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# MODERATING EFFECT OF INFORMATION PROCESSING CAPACITY TO INVESTMENT DECISION MAKING AND ENVIRONMENTAL SCANNING

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**Abstract**

*This study will examine the role of information processing capacity in enhancing investment decision quality and environmental scanning relationship. Cross sectional data was collected through a survey and analyzed by means of factor analysis and hierarchical regression analysis. Information processing capacity is only contingent upon technology information in order to affect the quality of investment decision. Method of scanning on the other hand will lead to quality decision only with the inclusion of information processing capacity. Use of convenience sampling may restrict the generalizability of findings. Information processing capacity is needed when scanning technology information to bring about decision quality, thus for technology related matters, firms should be investing in the information processing capacity to produce quality decision. Information processing capacity theory is genuinely new in the literature of investment decision making. This study uses decision as its unit of analysis.*
*Keywords – environmental scanning, decision quality, information processing capacity*
*Paper Type – Research Paper*

## Introduction

Companies invest hundreds of billions of dollars every year in fixed assets. By their nature, these investment decisions have the potential to affect a firm's fortunes over several years. A good decision can boost earnings sharply and dramatically increase the value of the firm while a bad decision can lead to bankruptcy. The reason is that, most of these decisions involved committing a big sum of money and the results heavily depend on forecasting and creating the future in a competitive and ever-changing business environment. Thus the risk and uncertainty is inherent in these investments. Hence, coping with uncertainty is a central issue whenever organizations adapt to environmental changes.

Information becomes a valuable input in decision-making as the potential increase in uncertainty may lead into more information seeking, and consequently may impact an organizational decision-making. The needs and values of environmental information have also been emphasized in corporate long-range planning because this information assists top management to effectively plan for future action (Fahey and King, 1977). To reduce uncertainty, scanning was done to identify key trends, changes and events in an organization's environment, which may affect an organization's functions and goals (Aguilar, 1967; Hambrick, 1981; Miliken, 1990).

Boyd and Fulk (1996) mentioned that scanning might well provide useful information for decision-making in response to perceived variability. The scanning literature has identified several sectors that need to be monitored: economics, technological, governmental, social, competitors and customer (e.g. Jain, 1984). It has been indicated that these areas create different levels of strategic uncertainty for executives. An increase in strategic uncertainty inevitably means both the general environment and task environment must be scanned (Daft et al., 1988).

## Motivation of the Study

The study on environmental scanning is well recognized in strategic management and decision making literature. However none of the study looked at the impact of information processing capacity towards in enhancing the relationship. The literature has generally agreed that environmental scanning has significant positive impact on the performance of an organization, as attested to by several studies such as Daft and Weick, (1984); Hambrick, (1981); Venkatraman (1989); and Dess, and Davis (1984). However, there is certainly a dearth of literature that focused on in-depth understanding of scanning and its differential impact on quality of decision, such as Information Processing Capacity (IPC) as moderator that may impact scanning under various contexts of the decision-making situation.

The general objective of this research therefore is to determine the impact of IPC as a contingent factor to environmental scanning and its contribution to the investment decision quality. It also attempts to address the issues of what information should be scanned to ensure quality decisions.

## Research Model

### *Information processing theory – decision making perspective*

The conceptual underpinning the present study is Information Processing theory, which was originally initiated by Thompson (1980), Simon (1957) and March and Olsen (1976). Starting from this theoretical foundation, Duncan (1972), Galbraith (1973), Ouchi (1980); Tushman and Nadler (1976); Williamson (1981); and (Bums and Stalker, 1961; Lawrence and Lorsch, 1967; Duncan, 1972; Van de Ven, Delbecq and Koening, 1976; Egelhoff, 1982; Kmetz 1984 as cited by Egelhoff, 1991) developed organizational information processing framework in terms of *decision making perspective*. They proposed that organizational models of information processing should focus on environmental uncertainty and how an organization absorbs uncertainty as the important contingency concept to gain the desired level of information processing capacity.

The decision making perspective analyzes organizations as rational decision making systems. However, since the individual as decision maker is bounded by cognitive limitations (Simon, 1957) information is processed in order to reduce or avoid uncertainty. Therefore, the organization sets its goals first, then searches for alternatives, and selects courses of action which leads to goal attainment (Choo, 1991). According to Galbraith (1973), all organizations must face uncertainty – uncertainty about the market, suppliers, shareholders, government agencies, and so on. Uncertainty arises because the executives experience lack of information about an external environment that is complex and variable (Choo, 2001). Building on the work of Simon (1957), Galbraith (1973) proposes the theory that an organization processes information in order to reduce task uncertainty. That is the difference between the amount of information required to perform the task and the amount of information already possessed by the organization. Thus, according to Galbraith there is a relationship between the amount of uncertainty faced by an organization and the amount of information processing that must go on in an organization. The capabilities of the organizational participant to process information to reduce uncertainty will lead to organization effectiveness. Organization effectiveness according to him is those that fit their information processing capacities (for gathering, transforming, storing, and communication information) to the amount of uncertainty they face (Egelhoff, 1991) and the quality of decision they made. Therefore information processing theory involves the collection of data and transforms data into more valuable information that relates to particular decision or function in the organization. Information processing theory had been viewed from many perspectives such as; (1) cognitive view (skill, knowledge and experience); and (2) logical view (decision support system).

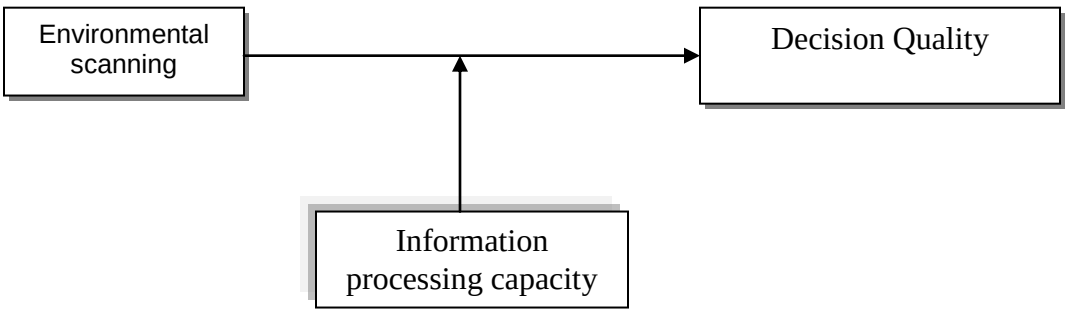



*Figure.1:* Information Processing and Contingency Concept

## Methodology

### *Sample and Procedure*

Data for this study was collected through survey-structured questionnaires. The questionnaires were distributed to higher level decision makers who make capital investment decision in Malaysian company of various sectors. A total of 118 responses were obtained from 320 questionnaires sent. The samples were gathered through convenient sampling method.

### *Variables and Measurement*

Hambrick (1984) was the first who set the methodological archetype in measuring environmental scanning behavior. He identifies three behavioral dimensions of scanning; amount of scanning, method of scanning and sources of scanning. Those attributes are the conceptualization of the extent of environmental scanning in the present study. The present study control the decision characteristics by assuming that all the decisions made were of the same complexity. Information processing capacities on the other hand looked at the skill, knowledge and experience of the decision maker as well as the decision support system used to interpret the information. Unit of analysis of the present study was decision.

The instruments were adapted from various literatures and were modified to the adaptation of the decision maker's behavior context. The dependent variable, investment decision making quality was measured using ten items. Responses were measured using five-point Likert type scale anchored by "strongly disagree" (1) to "strongly agree" (5). Meanwhile, to measure the independent variable items, five-point Likert type scale was used with scales ranging from "very unlikely" (1) to "very likely" (5).

## Result and Analysis

The results in the present study were analyzed using SPSS 13.0. Respondent's profile was interpreted looking at who made the decision. The majority of the decision-makers in our sample hold managerial position (39%) designated in most of the business units such as regional manager, branch manager, operation manager, financial manager and etc. followed by CEOs (33%). 58% of them have Bachelor's degree and about 32% hold Masters and Doctorate degrees. The majority of them have management and business background, but there are also a significant number of respondents with IT and engineering background. Thus, we can conclude that the respondents are sufficiently well versed with their company operations and are able to comprehend the needs of the questionnaire.

It was argued that different decisions need different types of information involving different methods and sources. Therefore, it is crucial to scrutinize the decision profile as it might point towards different scanning behavior. The data shows that most of the decisions in the sample are related to capital acquisitions (35%) involving decisions to acquire plant, machinery, building, land, computers, and etc., and 28% are related to decisions about research and development, developing new product and new market and etc. Another 22% are decisions related to business acquisition and mergers while 14% are related to market expansion. Hence, the study covers a whole spectrum of decisions which hopefully will reflect the various types of scanning behavior.

Table 1 f*actor analysis and reliability test result on the extent of scanning*

| ***Items*** | ***Types of information*** | ***Factor Loading*** | | |
|---|---|---|---|---|
| | | **1** | **2** | **3** |
| Q1 | Demographic trends affecting demand | .065 | -.120 | **.798** |
| Q2 | Advances in technology | **.754** | .110 | -.013 |
| Q3 | New concepts in technology | **.829** | .165 | -.279 |
| Q5 | Changes in societal values affecting demand | .065 | -.005 | **.774** |
| Q6 | Product comparable to competitors | .073 | .146 | **.626** |
| Q7 | Information about cash and investment techniques | -.073 | **.711** | .244 |
| Q8 | Internal budgeting and control systems | -.015 | **.923** | -.087 |
| Q9 | Improve sales level and pattern | -.194 | .342 | **.582** |
| Q10 | Company's performance (e.g. expenses, cost) information | .031 | **.666** | .127 |
| Q11 | New organizational design | .338 | **.591** | -.121 |
| Q13 | Technology information for product/service enhancement | **.784** | -.180 | .290 |
| Q14 | Technology information for product/service efficiency | **.804** | -.053 | .165 |
| **Reliability Cronbach Alpha** | | **.827** | **.786** | **.732** |
| Eigenvalues | | 4.505 | 1.797 | 1.300 |
| Percentage of Common variance | | 37.539 | 14.977 | 10.831 |
| Cumulative % | | 37.539 | 52.516 | 63.347 |

***Goodness of Measure***

Goodness of measure in the present study were identified and interpreted based on the criteria whereby, each item should load 0.50 or greater on one factor and 0.50 or lower on the other factors. The criteria were applied by deleting items that showed loading of less than 0.50 on all factors and items whose loading were greater than 0.50 on two or more factors. The three factors were extracted using the eigenvalue-greater-than-one rule for extent of scanning; cumulatively capture 63.3% of the variance. Factor loadings were in the range of 0.582 to 0.923. Thus the hypothesized five dimensions (technology, economic, regulation, competition, socio-demographic) are now reduced to only three components. These three were then labeled as technology, economic/financial, and competition information on the basis of the items loaded on them. It was then concluded that Malaysian decision makers scanned only 3 sectors of the environment (i.e technology, economic and competition). Table 1 is the factor analysis result on the extent of environmental scanning.

***Regression Analysis***

To test whether the model is significant in explaining decision quality, the F values, R squared, Adjusted R square, R square change and F change were analyzed. Table 5 displays the result of the relationships between Environmental scanning, Decision Quality and Contingent effect of IPC. Model 1 displays the effect of control variables, model 2 shows the predictor variables, model 3 shows the moderating variable and model 4 displays the effect of the interaction variables. Table 6 on the other hand displays the results of whether each variable is statistically significant and shows the direction of the relationships. The results concluded that a model exists and therefore relationships exist between the variables except for control variable.

*Relationship of Environmental Scanning and Investment Decision Quality*

The determinants of the relationship between environmental scanning and investment decision quality were based on the results from model 2 of hierarchical regression analysis presented in Table 5. Thus, as shown in table 5, model 2, indicates that the R-square is 0.258, indicating that 25.8% of the variance in the quality of the decision can be explained by the variations in the extent and method of scanning variables. Besides R square, F-value was also used to check how well the model fits the data. The significant F-statistics (2.809) indicates that a model exists. These statistics indicate that the direct model is of moderate fit with the data obtained. Model one which includes only control variables (decision complexity) shows that decision complexity has no impact on decision quality. F-statistics clearly shows that decision complexity is not significant (0.04) and R square has zero percent explanatory power.

Table 5
*Model summary of multiple regression analysis*

| | **Model 1** (control variable) | **Model2** (independent variables) | **Model3** (moderating variable) | **Model4** (Interaction variables) |
|---|---|---|---|---|
| F value | .040 | 2.579*** | 3.535*** | 3.112*** |
| R square | .000 | .258 | .343 | .506 |
| Adjusted R square | -.010 | .158 | .246 | .343 |
| R square change | .000 | .258 | .085 | .163 |
| F change | .040 | 2.809*** | 11.401*** | 2.086*** |

***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level

Impact of Environmental Scanning Variable on Investment Decision Quality

After checking for the model fit, the next step is to check whether or not the seven variables of the independent variable are statistically significant to the dependent variable as well as the direction of the relationship. If the model is statistically significant and the coefficient is positive, it would indicate that the more scanning done, the higher the quality of decision made. On the other hand, a negative coefficient will imply that the greater the value of independent variables, the lower will be the decision quality. On the other hand, for method of scanning, since lower value means the formality of scanning is lower, a negative coefficient would imply that the more formal the method of scanning, the better the quality of investment decision and vice versa. Thus, the standardized (b) coefficients are used to show this relationship. Statistical data bearing on these results are presented in table 6.

Table 6
*Hierarchical Regression – Environmental scanning and Investment Decision making quality*

| **INDEPENDENT VARIABLES** | **DEPENDENT VARIABLE DECISION QUALITY** | | | |
|---|---|---|---|---|
| | **Model1** | **Model2** | **Model3** | **Model4** |
| **Control variables** | | | | |
| Decision complexity | .020 | .047 | .027 | .000 |
| **Model variables**: | | | | |
| *Extent of scanning* | | | | |
| Technology | | -.075 | -.156 | -.353* |
| Economic | | .408*** | .384*** | .540** |
| Competition | | .182* | .138 | .015 |
| *Method of scanning* | | | | |
| Economic | | -.148 | -.156 | -.372** |

| | | | |
|---|---|---|---|
| Competition | .199* | .144 | .792*** |
| **Moderating variable** | | | |
| Information Processing Capacity | | .343*** | .316** |
| **Interaction variable** | | | |
| IPC*Tech | | | 3.493* |
| IPC*Econ | | | -.977 |
| IPC*Comp | | | .486 |
| IPC*Tech(M) | | | -2.452* |
| IPC*Econ(M) | | | 1.470** |
| IPC*Comp(M) | | | -2.480*** |

***significant at the 0.01 level, ** significant at the 0.05 level, * significant at the 0.1 level

Model 2 in Table 6 presents the standardized (b) coefficients that describe how strongly the independent variables are influenced by the dependent variables. As mentioned earlier, 25.8% of the variance in the quality of the decision can be explained by the variations in the four independent variables. The model fit is indicated by the F-statistics (2.809). Moreover, the summary result of regression analysis indicates that the extent of scanning with regard to economic information and competition information was significant and has positive relationship with investment decision quality. Furthermore, the higher beta value shows that the amount of scanning of economic information has the most significant impact in explaining the variance in decision quality, followed by scanning the competition information. However, scanning of technology information has no impact on decision quality. With regard to the method of scanning, only method used to scan competition information has significant and positive relationship with decision quality. Although it is weak (significance level of 0.10), competition information has little impact in explaining the variance in decision quality. Its positive direction indicates that the more formal the method used to scan competition information, the better will be the quality of decision.

*Moderating Effect of Information Processing Capacity*

To test the moderating effect of information processing capacity on the relationship of environmental scanning and decision quality, model 3 and 4 display the result of hierarchical regression analysis.

To test for moderating influence to the environmental scanning and quality decision relationship, model 3 upon inclusion of information processing capacity variable is analyzed. The results of table 5 indicate that the model is highly significant (F-change=11.401; p-value=0.001) and the R square improved by 8.5% to 34.3%. The additional explanatory power improves the R square significantly. Moreover with the inclusion of interaction variables in model 4, R square improved even higher to 50.6%, which indicates that the moderating variables generally influence the relationship between the independent variables and the dependent variable. This also indicates that information processing capacity when interacting with scanning behavior was able to explain an additional 16.3% of the variance in the quality of decision when functions of moderator were included. Hence, since the moderator acts as a predictor in model 3 as well as interacting with the independent variables in model 4, the moderator is actually a quasi moderator and not a pure moderator. However, information processing capacity does not moderate the impact of each of the independent variables uniformly. The impact of which independent variable on the dependent variable is moderated by IPC can be seen from the significance of the interaction terms.The regression coefficient measured by the standardized (b) coefficients indicate that moderating variables were significant for the interaction variable of IPC with the extent of information scan on technology (p-value=.058), method used to scan technology information (p-value=.093), method used to scan economic information (p-value=.010) and method used to scan information related to

competition (p-value=.000). This indicates that the relationship of all the above variables and decision quality was influenced by the inclusion of moderating variable.

To better understand this moderating influence, a graphical illustration was used. Figures 2 to 5 depict these moderating influences.

- **Moderating effect - Relationships between Extent of Technology Information and Investment Decision Quality.**

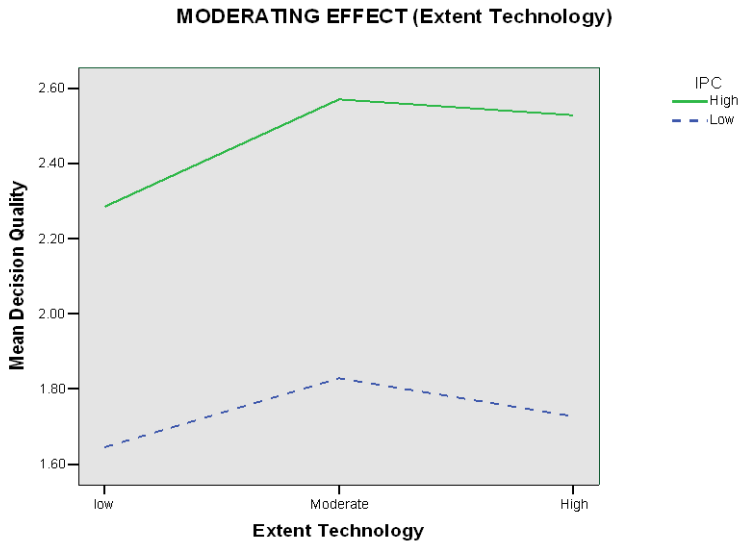
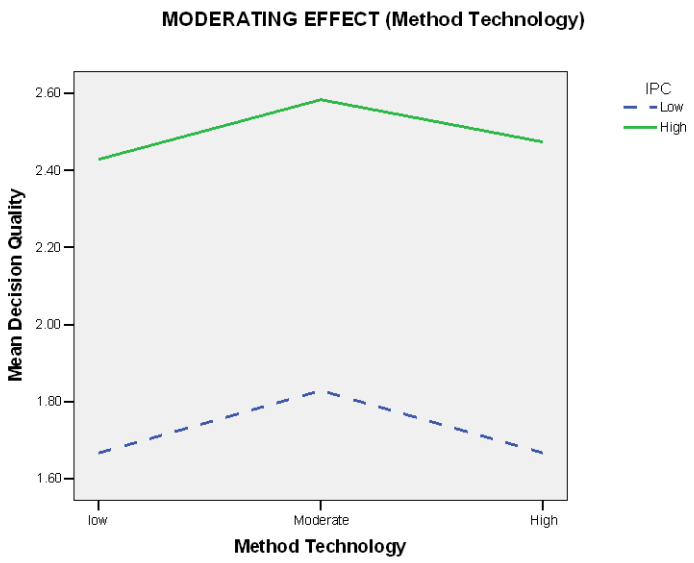



*Figure 2:* Moderating effect on amount of technology information scanned and Decision Quality.

Figure 2 explains that the impact of extent of technology information scanned on decision quality is positive only for low to moderate extent of technology information scanned; for both situations where information processing capacity is high and low. Beyond moderate level of extent of technology information, the impact on decision quality is negligible. However, the steeper slope when the level of extent of technology information scanned is low to moderate shows that its impact on decision quality is bigger when IPC is high. However, note also that decision quality is higher in situations where the IPC is high irrespective of the extent of technology information scanned. Thus, IPC is playing both a predictor role as well as a moderator role; i.e. a quasi-moderator role.

- **Moderating effect - Relationships between Method to scan Technology Information and Investment Decision Quality**

Figure 3 shows that, regardless of whether IPC is high or low, the effect of formality of method used to scan technology information impacts the decision quality positively only when the method is low to moderately formal. When the method used to scan technology information extends beyond moderately formal, the impact is negative. However, it is unclear whether or not IPC moderates the relationship between the methods used to scan technology information and decision quality as the two curves appear to be parallel to one another. However the SPSS output indicates that the interaction term is significant, indicating a slight quasi moderating role. Note that, irrespective of the extent of formality in the method used to scan technology information, decision quality is always higher when IPC is higher. This is always true when the hypothesized moderator is actually a quasi moderator.




Method Technology: Low = Informal; High = Formal; Moderate = Moderately formal/informal

*Figure 3:* Moderating effect on method of technology information used and Decision Quality

- **Moderating effect - Relationships between Method to scan Economic Information and Investment Decision Quality**.

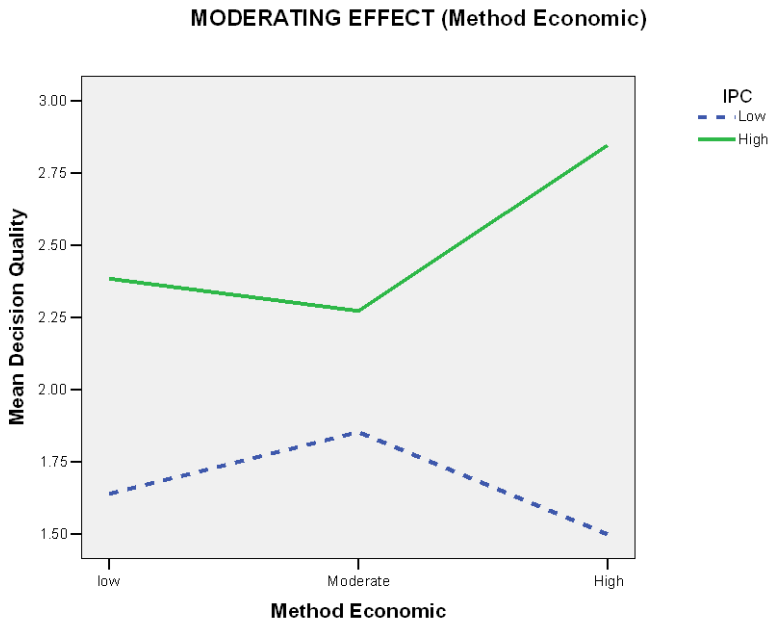


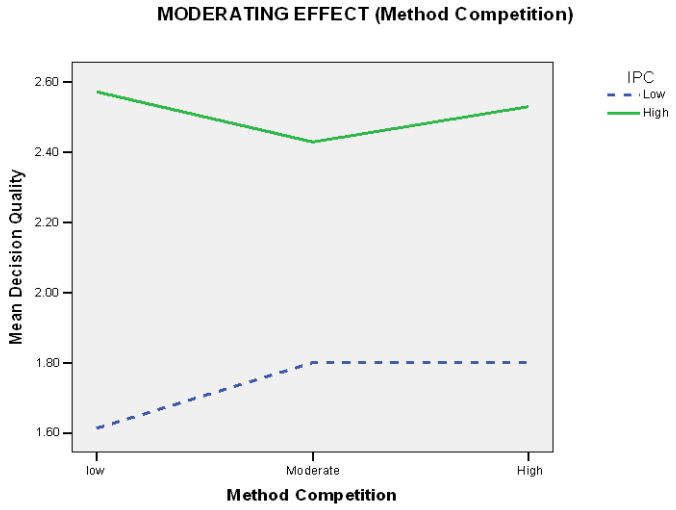

*Figure 4:* Moderating effect on method of economic information used and Decision Quality

Method Economic: Low = Informal; High = Formal; Moderate = Moderately formal/informal

In the case of method used to scan economic information, Figure 4.4 shows that when IPC is high, the effect of method used to scan economic information has an impact on decision quality only when the method used is very informal to moderately formal. Negative plot in the low to moderate value of method indicates that the impact of method is negative (namely decision quality reduces) when method increases from very informal to moderately formal. In the case when IPC is low, the effect of method used to scan economic information on decision quality is positive when it is low to moderately formal; and negative when it is moderate to highly formal. Thus, when IPC is low, it is best to use moderately formal methods to scan economic information and when IPC is high, it is best to use more formal method to scan economic information.

Again note that whatever the level of method used to scan economic information, the decision quality is higher in situation when the IPC is higher. This is typical of quasi moderator, where the two lines do not intersect and one is above the other.

- **Moderating effect - Relationships between Method to scan Competition Information and Investment Decision Quality.**




Method Competition: Low = Informal: High = Formal: Moderate = Moderately formal/informal

*Figure 5:* Moderating effect on method of competition information used and Decision Quality

Figure 5 clearly indicates that the method used to scan competition information has differential effect on decision quality depending on the level of IPC. In the situation where IPC is low, the method to scan competition information on decision quality is positive, when the formality of the method used is low to moderate and negligible beyond moderate level. i.e. there is an upper limit on the formality of the method used to scan competition information to have any effect on decision quality. In the situation where IPC is high, the effect of formality on the method used to scan competition information is negative when the method is low to moderately formal; and positive when it is moderate to highly formal.

## Discussion

In the present study, the environmental sectors scanned were technology information, economic/financial information and competition information. This may be due to the reason that decisions involved in this study were limited to capital investments that may need more information on economic condition, competitors and technology advancement. Moreover, it also shows that Malaysian decision makers are more task-oriented and focused more on short term perspective as technology, economic and competition information have more direct relevance to the decisions and shorter term in nature. Apparently,

information pertaining to competition followed by economic/financial information was scanned as the most by the executives at various levels. Technology information however was the least scanned. This is also a reflection of the nature of the decisions involved in this study, where the majority of the decisions were related to capital acquisition (e.g. to acquire plant and equipment, business premises, land, etc.), business acquisition, and market expansion which generally requires information related to competition and economic/ financial.

Comparatively, prior researchers found that the market sector (competitor, supplier and customer) of the environment received more attention from executives than any other environmental sectors (e.g. Aguilar, 1967; Auster and Choo, 1994; Ebrahimi, 2000; Ghoshal, 1987; Hambrick, 1984; Kefalas and Schoderbek, 1973; Smeltzer et al., 1988; Yunger, 2005; etc.). However, between the two, most studies found competition is the most scanned sector. Therefore it can be concluded that the findings of the present study was somewhat consistent with Aguilar's and friends that competition information was highly scanned as compared to other information although the differences were insignificant.

The data of the present study found that there is significant and positive relationship between environmental scanning and investment decision quality. What this means is that the more scanning done in making the decisions, the better is the decision made. However, the analysis suggests that this is only true for scanning activities related to economic and competition information. Between the two, competition information has more positive impact on decision quality than economic information. Indeed, the findings suggests that decision makers who concentrate more on the information related to the area such as competitive trend, values and product as well as economic and financial management will have higher decision quality. This is consistent with the findings of Yunger (2005), who also found that decision makers in Malaysian organization requires constant attention to competitors as well as economic changes that are impacting new product design and delivery. The main effect shows that decisions which scanned (and subsequently use) information from these sectors experienced high decision quality.

Although competition information and economic information have direct impact on quality decision, only formality of the method used to scan competition information has positive impact on investment decision quality. The finding suggests that a more formal method of scanning for competition information will contribute to better decisions. This is due to the nature of competition information. It can be concluded that extra effort using systematic formalized method will provide competitive edge resulting in better quality decisions. Hence, the more formal method used to scan competition information, the better the quality of investment decision. Scanning for technology information shows no significant impact on investment decision quality.

Particularly for the interaction of IPC with extent of technology scanned, IPC plays a predictor role to the decision quality instead of moderator's role. This means that it has both a direct effect on decision quality as well as it moderates the impact of extent towards technology information scanned. The direct effect is positive indicating that the greater the information processing capacity, the better will be the quality. This can be seen by the fact that decision quality is higher in situation where the IPC is high irrespective of the extent of technology information scanned. Moreover, the gradients of the two lines of high and low IPC are about the same. In addition, since decision quality only improved when amount of information scanned is low to moderate but reduced with increasing volume, thus one might speculate that information overload had occurred and environmental scanning without the necessary capacity to process the results of the scanning does not translate into better decision. Moreover, level of IPC shows no differential impact of scanning under various context of the decision making situation. The reasons for this scenario as explained by many researchers (e.g. Fahey and King, 1977) are due to two reasons. One is either the information is very complex to process or the information is common knowledge and therefore cannot be used to differentiate between low and high quality decisions. In both of these situations, the need for IPC is minimal. The second reason is the information may not be relevant to the business decisions involved; therefore having the capacity to process the information (high IPC) will not make an impact on turning data into information.

However, for method of scanning technology information, it is unclear whether or not IPC moderates the relationship between the method used to scan technology information and decision quality as the two curves appears to be parallel to one another. Similar situation occurred for method used to scan competition information. Note that, irrespective of the extent of formality in the method used to scan technology information, decision quality is always higher when IPC is higher. For method used to scan economic information, whatever level of method used to scan economic information, the decision quality is higher in situation when the IPC is higher. This is typical of quasi moderator, where the two lines do not intersect and one is above the other.

Examining Information Processing Capacity (IPC) as a potential moderator of the scanning-decision quality relationship is firmly grounded in the information processing perspective initiated by Galbraith (1973). Previous study (e.g. Daft et al., 1988: Kumar et al., 2001) allows an exploration of the detailed linkage among strategy, environmental scanning, and organizational performance advanced by contingency theorist. Kumar et al. (2001) confirm the moderating role played by environmental scanning activities with the usage of scanning system in the strategy-performance relationship. However, the one and only study that gives greater attention to the inclusion of IPC as a contingency factor is the present study. In the present study, we found that IPC influences the relationship between scanning and decision quality for certain amount and method used for certain types of information. However, Information Processing Capacity (IPC) as a moderator was not widely studied. Therefore the result of the present study cannot be easily compared to previous investigations. According to Kumar et al. (2001), in the context of the resource-based view of the firm, scanning system and additional skills, knowledge and experience will increase firm's capability in gaining firm's sustainable competitive advantage. However, the inclusion of the interaction between scanning and the capacity to process the information gives evidence of consistent differences in quality of the decision made by the decision makers. To a far greater extent, the effects of IPC only impact particular scanning behavior or certain type of information being analyzed. The high or low IPC level gives no significant difference in determining the degree quality of decision among other variables such as extent of scanning done for economic, competition information and all sources of information. The reasons that can be concluded from these findings are; (1) Moderate level of scanning done among Malaysian executives may not require high IPC to process data into knowledge in gaining quality enhancement; and (2) "common body of knowledge" may exist as the effect of IPC on decision making quality was not pervasive. This may be due to the decision made was considered common in nature as it was observed that nature of decision was insignificant to the executives in making the said decision. So far, we have used our findings to suggest that different levels of IPC may not strongly require, or induce different scanning behaviors. Although interaction between amounts of technology information scanned as well as method used to scan all three types of information (technology, economic and competition) and IPC significantly influence the quality of decision, the moderating role was weak. Therefore, the conclusion is that executives do not appear to attempt to enhance their quality decision through their information processing capabilities. Through the survey, as mentioned earlier, two observations were made which bear on this conclusion. First, this implies that IPC generally is not used as a basis for achieving a distinctive competence. It is either the information is very complex to process or it is common knowledge (i.e. it is easy to process). Second, the decision was not relevant to the business decision. Therefore, there is no necessity for IPC and having high IPC will not make an impact on turning data into information.

**Conclusion**

Based on the discussion, we conclude that, environmental scanning is vital to achieve quality decision, thus IPC is only needed when scanning technology information and using formal method to scan the information. However, we have found the limitation in this study regarding the sample selected, the present study identifies three methodological issues that should be raised. The first issue is lack of restriction on the executives making decision and the industries which were examined. This type of sample selected, however, is expected to lower the internal validity arising from diversified sample but the results may be more generalizable. Secondly, since only 118 managers participated in the study, this

also will limit the internal validity of the results and restrict a sample for tapping actual extreme decisions. Thirdly, due to unidentified sampling frame and the nature of the study, the data for the present research was collected via convenience sampling; many argues that, it is susceptible to biases. However, the strategies described in the section of non random sample increased our confidence in the representativeness of the sample. Nevertheless the present study has attempted to generalize the findings and caution was made on the interpretation of the result.

In the present study, the researcher feels that limitation on the scanning measures arises with regard to the definition of the environmental sectors (i.e. technology, economic and competition). As indicated earlier, the environmental sectors were defined based on the previous research (e.g. Aguilar, 1967; Ebrahimi, 2000; Elenkov, 1997; May et al. 2000) and the homogeneous groups of the sixteen items through factor analysis and reliability test. Despite the care taken in selecting items establishing homogeneous groups of items through factor analysis and internal reliability tests, evidence emerged indicating that the decision makers did not conceive type of information or environmental sectors the same way as relied upon by the research framework. In the factor analysis of decision makers response to the sixteen items comprising of extent of scanning measures, evidence emerged suggesting that the executives differentiated their scanning behavior along lines different from those comprising the environmental sectors used in this research.

In the present study, among the types of information, three dominant factors appeared to be what might be called as technology factor, economic factor and competition factor. In fact, only factor 1(name as technology) extracted align closely with the environmental sector definition used in the research. The others, factor 2 and 3 (economic and competition) were not aligned to the expected group defined in the research framework. For instance, items dealing with new organizational design are also loaded on factor 2 (the economic factor) and items dealing with demographic and socio cultural heavily loaded on factor 3 (competition). If decision makers compartmentalized their scanning behaviors in ways different from the ways assumed in the research paradigm, the findings could not capture the real scanning behavior of the decision makers. This is an issue of clean factor loading which must be noted as a limitation within this research and as an opportunity for future investigation in scanning research.

The data of the present study had no limit to the type of industries, size of company and managerial level of the respondent. Therefore, the mixed results occurred show no differences among the group of companies in relation to environmental scanning behavior. Similar situation also occurred across the respondents and the decision.

For future research, it is recommended that differences among groups of companies in relation to environmental scanning should be studied more meaningfully, using a broader empirical basis for reaching various kinds of comparative conclusions. Moreover, it is important to recognize the nature and sources of institutional effects on managerial scanning behavior in various environments, which will become a paramount objective of environmental scanning research in the age of rapid globalization of business activities. This can help multinational companies gain a competitive advantage by cooperating more effectively with foreign partners in the international arena.

It is also recommended to perform environmental scanning in different national setting that is another valuable avenue to examine the influence of national culture or ethnicity on the scanning behavior of the executives with different nationalities and races operating in one environmental setting. Future studies may also want to consider, for example, the effect of managerial and organizational values or ideologies, organizational slack (or effectiveness) or firm strategic orientation to the executives scanning behavior. Furthermore, future research should also examine the relationship between environmental scanning, information processing capacity and firm performance in Malaysia. This stream of research has great potential in the effective formulation of business strategies. According to Miller (1994), an organization's culture embodies the values and norms which support the extent to which managers can scan the constantly changing external environment. These cultural values influence environmental scanning by determining the extent to which the organization's boundary is open or close.

Based on the observation of the present study, it was found that method and sources used to scan the information were the antecedents that influence the extent of information scanned. It can be argued

that method and source may reflect the quality information scanned; for example formal methods typically involve hard facts and therefore produced better quality information. Therefore, method and sources of information will determine the amount and quality of information and furthermore, it is the amount (extent) and quality of information that is impacting decision quality. Thus, method and source of information impact is indirect through the extent of information scanned to the decision quality. Therefore, for future research, it is recommended to characterize extent of scanning as a mediator to method, source and decision quality.

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