THE IMPACT OF INTRA AND INTER-FIRM SOURCING STRATEGY ON SUPPLIES' QUALITY, DELIVERY AND COST

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ABSTRACT

In recent years, the business environment has become extremely competitive. Firms, searching for sources of competitive advantage began to look into the potential of sourcing in adding value as purchased inputs account for 60% to 80% of cost of goods sold. Thus, the objective of this paper is to investigate which sourcing strategy, inter-firm or intra-firm, will lead to better supplies' quality, delivery and cost and whether in the process of achieving this outcome, it is moderated by environment-related factors. Intra-firm sourcing takes place when a firm procures materials, parts and components from within its corporate system, either a parent from its subsidiaries, or subsidiaries from their parent or from other related subsidiaries. By contrast, inter-firm sourcing occurs when a firm sources from independent, unrelated suppliers. The population for this study is the organizations that are involved in the manufacturing of electronics and electrical product located in Penang. The results reveal that in all of the three performance measures: quality, delivery and cost, intra-firm sourcing is seen to outperform inter-firm sourcing. Additionally, assets specificity is not a significant moderating variable on the differences in supplies' quality, delivery and cost of intra-firm and inter-firm sourcing, but bargaining power is. This study provides an avenue for further exploration on the potential of intra-firm sourcing.

INTRODUCTION

In recent years, the business environment has become extremely competitive, with heightened competition from both domestic and global arenas. Firms, searching for sources of competitive advantage in order to survive and grow in this new environment, need to constantly seek not only where costs can be reduced but also how superior products or services can be delivered to customers. Under these circumstances, both practitioners and researchers have begun to observe the relevance of effectively managing the purchasing activities to help firms reduce costs and add greater value. Closely connected to purchasing is sourcing or supplier selection. Firms must view both elements as strategically important and as a source of enhancing its competitive advantage. Sourcing's potential for adding value and

improving a firm's competitive position is evident by the fact that purchased inputs account for 60% to 80% of cost of goods sold as compared to approximately 10% for direct labor. (Drucker, 1986; Leenders and Blenkhorn, 1988). Therefore, tremendous opportunity to improve the firm's cost competitiveness can be found in sourcing strategies. Many firms have come to recognise the crucial role sourcing activities plays in determining the overall corporate performance. Of equal or greater importance is the fact that sourcing decisions seriously impact delivery reliability, product quality and cost, thus making sourcing a key determinant of a firm's potential for added value.

In the world of increasing technological complexity, suppliers can offer knowledge and ideas for product development beyond the capabilities and resources of any single company. By integrating suppliers into operational requirements of a firm, an efficient and reliable flow of both materials and information from the suppliers to firm will be achieved. In addition, it also strengthens a firm's ability to grow and respond to increasing competitive demands of the market place. This will enhance the firm's competitiveness and profitability in the long run. The results are often reflected in significantly lower inventories, faster overall response times, higher quality and lower total cost. As suppliers are strategically important and critical for firms' success, it requires the firm to source the needed materials, parts and components more proactively from the best suppliers. Many factors must be considered when selecting and awarding the business to suppliers. Thus, the lowest possible price must be weighted against such issues as the importance of supply availability, a product's complexity from technological aspect, quality and the potential for increase in delivery value.

Together, the sourcing strategies available for firms to exploit are numerous and varied. Firm may procure the needed materials from a single supplier or multiple suppliers. It may also buy from local or foreign sources. The firm may further source within or outside its own corporate system. The former denotes the firm that source within the parent-subsidiary companies. While the latter indicates sourcing from independent or external suppliers. Thus, determining sourcing strategies provides a major challenge to most firms. A related question that arises in this context is which sourcing strategies should be pursued by firms, which will result in better supplies' quality, delivery, and cost which in turn will be translated into added profit for firms. These linkages of the relationship have not been well explored and understood.

Objectives of the Study

As it stands today, purchasing literature lacks empirical evidence that examines how sourcing strategies relate, if they do, to the supplies' quality, delivery and cost. Therefore, this study is an attempt to fill this gap. Specifically, the objectives of the study are, to investigate whether intra-firm sourcing outperform inter-firm sourcing on supplies' quality, delivery and cost and whether supplies' quality, delivery and

cost resulting from engaging intra-firm and inter-firm sourcing is moderated by specific environment factors.

LITERATURE REVIEW

The dynamic nature of the global market places a premium on a firm's ability to anticipate and respond to both users/customers' needs and changing competitive pressures. The whole field of purchasing and supply has received greater attention by firms as they have realized that the availability of high-quality, low cost materials and components delivered on time are important for their own competitive strategy. Suppliers must be reliable and flexible to respond to the ever-demanding customer expectation for high quality products at reasonable price.

Present day competitiveness has brought about a marked evolution in supply management, imposing on firms an increasingly close interaction with suppliers. The achievement of high-level performance in terms of cost, quality, flexibility and time to market appears ever more dependent on the quality and effectiveness of the supply network. Careful study of the Japanese's success in industrial competitiveness revealed at least some portion of that success can be attributed to the form of supplier choice and relationship. (Dobler, *et al,* 1984). While generic theories from several perspectives have been used in one form or another to explain the intra-firm and inter-firm sourcing strategies, there exists no particular theory of sourcing per se. One has to knit together scattered literature on topics including operations management, strategic management, business and manufacturing strategy in order to facilitate research in this under-researched topic and expose to practitioners the increasing strategic value of intra-firm sourcing as against inter-firm sourcing.

Intra-Firm Sourcing

Sourcing decisions often match intra-firm production sites with markets, and/or match intra-firm and inter-firm components suppliers with production sites. Thus, sourcing could occur in the form of intra-firm or inter-firm. Multinational firms create intra-firm trade between their various units. Today, intra-firm trade managed by multinational firms is a sizeable proportion of international trade. Kotabe (1992) in his study used a product-level analysis concluded that internal sourcing of non-standardized components is positively related to a product's market performance. This finding on the internal component sourcing is consistent with the prediction of the internalization theory. The theory, which postulates that multinational production is the result of the urge to internalize monopolistic and oligopolistic advantages across nations by multinational firms (Rugman, 1986), offers a reasonably sound explanation for intra-firm sourcing. The logic of internalization theory encourages internal procurement of major components between the parent

company and its affiliates and between its affiliates themselves, locally or abroad to retain a long-term competitive edge built on quality and reliability.

More recently, the importance and rationale for intra-firm sourcing in the multinational context was strengthened when Kotabe and Omura (1989) reported that market performance is associated with intra-firm sourcing in multinational firms. They examined two dimensions of market performance (relative market share and pre-tax profitability) and sourcing strategy (internal versus extrenal sourcing from home, market and third countries for components and final assembly) of U.S. subsidiaries of foreign multinationals at the product level. These dimensions of market performance were found to be positively related to internal procurement of major (non-standardized) components, and unrelated to assembly location (foreign versus domestic). Major components were defined as those components that could not be sourced from newly industrialized nations without technical assistance from the sourcing firm.

Recognising that sourcing strategies should have performance implications, Kotabe and Murray (1990) developed a taxonomy of eight sourcing strategies based on three factors. Factors considered were: (1) mode of international component sourcing (internal and external), (2) degree of product innovation (low and high), and (3) degree of process innovation (low and high). For the firms studied, they concluded that a product's market performance (relative market share, sales growth rate, and pretax profitability) was positively related to internal sourcing of major components. In addition, product and process innovations were found to affect a product's market performance. More specifically, the strategy associated with the highest market performance involved high product and process innovations.

Murray, *et al,* (1995) in their study on the 'Strategic and Financial Performance Implications of Global Sourcing Strategy' argued that when a firm uses internal sourcing, the firm typically has more control over the price and the supply of components. This control facilitates managing the costs of production; reduce production disruption and leads to increased market performance. In addition, the firm has more control as well over the quality and the availability of the needed components. By sourcing internally, it will also permit greater adaptation to changing circumstances. Firms that source internally will become more flexible in adapting to uncertainty and changes in the business environment. The empirical analyses confirmed that product-level performance was positively related to intra-firm or internal sourcing of major components. They also cited that possible reasons for this are that sourcing components internally provides a firm with potential price advantages, assurance in quality and delivery, and the ability to keep the unique technology involved in manufacturing components within the corporate system, without passing it on to suppliers or competitors (Murray, *et al*, 1995).

Inter-Firm Sourcing

Today, inter-company sourcing from various vendors external or independents to the firm is growing because it has become easier for any firm to source an increasing portion of its components for manufacturing from outside suppliers as the global marketplace are crowded with a myriad of competitive firms (Kotabe and Murray, 1990). At the same time, access to technology is an important reason for inter-firm sourcing for the supply of intermediate products because the cost of internalizing the technology may be prohibitive for most manufacturers. Additionally, shorter product life cycle in today's competitive market prevents any one firm from acquiring all the skills needed to make the end product. In rapidly changing market environments, manufacturers have to depend on inter-firm suppliers for state-of-the-art components to be able to introduce new products frequently. Thus, inter-firm sourcing sometimes is no longer an option but a necessity for the success of high technology manufacturers.

Sourcing from independent suppliers, whether domestically or from abroad, appears to have other long-term consequences. First, a firm tends to assign part of the most important value-creating activities to, and also become dependent on, independent operators for assurance of components quality (Kumpe and Bolwijn, 1988). Second, competition is promoted among independent suppliers to ensure continuing availability of materials and to exploit the full benefits of changing market conditions. But the suppliers are forced to operate in an uncertain business environment that inherently necessitates a shorter planning horizon. The uncertainty about the potential loss of orders to competitors often forces individual suppliers to make operating decisions that will likely increase their own long-term production and material costs. In the process, it tends to adversely affect companies sourcing components and/or finished products from those suppliers.

Kotabe (1998) in his study entitled, 'Efficiency vs. Effectiveness Orientation of Global Sourcing Strategy: A Comparison of U.S and Japanese Multinational Companies' argued that continual sourcing from independent suppliers leads to a long-term loss of the ability to manufacture at competitive cost and, as a result, loss of long-term global competitiveness. Management of the quality of major components is also required to retain the goodwill and confidence of consumers in the quality and reliability of finished goods. As a result, intra-firm sourcing of major components and finished products between the parent company and its affiliates abroad and between its foreign affiliates themselves enables a company to retain a long-term competitive edge built on quality and reliability.

Other Perspectives of Intra-Firm and Inter-Firm Sourcing

Other field of study that may contribute to the explanation of the desire to source internally came from the strategic management and operations management area.

One of the five-force models of competition (Porter 1980), bargaining power of suppliers, affects the intensity of competition in an industry. This is especially the case when there are a limited number of suppliers, when there are only a few good substitute raw materials, or when the cost of switching raw materials is especially costly. It is often in the best interest to both suppliers and producers if they can assist each other with reasonable prices, improve quality, development of new services, just-in-time deliveries, and reduced inventory costs, thus enhancing long-term profitability for all concerned.

Integration Theory

According to David (1997), forward and backward integration are sometimes collectively referred to as vertical integration. Vertical integration allows a firm to gain control over distributors, suppliers and/or competitors. Specifically, through backward integration, manufacturers and retailers who purchase needed materials from suppliers seek ownership or increased control of a firm's suppliers. This is especially appropriate when an organization's present suppliers are expensive, unreliable or incapable of meeting the firms' needs for parts, components, assemblies or raw materials. In addition, backward integration also allows an organization to acquire needed resources quickly. More importantly, it allows an organization the ability to stabilize the cost of its raw materials and the associated price of its products. Firms can generally negotiate more favorable terms with suppliers when they use backward integration. This is further supported by Krajewski and Ritzman (1996), citing that because a typical firm spends more than 60 percent of its total income from sales on purchased items, low price is one key to healthy profit margin. The hidden costs of poor quality can be high, particularly if defects are not detected until after considerable value has been added by subsequent manufacturing operations. Hence, the implementation of backward integration will mean better quality and more timely delivery. It also means taking better advantage of the firm's human resources, equipment and space.

Transaction Cost Theory

The main premise of transaction cost theory is that modes of exchange should be selected that economise on costs (Williamson, 1979). The theory viewed organizational activities as substitutes for markets. Transactions will be vertically integrated when costs of using market are perceived as being higher than organizing them through internal organizational growth. Thus, in transaction cost theory, Williamson suggested that cost efficiency should be an important factor to consider in determining alternative forms of exchange. It is necessary to evaluate and to minimize ultimate costs involved in market exchange. If an organization is more efficient to source the components and materials through internal organization rather than through independent outside sourcing, then, this organization should go for internal or intra-firm procurement. The theory framed the decision problem as a

choice between a spot-market transaction and complete vertical integration. Vertical integration is viewed a priori as a superior means of dealing with the transaction difficulties posed by uncertainty and specific assets. In purchasing context, one particular source of uncertainty is volume unpredictability. This is defined as the buyer's inability to specify in advance the required purchase volumes from suppliers (Burt, 1989; Walker and Weber, 1984). Resulting in part from volatility in the buyer's downstream market, this form of uncertainty creates an adaptation problem.

Environmental-Related Factors

Situational variables may have an impact on the appropriateness of a particular sourcing strategy and the corresponding supplies' quality, delivery and cost. This moderating effect may exist because different firms operate in different business environments that may require different sourcing strategies. The decision of intra-firm versus inter-firm sourcing is greatly influenced by factors such as the bargaining power of suppliers (Porter, 1980) and also elements of transaction costs (Williamson, 1979). When bargaining power of suppliers is high, the firm will use internal sourcing as it typically has more control over the price and the supply of components. This control facilitates managing the costs of production, reduces production disruption and leads to increased market performance. The bargaining power of suppliers is one of Porter's (1980) five competitive forces. The other four are threat of new entrants, bargaining power of buyers, rivalry among existing firms and threat of substitute products or services. These five forces determine the intensity of competition in an industry, which in turn affects the behavior of firms. Bargaining power of suppliers is exercised largely through price, which determines the costs of raw materials and other inputs. The availability of many alternative sources of supply may allow the firm to switch from one supplier to another or use substitute products without incurring high switching costs. Under these circumstances, the performance, especially the prices of materials of external supplier are very likely to be cheaper than internal supplier.

In addition, the decision of choosing internal versus external sourcing is also influenced by asset specificity, which refers to investments made in specific resources. It plays a significant part in the firm sourcing decisions. When specific assets are employed, a supplier and a buyer are 'locked into' the transaction because the assets are specialized to that transaction and have limited of no value outside the transaction (Williamson, 1979). Transactions of this kind pose a greater risk to the sourcing firm if the supplier does not make the components according to specification or meet the specified deadline, because alternative sources of supply are either limited or unavailable. When asset specificity is high, the firm that source internally will have more control over the quality and availability of the needed components. (Buckley and Casson, 1976). In addition, a firm may be able to ensure that the components are made according to specifications and delivered them on time. Under these circumstances, the intra-firm sourcing is anticipated to deliver

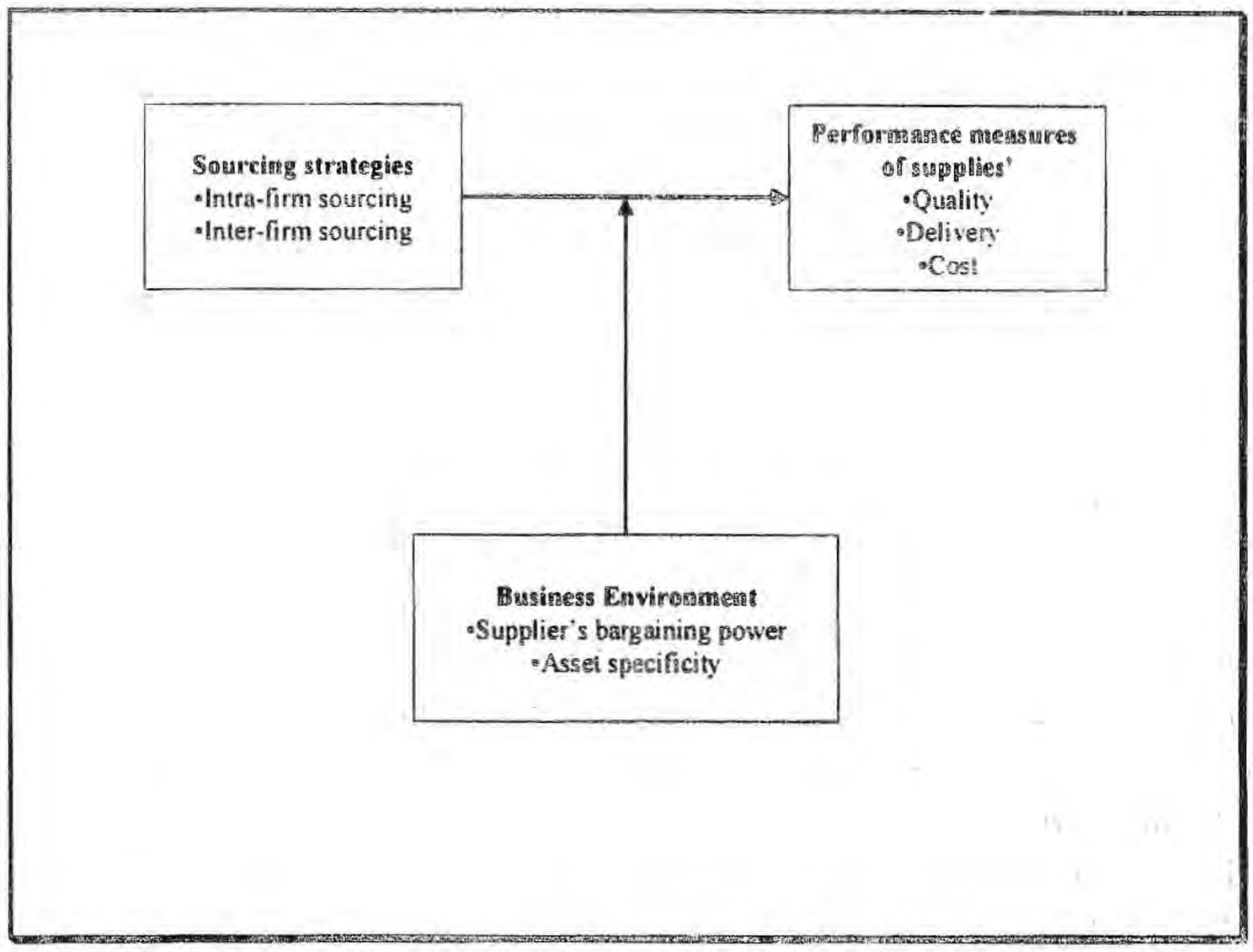
better supplies' quality and delivery. This is especially important when the frequency of transaction is high. On the contrary, the inter-firm sourcing is expected to have superior supplies' quality, delivery and cost when the transaction frequency and the assets specificity are low. This is attributed to the competitive market which will resulted to the availability of high quality material or component at reasonable cost. Moreover, a firm will have the opportunity to avoid investments in those specific assets. Using a contingency model of global sourcing strategy, Murray, *et al,* (1995) investigated the moderating effects of sourcing-related factors on the relationship between sourcing strategy and a product's strategic and financial performance. The results lend some support in the sense that assets specificity is a significant moderator variable for financial, but not strategic performance. However, the results provided no support for bargaining power of suppliers as moderator variable.

RESEARCH METHODOLOGY

Conceptual Framework

Generally, organization practice mixed sourcing strategies depending on its operating environment and the perceived benefits that suppliers will bring along with the sourcing strategy adopted. The literature review thus far concentrated on the perspective of market, financial and strategic performance dimensions at product or component level when intra-firm and inter-firm sourcing is empirically tested against those performance dimensions. None of the researcher had used supplies' quality, delivery and cost as their performance dimensions in any of their studies. However, this does not deter us from drawing the theoretical framework based on the literature reviewed even the performance dimensions in this studies are significantly different from previous research. This is due to the reason that much have been quoted as possible reasons for the increase in market, financial and strategic performance are associated with the ability of firms to have more control over the quality, take the potential of price advantage and assurance in delivery. The achievements are in effect with the transferred performance from supplies procured. Hence, the following diagram can depict the theoretical framework for the study.

Figure 1: Conceptual model of sourcing strategy and supplies' quality, delivery and cost



Even though it is not explicitly cited that intra-firm sourcing or inter-firm sourcing give rise to the differences in supplies' quality, delivery and cost, however, based on the arguments put forward, it can be indirectly generalized from the literature that intra-firm and inter-firm sourcing strategy yield different levels of supplies' quality, delivery and cost.

Research Hypotheses

The intent of the study is to answer the questions pertaining to the supplies' quality, delivery and cost implication of adopting the intra-firm or internal sourcing within the parent-subsidiaries system and inter-firm sourcing with external independent parties. The ultimate objective of any firm is to make profit by providing customer with goods and services that offer better value than the competitors. In order to produce high-quality competitive product on time, it is essential that the purchased materials used to manufacture the product be obtained at competitive levels of quality, delivery and cost. The ability of suppliers to support a firm's needs and its committed objectives are highly dependent on the relationship that exists between both buyer organization and seller organization.

Hypothesis 1: *Intra-firm and inter-firm sourcing will result in different level of supplies' quality, cost and delivery.*

It has been concluded from literature, firms that source the needed materials, components, parts and subassemblies internally within the parent-subsidiary setting are bound to have better control over cost of materials, quality and the availability of the needed components. In addition, firms that practice intra-firm sourcing also stand to gain better assurance in delivery and are more flexible to adapt to any uncertainty circumstances. Scholars in the field of strategic management have conceptualized environment as one of the key constructs for understanding organizational behavior and performance (Prescot, 1990). Thus, failure to include environment in examining the relationship of strategy and performance may impede our understanding of the effects of different environments to optimal sourcing strategy. Situational variables may have an impact on the appropriateness of a particular sourcing strategy and the corresponding level of supplies' quality, delivery and cost. This effect may exist due to different business environment in which each a firm operates, which may require the adoption of different strategies.

In this study, the sourcing strategy and performance relationship are postulated to be moderated by bargaining power of suppliers (Porter, 1980) and certain elements of transaction costs (Williamson, 1979). The selections of these two elements are largely based on the literature, feedback from academician and experts in sourcing field. Other elements, which may have impact on the relationship, are the proprietary technology and company policies. However, they are not widely discussed and supported in the literature and hence are excluded in this study.

Hypothesis 2: *The impact of sourcing strategy on supplies' quality, delivery and cost are moderated by environment-related factors.*

The bargaining power of supplier, which is exercised largely through price and will ultimately, determines the cost of raw materials and other inputs. It is one of the five competitive forces that were introduced by Porter, 1980. When the bargaining power of suppliers is high and the firm uses internal sourcing, it will has more control on the price and the supply of components. On the other hand, when there are many suppliers in the market and vast alternative sources of supply available, it also allows the firm to switch supplier without incurring high cost. In this instance, external sourcing will provide cheaper cost for the material or component sourced.

Hypothesis 2a: *The impact of sourcing strategy on supplies' quality, delivery and cost are moderated by the bargaining power of suppliers.*

Transactions that employed high specific assets pose a greater risk to the sourcing firm when the supplier does not provide the component according to the quality specification or meet the delivery deadline as sourcing from external supplier are limited or unavailable. Hence, the firm will have more control over the quality and availability of the needed components when it sources internally within the parent-subsidiaries setting. On the contrary, for materials or components that need low asset specificity to manufacture, they are often readily available on the spot market at any quantities.

Hypothesis 2b: *The impact of sourcing strategy on supplies' quality, delivery and cost are moderated by assets specificity.*

Population and Sample

The population for this study consists of manufacturing firms in the electronics and electrical industry located in Penang. Electronics and electrical industry comprises of semiconductor, computer and computer peripherals, telecommunications and electrical products and instruments. The population frame is drawn from about 150 companies listed in the Factory Directory published by Penang Development Corporation dated March 1997.

The objective of this study is to identify which sourcing strategies, intra-firm or inter-firm sourcing, will yield greater level of supplies' quality, delivery and cost. Therefore, the samples of interest in the population will be restricted to those organizations that practice both intra-firm and inter-firm sourcing strategies for the same or similar type of materials or components. As such, using the probabilistic method of sampling may not achieve the level of representation desired in this study. Instead, a purposive judgmental sampling method (non-probabilistic) will be used in the sampling design. This is due to the nature of the study whereby only specific targets that practice both intra-firm and inter-firm sourcing for the similar or same materials or components are in the best position to provide the desired information for this study. As a result, only a total of 132 organizations that fulfilled the criteria set are selected to be the target respondents. The data of supplies' quality, delivery and cost will be collected at materials or components level. Hence, each organization selected may response to more than one questionnaire.

Questionnaire Design and Data Collection

The design of the questionnaire is primarily derived from the issues and questions raised in the literature. Academician with expertise in the topic was first consulted while developing the questionnaire. Personal interviews were also conducted with individuals who have vast experiences in sourcing related field. Once the suggestions are incorporated in the questionnaire, the entire questionnaire was protested. The second stage of data collection is the pretest of the questionnaire. The pretest was performed on 3 purchasing managers in multinational corporations to ensure that issues of concern are correctly addressed and also to ensure the clarity, validity of the questions raised. Changes were made based on this initial feedback and final version of the questionnaire was developed. The final questionnaire consists of 43 items. Section A consists of five general questions where respondents are requested to provide some general information pertaining to individual and organization profile. Section B has 6 questions dealing with the

same or similar material/component profile where the firms source partially from external independent supplier and partially from its own parent-subsidiaries system. Section C with 13 questions, measuring 3 performance dimensions of internal supplies. They are related to quality, delivery and cost measures. Each item is measured on a 6-point Likert scale anchored by 1 (Strongly Disagree) and 6 (Strongly Agree), with the response of 6 indicating better quality, better delivery and lower cost respectively. Sections D consists of identical questions set as Section C with the respondents are now requested to rate the external supplies. Section E contains 6 questions of the business environment related to the identified material/component. Each item is also measured on a 6-point Likert scale anchored by 1 (Strongly Disagree) and 6 (Strongly Agree). Response of 6 indicates low bargaining power of supplier for item measuring bargaining power and high assets specificity for item measuring the corresponding dimension. So as to ensure the reliability of the measures, the multiple statements dealing with supplies' quality, delivery and cost as well as the business environment were first assessed for reliability using Cronbach's alpha. The reliability coefficient obtained ranges from 0.78 to 0.92 indicating acceptable reliability (Nunnally, 1978).

Data collection is accomplished primarily by mail and by personal delivery. The sampled companies selected are contacted in advance by telephone and the individual buyer to whom the questionnaire is to be mailed is identified. A self-addressed, stamped envelope is included to facilitate the return of the completed questionnaire. A follow up telephone call soliciting the cooperation from targeted respondents is made a week after the survey questionnaire was mailed out. The respondents for this study comprised of purchasing/procurement managers and executives.

DATA ANALYSIS

Respondent and Organization Profiles

A total of 150 questionnaires were sent and only 121 were collected from the respondents in this survey. However, out of the 121 responses received, 82 are usable, which indicates a response rate of approximately 55%. Table 1 provides the descriptive statistics for the sample.

Table 1: Profiles of the respondents and organisations

Profile	Description	No. of respondents	Percentage
Designation	Manager	29	35
	Executive	53	65
No. of employees	Less than 500	20	24
	501-1000	16	20
	More than 1000	46	56
Equity structure	Local	19	23
	Foreign	43	52
	Local and foreign	20	25

Of the 82 respondents, 35% are managers, whom have varied designation such as Commodity Manager, Procurement Manager, Purchasing Manager and Sourcing Manager. The Executives, who hold the position of Buyer, Purchasing Executive, Purchasing Officer, Sourcing Specialist and Procurement Officer, form the remaining 65% of the respondents. As for the organization profile, 46 companies have more than 1000 employees, while the other 20 firms and 16 organizations, each have less than 500 and between 501-1000 employees respectively. On the equity structure of the responding organizations, a majority of the firms, 52% or 43 firms are foreign owned, 19 companies are wholly owned by Malaysian while the remaining 20 firms are jointly owned by Malaysian and foreigner.

Sourcing and Component Profiles

Table 2 presents the profile of respondents. All responding organizations in this survey engaged in both intra-firm and inter-firm sourcing simultaneously in obtaining the same or similar supplies' of components, parts and raw materials needed in their operations. The components are grouped into 5 major categories, with 35% of the samples responded they procured electronic part, 25% or 20 companies said they purchased mechanical parts, while plastic and packaging each has a response rate of 17% and 12% respectively. The remaining is others category which consists of among others, chemical and electro-mechanical part. In some instances, the degree of intra-firm sourcing is greater than inter-firm sourcing for the same component. The components sourced are used mainly in sub-assembly and in end product, each with a response rate of 44%. While the rest are for the usage of packaging. Most of the organizations, 37 surveyed indicated that the internal source of their component are from both local and abroad, with 63 companies responded the same for their external source.

Table 2: Components and sourcing profiles

Profile	Description	No. of responses	Percentage
Component types	Mechanical parts	20	25
	Electronic parts	29	35
	Plastic	14	17
	Packaging	10	12
	Others	9	11
Component usages	Sub-assembly	36	44
	End-product	36	44
	Packaging	9	11
	Others	1	1
Internal sourcing location	Local	10	12
	Foreign	35	43
	Both	37	45
External sourcing location	Local	7	8
	Foreign	12	15
	Both	63	77

FINDINGS

Descriptive Analysis

It can be seen that the mean on bargaining power of supplier is rather low (below than the average-2.83) on a six-point scale, indicating that the materials, components or parts sourced have limited suppliers with handful substitute available in the market. The mean for external supplies' delivery and cost are about the average. The rather high mean of internal and external supplies' quality indicates both sources of materials or components are of high quality. Additionally, high mean of internal supplies' delivery and cost imply the supplies' are delivered on time and have low cost. Finally, the mean of 4.39 for assets specificity indicates that generally the materials or components sourced require specific investment, knowledge and technology to manufacture. The standard deviation for all variables is very small, indicating that most respondents are very close to the mean of all variables.

Table 3: Description of the composite variables

Variable	Mean	Standard Deviation	Variance
Internal supplies' performance			
Quality	4.56	0.96	0.92
Delivery	3.97	0.91	0.83
Cost	4.20	1.03	1.06
External supplies' performance	4.17	0.92	0.85
Quality	3.64	0.90	0.80
Delivery	3.73	1.01	1.02
Cost			
Business environment			
Supplier's bargaining power	2.83	1.41	2.00
Assets specificity	4.39	0.87	0.76

The Impact of Intra-Firm and Inter-Firm Sourcing on Supplies' Quality, Delivery and Cost

Each respondent is requested to rate the internal and external supplies for the same or similar component, which the responding organization source partially from independent suppliers and partially from the related parent-subsidiary company. The performance measures are with respect to quality, delivery and cost. The parameter of interest is whether firms that use intra-firm sourcing or inter-firm sourcing will result in different level of supplies' quality, delivery and cost. The performance is the difference between the performance of intra-firm sourcing and inter-firm sourcing. Table 4 summarises the paired sample t-test for the differences in performance of supplies obtained from the two sources. On all three measures of performance, quality, delivery and cost, supplies from intra-firm sources outperform those from inter-firm sources.

Table 4: Summary of the paired samples T-Test

Performance dimensions	Mean rating		p-value
	Intra-firm	Inter-firm	
Quality	4.5634	4.1683	0.000
Delivery	3.9726	3.6402	0.003
Cost	4.2012	3.7317	0.001

The Impact of Sourcing Strategy on Supplies' Quality, Delivery and Cost, Moderated by Environment-Related Factors

To test hypotheses 2, 2a and 2b, the differences in performance of internal and externally sourced supplies were regressed against the moderators, bargaining power of supplier and assets specificity. Table 5 further tabulated the results. In terms of quality and delivery both the moderators were not able to explain the variations in the differences in performance. However differences in cost performances can be explained (approximately 60%of the variance) by the two moderator variables. In particular we found that differences in supplies' cost is negatively correlated to the supplier's bargaining power. This implies that the greater the supplier's bargaining power, the larger the differences in supplies' cost between intra-firm sourcing and inter-firm sourcing. Hence, Hypothesis 2a is supported.

Table 5: Summary of the regression analysis amongst the variables

Attributes	Difference in quality		Difference in delivery		Difference in cost	
	Beta	Sig. T	Beta	Sig. T	Beta	Sig. T
Supplier's bargaining power	-0.0036	0.9580	-0.1272	0.1043	-0.6918	0.0000*
Assets specificity	0.1853	0.0935	0.2686	0.8309	0.1026	0.3115
R^2	0.114		0.104		0.6098	
Sig. F	0.2366		0.2463		0.0000	

*p-value <0.01

From the result of the paired-samples t-test, it can be concluded that intra-firm sourcing will result in better supplies' quality, delivery and cost. This is consistent with the internalization theory and integration theory. Kotabe and Murray (1990) reported that market performance (relative market share and pre-tax profitability) is associated with intra-firm sourcing. While the performance dimensions are different, the increased in market performance have been quoted by Kotabe and

Murray (1990), citing that when a firm source material or component internally, it will provide the firm with potential price advantages, assurance in quality and delivery. In other words, the ownership aspect that exists within parent-subsidiaries system essentially translated into a 'single' management team, which allows for better controlling of all group resources and coordination of group practice.

Contrary to Murray, *et al,* (1995), assets specificity is not a significant moderating variable, between the relationship of intra-firm and inter-firm sourcing strategy. However, this is not a direct disagreement as Murray, *et al,* (1995) performance dimensions' used in their study. The differences in internal and external supplies' cost are influenced by the supplier's bargaining power. The greater the supplier's bargaining power, the greater will be the difference in costs between inter-firm and intra-firm sourced supplies. This is due to the organisation's ability to reap the benefits of monopolistic control by engaging themselves in the same business if the supplier's bargaining power is high, resulting cheaper supply of material or component. Quite the opposite, assets specificity is found not to moderate the differences in all three-measures of supplies' quality, delivery and cost between internal and external supplier. The cost of investment may outweigh the benefits of on-time delivery and ability to obtain material or component that conforms to the specification as suggested by Murray, *et al,* (1995) in their study, resulted in the trade-off between the two elements.

CONCLUSIONS

The results from this study provide partial support for the theoretical framework as depicted in Figure 1. Generally, the findings of this study are consistent with the literature, with intra-firm sourcing resulting in better supplies' quality. delivery and cost of internal supplier as opposed to external supplier. Possible reasons for higher quality may be attributed to the better understanding of the design specification when the buyer organization and seller organization are in the same corporate system. The privileges of cross visitation and ease of communication inherent in intra-firm sources will further enhance the understanding of all aspect of requirements. This may be highly applicable to those materials or components that involve proprietary technology, which further complicates the feature and design specification. External suppliers may not have such capability and if they do, barriers to communication and access to proprietary information may deter the complete understanding of the customers' specifications and requirements.

In addition, if the parent company or its subsidiaries are being measured as profit center, rather than cost center, this will further motivate them to improve profitability, one way through achievement of high quality supply of intermediary or finished products. Furthermore, groups of companies, which essentially have a 'single' management team, usually share the same quality culture and quality policies, which is well coordinated and incorporated in the whole parent-subsidiary system. This will lead to high quality conscious among the companies of the same

group. The result is often translated into higher quality material or component supplied. The empirical evidence supporting better supplies' cost and delivery of internal supplier deserves careful consideration. Purchase price of material or component may be quoted at cost by its parent to subsidiaries or vice versa, and between subsidiaries which may have taken into consideration the different tax implication of a nation, especially if the parent-subsidiaries are located in different countries. The better supplies' delivery possibly due to the internal supplier is more committed to the specified lead-time, failing to meet the requirements will bring severe negative consequences to the corporate system as a whole.

This study also found that the difference in internal and external supplies' cost is influenced by supplier's bargaining power. High supplier's bargaining power is due to few substitutes (suppliers) and its switching costs. Companies in this environment will reap the benefits of monopolistic control by engaging itself in the same business. It is usually the counter action of a company if the material or components are in high utilization by the company, its parent or subsidiaries. This is even more likely if the group of companies have excess capacity, expertise and resources available for investment, so that cheaper material or component as compared to external supplier will be supplied to the companies within the same group.

In addition, assets specificity is found not as a variable that moderates the differences in all three-performance measures of supplies' quality, delivery and cost between internal and external supplier. When assets specificity is high, firms within the same group may not want to invest in those specific assets, either physical or intangible to avoid any over commitment. The cost of investment may outweigh the benefits of on-time delivery and ability to obtain material or component that conforms to the specification as suggested by Murray, *et al,* (1995) in their study, resulted in the trade-off between the two elements.

LIMITATIONS AND IMPLICATIONS

The study is limited in both the research methodology and scope. First, the study is only involved with manufacturing firms of electrical and electronics industries in Penang. Thus it may suffer from industry clustering bias. Second, majority of the responding companies are foreign-owned multinational firms, thus the findings may not be generalized to local firms.

The findings suggest several general managerial implications. First, the study provides an avenue to explore the potential of intra-firm sourcing as against inter-firm sourcing. Substantively, the most interesting conclusion is the notion that buying organization may realize enhanced supplies' quality, delivery and cost by engaging in intra-firm sourcing. Second, there may not be one best way to source, although intra-firm sourcing is seen in this study to outperform inter-firm sourcing in all three-performance measures. One should consider other determining factors,

such as availability, counter-trade obligation, proximity technology, service, convenience, and flexibility before making the sourcing strategy decision. Third, as business and its environments are dynamic in nature, what is considered an optimal strategy at the present time may not hold true in the future. This suggests the need to constantly evaluate the internal and external supplies' quality, delivery, cost and modify the sourcing strategy from time to time as necessary. Fourth, different material or component may require different sourcing strategy specially tailored for.

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