43	36.4
Size of company (average annual revenue) [a]		
RM10 million or less	30	25.4
RM11 million-RM100 million	40	33.9
More than RM100 million	42	35.6
Type of decision		
Capital acquisition	41	34.7
Business acquisition	26	22.0
Market expansion	17	14.4
Others	33	28.0

Note: [a]Six respondents declined to provide information on annual revenue. $US1 is equivalent to approximately RM3.5

summarizes information pertaining to products that are comparable those of competitors, changes in societal values and competitive trends. Subsequently, the 16 items measuring the methods and sources used were similarly grouped. The Cronbach's α reliability measures for these three dimensions – i.e. extent, method and sources – ranged from 0.6 to 0.79 and were deemed to be satisfactory.

Descriptive analysis indicates that the extent of scanning conducted for the three sectors is about the same. During the scanning, moderately formal methods are used with slight reliance on impersonal and external sources. The details are as shown in Table II.

Results and discussion

All the hypotheses of this study are tested simultaneously using hierarchical regression involving four levels (denoted Models 1, 2, 3 and 4). Model 1 focuses only on the control variable – i.e. decision complexity – and its relation to investment quality, while Model 2 includes control variables and independent variables (extent of environmental scanning). The third model includes information processing capacity as an additional independent variable before the interaction terms are introduced in Model 4. The details of the findings are as displayed in Panel A of Table III while a summary of the model fits are as shown in Panel B of Table III.

Decision complexity (or nature of the decision) is found to have no bearing on the investment decision quality. Though much has been said in the literature about an increase in decision time when the task is unfamiliar or ambiguous and also an increase in the amount of information used when the task is complex or difficult (Wood, 1986; Leonard *et al.*, 2005), the evidence presented in this study lends no support for decision complexity.

Variables	Mean	SD
X_1: Extent of scanning		
Technology	3.369	0.985
Economic/financial	3.371	0.988
Competition	3.392	0.936
X_2: Method of scanning		
Technology	3.413	1.046
Economic/financial	3.469	0.848
Competition	3.405	0.752
X_3: Source of scanning (personal/impersonal)		
Technology	2.913	0.743
Economic/financial	2.989	0.863
Competition	3.068	0.767
X_4: Source of scanning (external/internal)		
Technology	2.866	0.779
Economic/financial	3.047	0.917
Competition	2.867	0.747

Notes: Number of decisions = 118; X_1 scale range: 1(not at all) to 5 (great amount); X_2 scale range: 1 (informal) to 5 (formal); X_3 scale range: 1 (impersonal) to 5 (personal); X_4 scale range: 1(external) to 5 (internal)

Table II.
Descriptive statistics of independent variables

Independent variables	Model 1	Model 2	Model 3	Model 4
		Dependent variable: decision quality		
Panel A: Results of regression				
Control variables				
Decision complexity	0.020	0.047	0.027	0.000
Model variables				
Extent of scanning				
Technology		−0.075	−0.156	−0.353*
Economic		0.408***	0.384***	0.540**
Competition		0.182*	0.138	0.015
Method of scanning				
Economic		−0.148	−0.156	−0.372**
Competition		0.199*	0.144	0.792***
Source (P/IP) of scanning				
Technology		−0.101	−0.112	0.032
Economic		0.041	0.090	0.140
Competition		0.033	0.057	0.238
Source (E/I) of scanning				
Technology		0.031	0.031	−0.024
Economic		−0.139	−0.161	−0.296
Competition		−0.011	0.019	−0.273
Moderating variable				
Information processing capacity			0.343***	0.316**
Interaction variable				
IPC*Tech				3.493*
IPC*Econ				−0.977
IPC*Comp				0.486
IPC*Tech(M)				−2.452*
IPC*Econ(M)				1.470**
IPC*Comp(M)				−2.480***
IPC*Tech(S1)				0.071
IPC*Econ(S1)				−0.606
IPC*Comp(S1)				−0.153
IPC*Tech(S2)				−0.054
IPC*Econ(S2)				0.397
IPC*Comp(S2)				0.839
Panel B: Model summary of multiple regression analysis				
F value	0.040	2.579***	3.535***	3.112***
R^2	0.000	0.258	0.343	0.506
Adjusted R^2	−0.010	0.158	0.246	0.343
R^2 change	0.000	0.258	0.085	0.163
F change	0.040	2.809***	11.401***	2.086***

Notes: *Significant at the 0.1 level; **significant at the 0.05 level; ***significant at the 0.01 level

Table III. Results of hierarchical regression and model summary

The findings also indicate that the extent of environmental scanning influences the investment decision quality with regard to economic and, to a lesser extent, competition information only. This result means that decisions that use more information relating to economy and competition tend to result in better decision quality, i.e. achieving the desired outcomes. The scanning of technology information, however, has no direct impact on the decision quality.

With regard to the method of scanning, only the method used to scan competition information has a significant and positive relationship with decision quality, albeit only weakly. Its positive direction indicates that the more formal the method used to scan competition information, the better the decision quality will be. The same conclusion, however, cannot be extended to the source of scanning – i.e. either external or internal or impersonal or personal. Regardless of the origin of the information used to scan the environment (i.e. personal, impersonal, external or internal), the decision quality remains unaffected. The mean scores for source of scanning in Table II remain about the same for the three dimensions of scanning areas. One potential explanation is that the role of the scanning source is intertwined with the types of information and the amount of scanning conducted. It does not matter where the information is coming from as long as it is sufficient (amount) and of good quality. Invariably, the source of the information would also determine the amount and quality of information to be scanned. Thus, when taken simultaneously with all the other variables source of information becomes insignificant, as its impact on decision quality may have been indirectly affected through the extent of information scanning.

The results of Model 3 suggest that as information processing capacity increases so does the quality of the investment decision, indicating the role of IPC as a predictor. When the interaction terms are included, only some of them are significant, notably interaction between IPC and extent of information scanned on technology and IPC and method used to scan for all three types of information (technology, economic and competition). Since IPC plays the roles of both a predictor and a moderator, it is a "quasi moderator". This term means that IPC has both a direct effect on decision quality as well as modifying the impact of extent of information scanned on technology and methods used on decision quality. Notice that technology-related scanning factors become significant only when IPC interaction terms are included. This result indicates that the extent of technology environmental scanning alone would not be sufficient to impact the quality of the investment decision. The relationship is enhanced with greater IPC. It is interesting to note that while the extent of economy and competition scanning has a direct impact on investment decision quality, technology-related scanning depends on the information processing capacity to turn it into useful information for a quality investment decision to take place.

The findings can be explained by the predictability assumption inherent in the scanning activities. Implicitly assumed in the scanning behavior is that the information gathered will follow a predictable pattern that is often observed in the market. While this is proven to be true in most instances, for example in the cases of economy and competition, the same assumption cannot be extended to the technology sector, which is noted for its unprecedented growth and rapid changes. The extent of scanning conducted for technology information would have to be processed further before useful information could be used to aid decision-making. In a way (though not directly related), the findings of this study concur with that of Kumar *et al.* (2001), where environmental scanning activities were found to have moderated the usage of the scanning system in the strategy-performance relationship.

Conclusion

Scanning is an important first step in the strategic decision-making process, which influences the perception and action of the organization (Daft and Weick, 1984;

Hambrick, 1981). However, many previous studies (Beal, 2000; Daft and Weick, 1984; Ebrahimi, 2000; Elenkov, 1997; Hambrick, 1981; Kumar *et al.*, 2001; Venkatraman, 1989; May *et al.*, 2000; McGee and Sawyerr, 2003; Suh *et al.*, 2004) have focused mainly on decisions relating to the choice of corporate strategies, leaving strategic investment decisions largely understudied. This study intends to bridge the gap not just by examining strategic investment decisions but also by investigating the role of information processing capacity in enhancing the relationship between the extent of scanning behavior and the quality of the investment decision. To further understand decision-making, the study uses the decision as its unit of analysis to avoid having to average out the effects of making good and bad decision often associated with a decision maker.

The results suggest that the extent or amount of environmental scanning for economic and competitive reasons positively influences investment decision quality. The more scanning is carried out to look for economic and competitive data, the better the decision quality. The remaining dimensions of environmental scanning, such as method and source of information – personal and impersonal, and external and internal – do not seem to help improve decision quality. Information processing capacity, which is postulated to have moderated the relationship between the extent of scanning and decision quality, does so for technology-related variables and method of scanning involving the three types of information scanned (economy, competition and technology). The differences in the results are attributed to the fast changing character/trend often associated with technology, rendering the extent of scanning alone an insufficient condition to improve decision quality. The information processing capacity is needed to turn technology data into useful information or knowledge to influence the quality of the decision made. On the other hand, information processing capacity also acts as a predictor in enhancing decision quality. The dual roles played by information processing capacity qualify it to be a quasi-moderator in influencing the investment decision. Arguably the generalizability of these findings is somewhat limited due to inherent bias related to convenience sampling. Nonetheless the contribution offered by using the decision as a unit of analysis is incomparable. Future studies should examine the consequences of scanning behavior – i.e. performance. Replication of this study, but focusing on individual decision makers, would be a useful avenue to follow to ascertain the effect of a different unit of analysis on scanning behavior.

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