APPLYING SUPPLIER EVALUATION-SELECTION IN A GARMENT COMPANY

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ABSTRACT

This is a report of a case study which applies a supplier evaluation and selection model to the buyer sourcing in a garment company in Thailand. Supply is an integral part of a supply chain, and Suppliers have to be selected carefully, as they can have a great impact on organizational performance. Currently, the company selects its suppliers by experience; it lacks a method to support these judgments. Also, the Company is facing several supplier problems such as quality, lead time of development, and cost.

To have a close relationship with suppliers, can lead to benefits and help to increase the company's performance. The number of suppliers in the supply base is the one important issue, and their condition and qualification have to become the best. A supplier evaluation and selection method should be adapted to the company so that it can build the relationship at a strategic level rather than just a transactional level. The methodology in this case study is a mixed approach. The data collection involves capturing numeric as well as textual information: in other words, both quantitative and qualitative methods are employed. To select the method of supplier evaluation and evaluation, several studies were reviewed, for this case study, and the model of Teng and Jaramillo (2005) was selected for simulation. There are 267 existing suppliers of the ABC Company, divided into five categories. The greatest spending cost is the fabric category. Thus, it is the initial group in which to implement improvement. The score is calculated by using an equation with general application, such as Microsoft Office Excel. The supplier with the highest total performance score will be selected as a key supplier for improvement in performance and development in the supplier relationship program.

Keywords: Supplier Evaluation, Supplier Selection, Supply Chain Management, Supply Base Management, Garment Industry

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INTRODUCTION

Suppliers are an integral part of the supply chain of an organization, and management of suppliers requires specialized negotiating skills, as they are not a part of the organization. Suppliers have to be selected carefully, as they can have a very positive or adverse impact on the overall performance of the organization (Ramakrishnan, 2007). For instance, a majority of quality problems of an organization are said to be due to defective material (Heizer and Render, 2006). Carefully selected, competitive suppliers can go a long way in minimizing adverse impacts and in enhancing positive impacts on the quality of output of an organization.

Supplier selection is a crucial part of the functioning of an organization. A wealth of literature describes best practice and models for evaluating and measuring supplier performance (Tan et al., 1999; Neely, 1999; Anderson and Lee, 1999; Tracey and Tan, 2001; Çebi and Bayaktar, 2003; Gunasekaran et al., 2004). High performing organisations tend to place less importance on unit price as a selection and evaluation criterion; instead, they select and evaluate suppliers on the basis of good quality, delivery reliability and product performance (Gunasekaran et al, 2004). They also involve their key suppliers in the decision-making process and successfully involve them in continuous improvement programs (Tracey and Tan, 2001). Supplier selection is increasingly recognized as a critical decision in supply chain management in manufacturing industries (Choi and Hartley, 1996; Dahel, 2003). In such industries, raw materials and outsourced components are usually the largest costs, and the procurement department often plays an important role in reducing purchasing cost and selecting appropriate supplier (Ching and Bai, 2006).

THE GARMENT INDUSTRY SITUATION

Current trends show that Southern and South East Asian countries have emerged as important sources for USA and European Union (EU) clients since they are biggest textile and garment markets in the world (www.thaigarment.org).

Chinese textile and garment exports to the world in 2006 rose by 25% in value, and by 21% in volume, compared to 2005. In this growth, there is a great contribution from other markets besides the United States and EU. Textile and garment imports by both the United Sates and EU from Asian low cost manufacturing countries have risen sharply. Bangladesh's textile and garment exports to United States rose by 22%, and to EU rose by 34%. EU's textile and garment imports from Vietnam have risen by 51% in value. Cambodia and Indonesia have also seen a sharp increase in textile and garment exports

to both the U.S. and EU marketplaces. Asian developing countries continue to derive benefits from their low cost export textile and garment products. Bangladesh, Cambodia and Vietnam are the victorious countries in the post-quota period of the world's textile and garment trade, along with China.

In 2007, the revenue from Thailand's garment category was USD 2,498 million. Most revenue came from textile, followed by garment, but the growth rate increased a little when compared with the growth rate in 2006. On the other hand, the growth rate of garment is much reduced when compared with the growth rate in 2006 and other items (www.thaitaxtile.org).

The main export markets of the Thai textile and apparel industry are USA and EU. China is the world leader in exporting apparel, with 32.87% of market share, because of its low production cost and high production efficiency. Thailand is 17th in order in the export of apparel to the world market. Thailand has been losing market share to competitors since 2004.

The safeguard measure by EU for limits on importing textile and apparel from China was eliminated in 2008. The safeguard measure in USA will also be eliminated in 2009. Thailand's competitive advantage is very difficult since the cost of production in China and Vietnam is lower than Thailand. Therefore Thailand's textile and garment exporters have to adjust and find ways to maintain their world market share.

Information from the Thai Textile Institution shows the problems in the export textile and apparel industry:

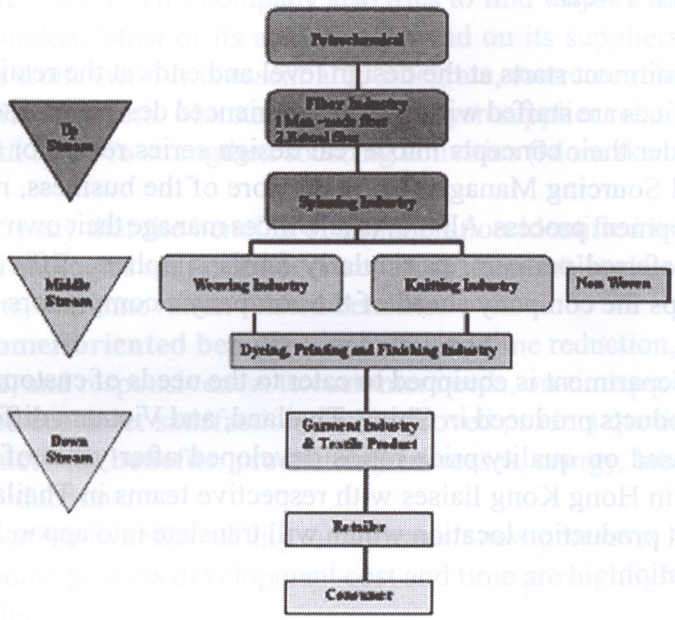
- Lack of product distinctiveness and variety due to lack of product research and development (R&D) and lack of innovation technology
- Lack of serious cooperation and integration between the clothing industry and textile industry (supply chain), and thus efficiency from quick response to the market is less. Moreover, it leads to high product cost.
- Less efficiency and skill of labour and human resource.
- Competitors are more efficient.

The main problems above are that the USD currency is losing its value effect on the export industry. However the currency problem is not the only factor that causes Thailand to lose market share. Since there is high competition in the market, the participants in the chain have to pay more attention and make adjustments to maintaining market share in the current situation. Thai textile and garment exporters have to find a strategic way to create competitive advantage and increase their competency in the world market.

SUPPLY CHAIN IN THE GARMENT INDUSTRY

Supply chain management in the textile and garment industry can be very complex because of a very long supply chain. This is shown in the next Figure (www.thaitextile.org/dataarticle process.html).

Business Chain in Textile industry



Source: *Thai Textile Institute*

This Figure is an overview, involving a number of parties, and consisting of many small extremely fragmented chain members from upstream to downstream. In other words, the participants are suppliers, manufacturers and customers (import buyers or garment traders). Each stage in the chain consumes the time needed to deal with the suppliers during development and production for launching the finished goods to the global market. The garment process starts from raw material (fibre) that will be transformed into raw fabric. The raw fabric will go for dying or printing in colour, and fabric finishing. The ready fabric will be converted into garments or finished goods, ready for delivery to the customers. The fabric suppliers are not the only parties whom the garment producers deal with, as they also have to deal with the accessories suppliers.

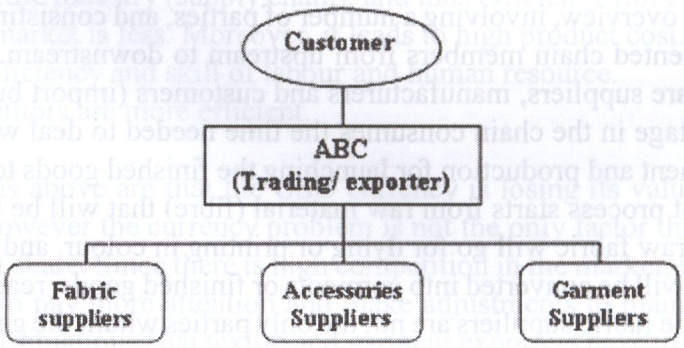
THE COMPANY IN THIS CASE STUDY

The Company is constantly expanding in the international market, especially in the European Zone. It is sourcing and manufacturing for export garment companies which mainly specialize in boutique fashion children's wear. Designing, developing, manufacturing and sourcing children's wear from babies to 14 year-olds has always been the core of the Company's specialization. In this line, it also sources a variety of products at the customer's request. Flexibility and adaptability are the keys to the successful development of children's wear.

The service commitment starts at the design level and ends at the retail level. All European and Thai offices are staffed with highly experienced designers who work alongside customers to render their concepts into a real design series ready for sampling or production. Material Sourcing Management is the core of the business, representing over 50% of the development process. All the Asian offices manage their own material sourcing from a list of preferred partners, particularly fabric suppliers. Efficiency in material procurement keeps the company ahead of the company's competitors.

The production department is equipped to cater to the needs of customers and markets. Currently, the products produced in China, Thailand, and Vietnam differentiate production locations based on quality/price ratios developed after years of experience. The production team in Hong Kong liaises with respective teams in Thailand and China to decide the correct production location which will translate into apparel that exceeds the customer expectation.

THE COMPANY'S SUPPLY CHAIN



This project focuses on this Thai company, which realizes the importance of suppliers as they are at the beginning of producing positive or negative quality of product and service.

The Thai Textile Institution's list of problems implies that it is important to realize the importance of cooperation and relationship between supplier and buyer in the chain. Most firms try to find a way to keep improving quality and delivery and to reduce cost. The improvement factors also depend on supplier performance. Some companies reduce and streamline the supplier base, and/or develop a closer relationship with suppliers (Scannell et al., 2000). This company also tries to find ways to adapt to the current situation in the market. Most of its activities depend on its suppliers, and it is facing various problems from them. It is essential to integrate, to create relationship and collaboration with the suppliers. Maintaining good buyer-supplier relationships has been seen as a powerful tactic to strengthen sourcing activities (Monczka et al., 2002).

Dilek et al. (2005) say that the benefits of collaboration identified by the members of Textile Dying Technologies may be categorized as customer related benefits, productivity related benefits, and innovation related benefits.

- **Customer oriented benefits**: include lead time reduction, market share increase, and responsiveness to customer needs, on-time product delivery, enhanced customer satisfaction, and improved product quality.
- **Productivity benefits**: productivity increases, energy, labour, and material cost reductions.
- **Innovation benefits**: ability to implement new processes and improvement in product/process development cost and time are highlighted as innovation benefits.

To collaborate with the supplier can lead to benefit for the company. But the company cannot provide the same level of relationship for all suppliers. The company has to select the suppliers who best qualify for dealing at more than a transactional level. To access the development of a close relationship level with the supplier, monitoring and evaluating suppliers have to be developed for selecting the supplier with the best qualification. Supplier evaluation method is the way to assess supplier performance, on a set of selected criteria over a period of time. Much attention has been paid to the development of effective supplier selection models, trying to deal with structured/unstructured relevant information and qualitative/ quantitative criteria. As discussed in Shin and Danny (2008) and De Boer et al., (2001), a typical supplier selection problem consists of four phases:

1. Problem definition;
2. Formulation of criteria;
3. Pre-qualification of suitable suppliers; and
4. Final selection of the ultimate suppliers.

Therefore the information in the next section will be investigated step by step according to the ideas of Shin and Danny (2008) and De Boer et al. (2001, and with methodology suitable to this case study.

STATEMENT OF PROBLEM

Many buyers just rely on their judgment and attitude to evaluate suppliers, and the company's purchasing department does the same. The company makes decision without any tools to generate the statistics necessary for supporting the decisions. Although this old way makes evaluation easy, it does not create economic value for the company - and that can lead to a slow and undetected drain on profits. To select the supplier by experience judgment means not to select key suppliers, and thus there is not a good relationship. In some cases the expected supplier's performance does not achieve the company's expectations of quality, cost, delivery and flexibility of performance. Choy et al., (2002) state that selecting suppliers only on the basis of the evaluators' personal experiences is neither effective nor scientific - due to the inherent risks of subjective judgment and a lack of systematic analysis. The company is facing many supplier problems. It wants to improve supplier performance especially quality of materials, components and finish goods. In some cases, the suppliers do not want to clarify the problem and do not take the responsibility for their problem due to lack of a special or close relationship. Hence this study is designed to address to research question: "***Who are the right suppliers with whom the company should build a relationship at a strategic level rather than just a transactional relationship?***"

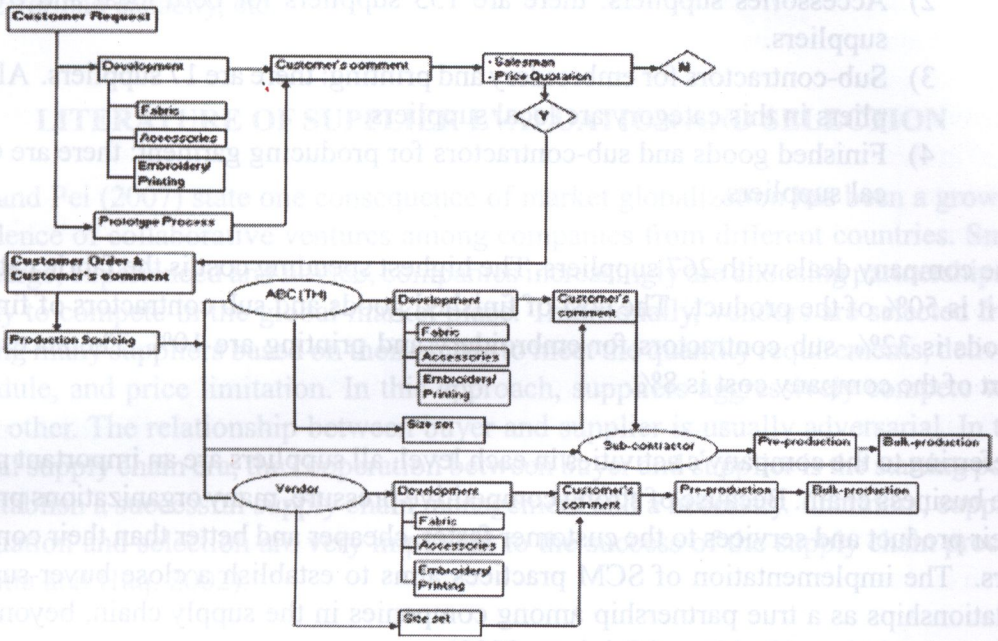
This research has the following objective: To apply a supplier evaluation and selection method to determine the capability of the existing suppliers' performance so as to turn them into key suppliers for improvement in supplier performance.

Applying a method of evaluation and selection to suppliers will be useful for the Company, because:

1. An evaluation and selection method is the one tool that will help and support the purchasing manager's decision-making to select the right suppliers and fit with the company's objective. The key suppliers will be selected for implementation into the next step of developing supplier relationships.
2. This study provides some kind of confirmation for the applicability of the approach of Teng & Jaramillo (2005) to supplier evaluation.
3. To select the right supplier will produce benefits to the company in terms of quality, price and delivery.

THE COMPANY'S BUSINESS FLOW

Rajkumar and Pradip (2004) state that in order to ensure the uninterrupted supply of items in a supply chain, more than one supplier or vendor should be available for each item. The Company's business flow is shown next.



Inside the business flow, the working process is divided into 3 levels.

1. **High level involvement**: - The company takes responsibility for buying raw materials for customer's pre-marketing or pilot launching, bulk production until the goods are shipped out to the customers. Since the order placement is low to medium size, with a short lead time for development, and complexity of products, ABC will place the order to a subcontractor.
2. **Medium level involvement**:- The company takes responsibility for buying raw materials for customer's pre-marketing or pilot launching. Materials of bulk production will be handled by vendors.
3. **Low level involvement**: - The vendors take responsibility for all steps in buying raw materials for producing the finished goods and shipping the goods to the customers.

THE COMPANY'S SUPPLIER SELECTION PROCESS

The level of involvement of the suppliers is an important part of the product. There are four groups of suppliers;-

1) Fabric group: 19 suppliers of knitted fabric and 33 suppliers of woven fabric. This category includes local and overseas suppliers.
2) Accessories suppliers: there are 133 suppliers for both local and oversea suppliers.
3) Sub-contractors for embroidery and printing: there are 17 suppliers. All suppliers in this category are local suppliers.
4) Finished goods and sub-contractors for producing garment: there are 65 local suppliers.

The company deals with 267 suppliers. The highest spending cost is the fabric category as it is 50% of the product. The cost of finished goods and sub contractors of finished goods is 32%, sub contractors for embroidery and printing are 10%. The accessories part of the company cost is 8%.

Referring to the company's activities in each level, all suppliers are an important part of the business chain. Because of strong competitive pressure, many organizations provide their product and services to the customer faster, cheaper and better than their competitors. The implementation of SCM practices aims to establish a close buyer-supplier relationships as a true partnership among companies in the supply chain, beyond just price negotiations (Sarkis and Srinivas, 2002).

The current process of supplier selection is that the ABC Company selects the suppliers by judgment based on experience. The process of selecting suppliers starts from the customer enquiry. When the customers or branch offices send the enquiry to ABC Company, the order will be allocated to a merchandiser depending on the manager assigned. After that, the merchandiser will pass the details about the raw material or components to the purchasing department. In the purchasing department, there are two staffs for handling the merchandisers' request. It is divided into fabric and accessories and embroidery/ printing. For finished goods, sub-contractors will be handled by the production sourcing department. Both the purchasing department and the production sourcing department will handle merchandisers' requests. The purchasing staffs and production staffs use their experience to judge and select the supplier in order to match with the enquiry. After the purchasing staffs and production staffs get the details of an enquiry, they will pass the information to selected suppliers (small number of suppliers) from the list of suppliers on hand and their experience. They will ask each supplier to submit the price and sample, and after that the supplier who can offer the best quality (from the sample or commitment), price and other factors will be selected. Sometimes, more than

one supplier will be selected for alternative choice since there is little different offered by each supplier. Sometimes the suppliers cannot offer a sample but insist that they can follow the material specification, and this case can be accepted. After that the purchasing staffs select only the best qualified to pass all samples and details of suppliers to merchandiser to satisfy the customer. However, there are various problems, such as the quality of the product in a real order is not the same as the sample, delivery date delay, and overload capacity, etc.

LITERATURE OF SUPPLIER EVALUATION AND SELECTION

Yin and Pei (2007) state one consequence of market globalization has been a growing incidence of collaborative ventures among companies from different countries. Small and large, experienced and novice, companies increasingly are choosing partnerships as a way to compete in the global market place. Traditionally, vendors are selected from among many suppliers based on their ability to meet the quantity requirements, delivery schedule, and price limitation. In this approach, suppliers aggressively compete with each other. The relationship between buyer and supplier is usually adversarial. In this global supply chain era, the cooperation between buyer and supplier is the starting point to establish a successful supply chain management and a necessity. Therefore, supplier evaluation and selection are very important to the success of the supply chain process (Bhutta and Huq, 2002).

Supplier selection and evaluation are directly related to the purchasing function since the purchasing function encompasses determining the need, selecting suppliers, arriving at a proper price, specifying terms and conditions, issuing the contract or order as well as following up to ensure proper delivery. Among the primary purchasing functions, one of the major responsibilities is the evaluation and selection of suppliers. Supplier Evaluation is the method to assess supplier performance on a set of selected criteria over a period of time.

After analyzing the strengths and weaknesses of various decision methods, that of Teng and Jaramillo (2005) was selected for this case study. They studied two mains methods: - AHP and ANP. AHP is a robust and simple method that contemplates hierarchical relationships among factors considered by decision makers but it is weak in determining interrelationships among factors. Their study found that ANP can overcome the AHP weakness in determining interrelationships among factors, but the determining of the correlation factors makes it a more complex and time consuming process. Therefore ANP was not applied in their model. Moreover, the weakness in the point of determining interrelationships in AHP was not necessary, since the correlation between factors would not be considered, as they wanted their model to be easier to use. They also gave

the reason for inconsiderable correlation between factors: they found that the buyers and the cross functional teams in the downstream companies often use some subjective rating scheme to rate factors, but putting efforts into determining the correlations between factors is often not valuable in practice. On the other hand they found the multiple attribute utility approach of Min (1994) provided the adequacy of critical and possibility factors. Therefore the new model is developed from AHP and the multiple attribute utility theory approach, and has the possibility of being altered for "what-if" scenarios and sensitivity analysis.

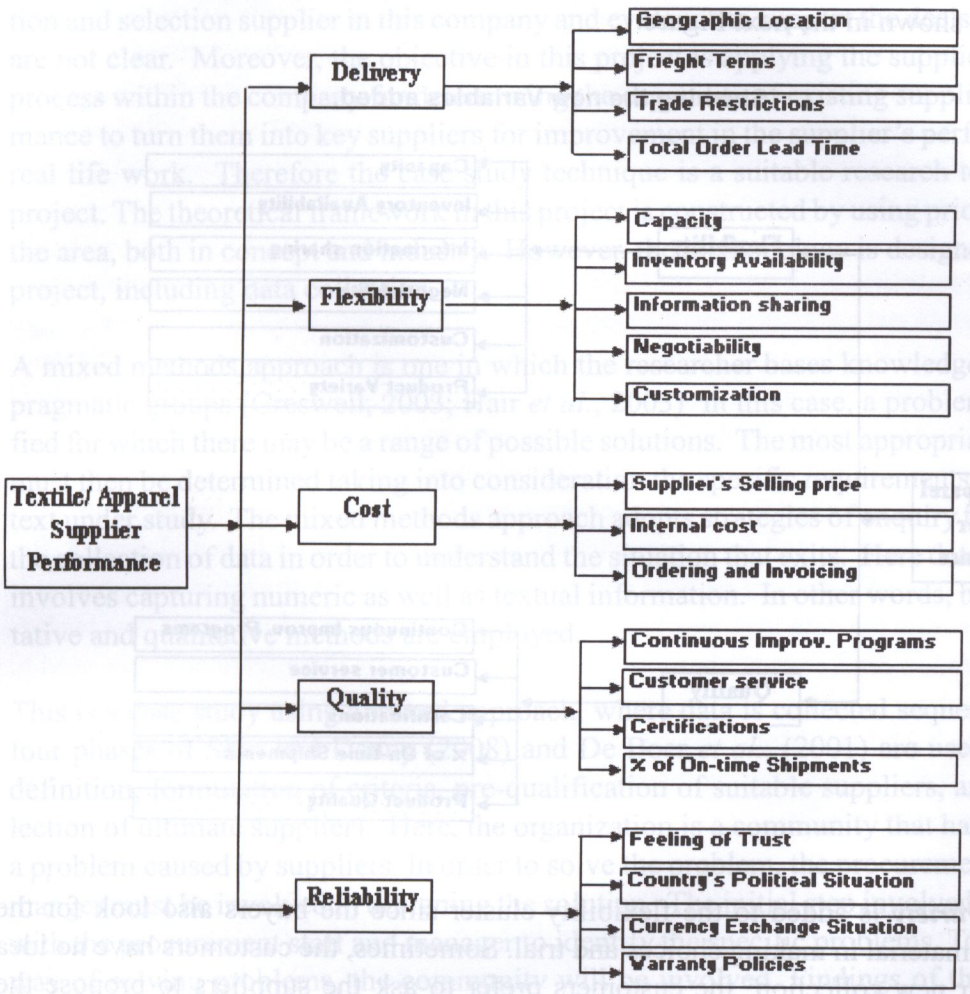
Moreover they stated that the variables used in the model represent the most critical issues in the evaluation and selection of textile/apparel suppliers. They develop a new model for providing an easy-to use evaluation matrix for helping US textile/apparel companies in selecting the right supply partners to improve the whole supply chain's performance.

Teng and Jaramillo (2005) show that the advantages of their model are its hierarchical approach that covers the decision structure containing major issues in each cluster, its flexibility in adopting changes in business circumstance and its simplicity with no complex equations in the model.

Monczka (2002) stated that most purchasing experts will agree that there is no one best way to evaluate and select suppliers; organizations use a variety of different approaches. Referring to Monczka's statement, to select a suitable method to apply by determining the nature of the company and product is a better way because there is no one best way. From the various literature, Teng and Jaramillo's model fits this case since their research and model were developed specially for a Textile and Apparel Company and is easy to understand.

The factors for supplier evaluation and selection will be identified. Monczka states that the purchasers usually evaluate the potential suppliers across multiple categories using their own selection criteria with assigned weights. A variety of criteria are addressed as they are important in supplier selection. Teng and Jaramillo (2005) group the factors by following the recommendation of Saaty (1996); it is called 'cluster'. His factors are selected based on the most common and significant issues in textile/apparel supply chains. The factors are grouped into five clusters; delivery, flexibility, cost, quality and reliability. Each cluster consists of factors that have an effect on each cluster, as in the next Figure.

Teng and Jaramillo (2005) group factors for evaluation and selection of suppliers in global textile and apparel supply chains.

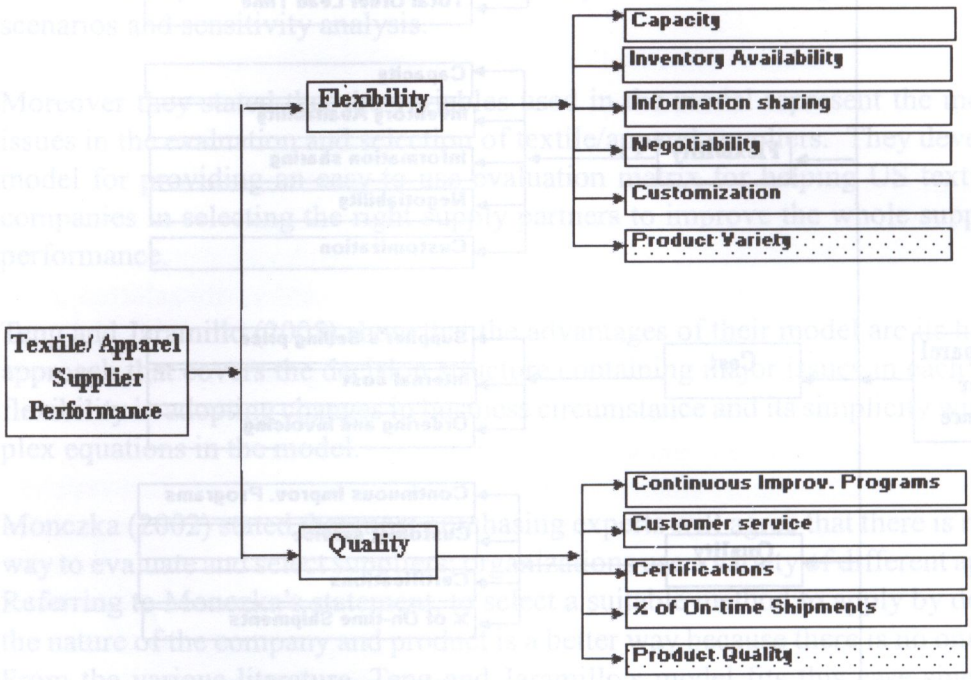


CONCEPTUAL FRAMEWORK

The framework of supplier evaluation and selection in this case study uses Teng and Jaramillo's 2005 methodology and factors criteria. The criteria factors in their research were mostly used. They mention that the implementation of Supply Chain Management practices aims to establish a close buyer-supplier relationships as a true partnership among companies in a supply chain, beyond just price negotiation since outsourcing is an unavoidable trend in cost-cutting. It is important for textile/ apparel companies to find reliable and trustworthy suppliers. All their criteria factors are used but each factor

is be investigated and screened by the purchasing and sourcing staffs and branch manager for its fit with this company. After discussion, some factors are added; there are product varieties under the flexibility section, and quality of product under the quality section, as shown in the next Figure.

Showing the new Variables added.



Product Variety is added to the flexibility cluster since the buyers also look for the variety of material in making choices and trial. Sometimes, the customers have no idea about their new collection; the customers prefer to ask the suppliers to propose the variety of material to help them generate an idea. If the suppliers can offer variety of product, it also affects the performance of the company.

Product quality is added to the quality cluster The quality of raw materials or components should be considered since it these are the tangible things for proving the quality and also affect the finished goods. The final product has to be tested and pass the standard of the customer's specification.

RESEARCH METHODOLOGY

The methodology for this project is the case study since the current method of evaluation and selection supplier in this company and evidence to support the decision making are not clear. Moreover, the objective in this project is applying the supplier selection process within the company for determining the capability of existing suppliers' performance to turn them into key suppliers for improvement in the supplier's performance in real life work. Therefore the case study technique is a suitable research tool for this project. The theoretical framework in this project is constructed by using prior studies in the area, both in concept and industry. However, the methodology is designed to fit the project, including data collection.

A mixed methods approach is one in which the researcher bases knowledge claims on pragmatic groups (Creswell, 2003; Hair *et al.*, 2003) In this case, a problem is identified for which there may be a range of possible solutions. The most appropriate solution must then be determined taking into consideration the specific requirements of the context under study. The mixed methods approach adopts strategies of enquiry that involve the collection of data in order to understand the situation that exits. Here data collection involves capturing numeric as well as textual information. In other words, both quantitative and qualitative methods are employed.

This is a case study using a mixed approach, where data is collected sequentially. The four phases of Shin and Danny (2008) and De Boer *et al.*, (2001) are used (problem definition, formulation of criteria, pre-qualification of suitable suppliers, and final selection of ultimate supplier). Here, the organization is a community that has identified a problem caused by suppliers. In order to solve the problem, the procurement staff and manger must be involved in designing the solution. The initial step involved interviews with the procurement staff and manager to identify the specific problems. To define the way of solving problems, the community will be involved. Findings of the literature review were presented to procurement staff and manger to determine what may be the best or easy way for the organization. Based on this review, a prototype was developed for measuring supplier performance. It was then tested using specific company data. A questionnaire was launched to measure the supplier performance. The data collected generated the result. The findings of the test data processed by the tool were analyzed with the manager, checking the output with real life experience. Once the tool and method were acceptable, the full database was fully implemented. The performance of the supplier base was measured by the capability of the existing suppliers for turning them into key suppliers to improve the company's performance.

Microsoft Office Excel was used as a tool to generate the database, since it is the general application tool in the business enterprise. The database was simulated by using the

equation with this tool. Davies (2000) states the characteristics and properties of a spreadsheet. Excel is suitable to simulate computing with equation setting.

To show the quality of the research design, tests of validity and reliability were established. The way of testing in a case study is different from a survey method since the case study does not quantitatively orient. Yin (1994) summarizes four design tests to judge the quality of the research design for a case study: construct validity, internal validity, external validity, and reliability. In this case the construct validity and reliability were used in combination to show the quality of research design.

Construct validity: Abd and Mohd (2003) state that it is the process of establishing correct operational measures for the concepts being studied. Multiple sources of evidence were used in this project in order to meet the construct validity test. In this case, to establish operational measurement, a suitable statistical method and factor criteria were be selected for applying to this study. Moreover, the multiple sources come from the primary data as the company documents and semi- structured interviews were combined to build the methodology for reaching a result and supporting the decision. The primary data was collected from company documents of supplier lists and details. Because of the lack of statistical records and documentary support, the interview process is part of collecting the data to support validity. Finally, before the final report was written and presented, a draft case study report had to be reviewed. The feedback was used to improve the case write-up. For improving the validity, this case study also followed the method which Abd and Mohd mention. Moreover, reviewing the information had to be conducted by the expert staff as the procurement manager has experience in real work for increasing the validity.

Reliability: Ellram (1996) stated that the validity and reliability have been gained by using multiple sources of evidence, establishing a chain of evidence, having key interviewees review case study reports, and developing a case study database. The interviewee in this case study also has a part to support and help to perform a reliability check by reviewing the procedures, data and information. A check was made of the step of operational statistics and the result to see if exactly repeated it would result in the same findings. All procedures were documented and reviewed to ensure minimum error and bias, increasing the repeatability of this case.

There are several of suppliers that ABC dealt with. However, we can divide these into four groups of supplier, of which fabric suppliers are the most significant. The fabric suppliers group has to be screened since some customers are active or non-active, before applying the supplier selection and evaluation method, and then determining the criteria factors for evaluation. The number of candidate suppliers remaining in fabric category after screening were 16 knitting suppliers and 19 woven suppliers who were

evaluated after the non-active suppliers were screened out. The respondents for this case study are managers and purchasing staff who handle the fabric category.

In data collection, the total score of each supplier comes from the questionnaire. The procurement staff and manager make the evaluation and give the ranking and scale for each factor. The questionnaire was distributed in two sets since this case study will be applied in the fabric categories (knitted fabric and woven fabric). After collecting the database, the supplier performance evaluation matrix table was applied to the database.

Supplier performance evaluation table matrix

The following Table shows the matrix table, from Teng and Jaramillo's matrix table. It is an easy way for the buyers/users use to evaluate and select the supplier by considering the major factors involved in the supply chain operations. The buyers/ users have to give the weight of each cluster and factor at the same time while the scores of each factor have to be collected. After that, all the quantity information is calculated in the equation that has been set.

The decision matrix table

Proposed decision matrix for supplier selection

Cluster	Weight	Factors	Weight	DVG	DV	Supplier A	Supplier B
Delivery	C_D	Geographic location	K_{gl}				
		Freight terms	K_{ft}				
		Trade restictions	K_{tr}				
		Total order lead time	K_{tl}				
		Delivery index = CD[(Kgl *Vgl)+(Kft *Vft)-(Ktr *Vtr)+(Ktl *Vtl)]					
Flexibility	C_F	Capacity	K_C				
		Inventory availability	K_{iv}				
		Information sharing	K_{is}				
		Negotiability	K_n				
		Customization	K_{cu}				
		Product Variety	K_{pv}				
		Flexibility index = CF[(Kc *Vc)+(Kiv*Viv)+(Kis*Vis)+(Kn*Vn)+(Kcu*Vcu)+(Kpv*Vpv)]					
Cost	C_C	Supplier's selling price	K_{sp}				
		Internal cost	K_{ic}				
		Ordering and invoicing	K_{oi}				
		Cost index = CC[(Ksp *Vsp)+(Kic*Vic)-(Koi*Voi)]					
Quality	C_Q	Continuous improv. Programs	K_{ip}				
		Certifications	K_{cs}				
		Customer service	K_{ct}				
		Percent of on-time shipments	K_{ot}				
		Product quality	K_{pq}				
		Quality index = CQ[(Kip *Vip)+(Kcs*Vcs)+(Kct*Vct)+(Kot*Vot)+(Kpq*Vpq)]					
Reliability	C_R	Feeling of trust	K_t				
		Country's political situation	K_{ps}				
		Currency exchange situation	K_{ce}				
		Warranty policies	K_{wp}				
		Reliability index = CR[(Kt *Vt)+(Kps*Vps)+(Kce*Vce)+(Kwp*Vwp)]					
Total score		delivery + flexibility score + quality score + reliability score -cost score					

Notes : DV = desired value

Source: *Teng and Jaramillo (2005)*

DISCUSSION OF RESULTS

The procurement staff and manger give the highest weight with 0.30 for quality followed by delivery and cost with score 0.20. For flexibility and reliability they give the equal weight as 0.15. The quality cluster is emphasized according to the company direction as quality is the main factor that the company wants to improve in the suppliers' performance. Moreover, they have to make decisions for giving the factors' weight inside each cluster.

Delivery cluster: total order lead time is the most important factor with weight 0.40 since this factor is out of control by the company itself. Moreover, the impact of this fabric is the highest impact on performance; it will affect the lead time in the chain, and customer satisfaction.

Flexibility cluster: capacity, inventory availability, information sharing and negotiability will allocate in the same weight with 0.20 for this important factor since it will affect the operational part. Customization and product variety are given less weight as they are minor factors.

Cost cluster: the highest weight given is the supplier's selling price with 0.50 since the product cost itself is the high proportion in determining decision making.

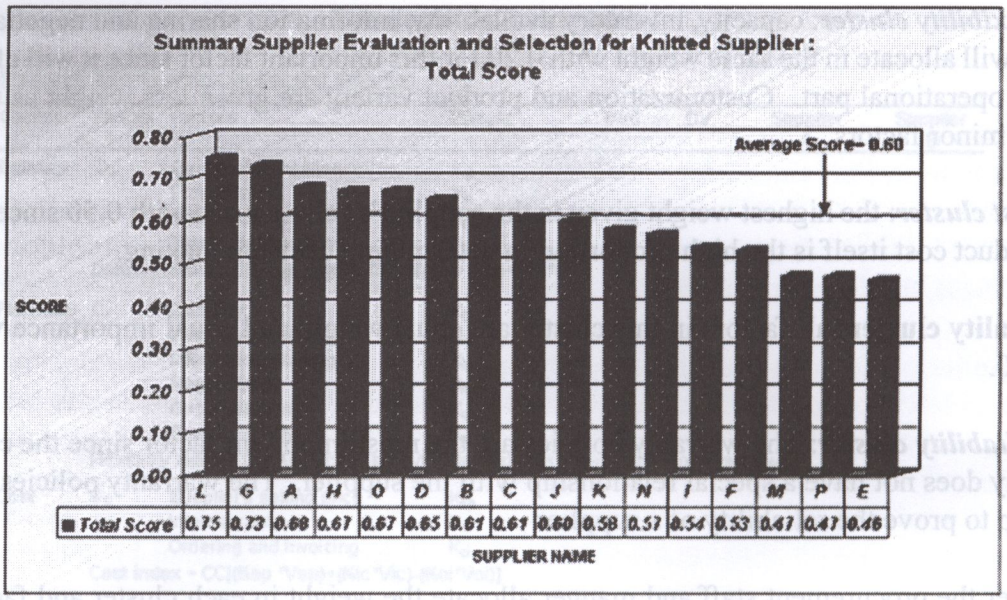
Quality cluster: all factors in this cluster are equal weight and equal importance with 0.20.

Reliability cluster: The warranty policies are the most important factor since the company does not have a special relationship with the supplier. The warranty policies can help to prove the reliability of a supplier.

After the procurement staff and manger allocate the weight in each cluster and factor, the score of each supplier is collected by using the questionnaire..

Results for Knitted Suppliers

After the data was collected, it was applied to the decision matrix. A summary of supplier evaluation and selection of total scores for knitted suppliers was reached, for 16 suppliers in according to the company requirements. Finally, the company has a clearer point of view for making the decision in selecting suppliers. The result is that Supplier "L" gets the highest performance score with 0.75. The following suppliers are Supplier "G" with a total score 0.73 as second choice, and Supplier "A" as third choice with a total score 0.68.

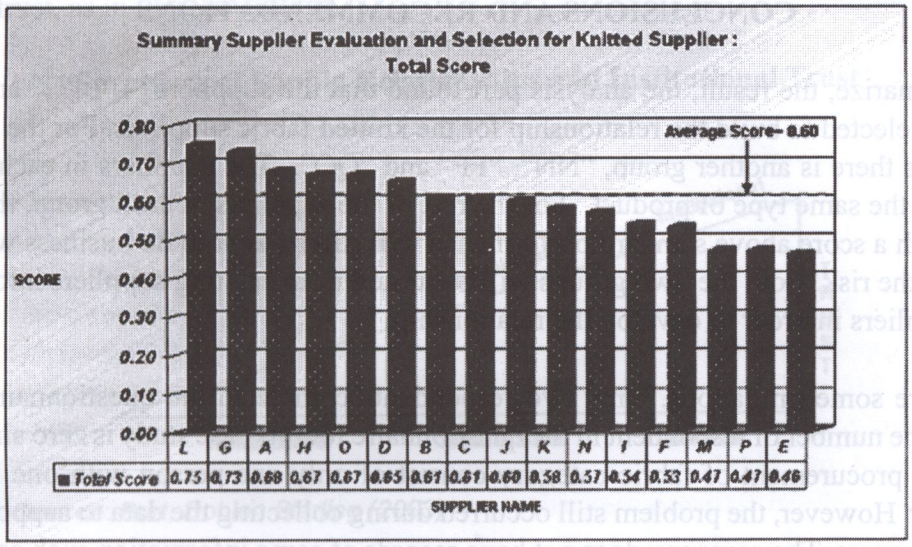


To keep the concept of multiple sourcing, the company will still keep in contact with more than one supplier for protection against the risk of times of shortages due to failure at a supplier's plant. Thus, the average score has to be seen as a standard score for reducing the supplier base. Since the average of the total scores is 0.60, the suppliers with a score below 0.60 means they have an out of standard performance. Hence, the top three will be selected as the initial key supplier group for developing a buyer and supplier relationship program. On the other hand, the company still connects with the rest of the group to share the possibility of an unsuccessful buyer and supplier relationship program from among the top three suppliers. Moreover, the company can investigate the weakness of the top three suppliers. The company can narrow the scope to look at each point of the three suppliers.

Supplier "L" is the first priority with the highest total score of 0.75. However, the weak point of supplier "L" is delivery only. The weaknesses of supplier "G" are cost and quality. Supplier "A" has to improve all factors except the flexibility factors. To look deep down inside the cluster of each supplier, the company can define which factor gets the low score that affects the total score index. For instance, the weakness of supplier "L" is in the delivery cluster: this supplier gets the lowest score in the total order lead time factor. Referring to the geographic location, freight terms and trade restriction; all three suppliers get the same score. The weakness point is total order lead time. It is possible to adjust this factor if the company creates a long term relationship and discussion with the supplier.

Results for Woven Suppliers

Data of 19 Woven Suppliers was collected and applied the same way as for Knitted fabric. The summary scores in evaluation and selection are in the next Chart. This shows supplier "NN" in the first order with the highest total score of 0.72, follow by supplier "QQ" with a score 0.71, and the third order is supplier "FF" with a score of 0.68. The average of total scores is 0.60 as standard score: a supplier who gets a score of 0.60 or above is still connected to the company to share the business risk.



The company also looks at the weakness point for possible adjustment. The weakness of supplier "NN" is flexibility cluster and gets a score less than supplier "FF" and "QQ", as Table 5.5 and Figure 5.9 show. The weakness of supplier "QQ" is the cost factor. "FF" supplier gets the lowest score, in delivery and cost.

Looking deep down inside the cluster of each supplier, the company can define which factor gets the low score that affects the total score index. For instance, "NN" supplier's weakness is in the flexibility cluster, and the company can thoroughly investigate this.

The weakness points of supplier "NN" is in the flexibility cluster: all points are weak points except negotiability and customization. Some factors are difficult to adjust, such as customization and product variety. If in this factor the supplier does not have new technology or machinery to support the making of varieties of products, it is difficult to adjust this point. If the nature of suppliers emphasis is on producing the mass product, it is difficult to change their nature. For capacity, information sharing and product variety factor can be improved, and the company can start to discuss with this supplier the possibility to improve their weakness point. Another point is product variety, this factor

has to be discussed between buyer and supplier for the possibility of more product variety. If it is impossible to improve, the company can be use the second and third supplier. By the way, that is a minor factor on which the company makes a decision to select the supplier: we have to look at the supplier's total performance. Whatever, the weak points of key suppliers, these can be improved. The company can discuss these points with these three suppliers to produce continuous improvement in performance.

CONCLUSIONS AND RECOMMENDATIONS

To summarize, the result, the analysis part found that the suppliers "L", "G" and "A" will be selected to build the relationship for the knitted fabric suppliers. For the woven suppliers there is another group, "NN", "FF" and "QQ". The suppliers in each group produce the same type of product. For the rest of the suppliers in each group, the supplier with a score above standard performance will still be kept to do business with for sharing the risk. Both the two groups will be turned from existing suppliers into being key suppliers in order to develop the relationship.

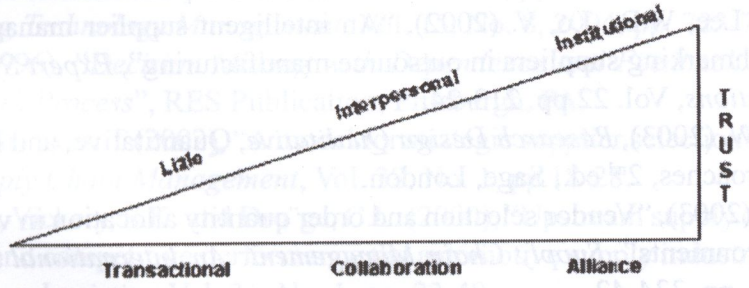
There are some limitations. Only two respondents completed the questionnaire. The bias of the number of respondent in the questionnaire for this case study is zero since the staffs in procurement of fabric category consist of only one person with one branch manager. However, the problem still occurred during collecting the data to support producing a score. The company does not have records of some information such as delivery dates, and some information is not well organized and was therefore difficult to find or was unavailable. Time constraint was also a problem; to find the same free time for everybody was difficult. Time to explain the information in this case study was required before the start and at every step, because the respondents needed to understand the advantages and details.

Finally, there are some recommendations. Although this case study applies supplier evaluation and selection in the fabric supplier category, the construction of Teng and Jaramillo (2005) can be applied to other groups of supplier. The advantage of this model is its flexibility in adopting changes in business circumstances, and the buyer can add or remove some factors to reach a deeper evaluation of a suppliers' operations, or simply when the suppliers have a similar environment. The criteria factors and questions in evaluation have to be adjusted to fit with the nature of product and type of suppliers. Moreover, the supplier evaluation and selection method can be extended into the computer software system used in the internal company. However, Teng and Jaramillo's methodology does have weaknesses. AHP is the one methodology for developing their method, and has weaknesses.

For some factors in the evaluation model, it necessary to look at the historical record for using evaluation in order to produce an accurate score. The case study Company has to re-construct the organization and management of the database in the system as some information is difficult to find and some is not recorded.

Furthermore, after the company selects the key suppliers, the company has to study the method or process of supplier relationship development. Burt et al., (2003) divides the supply relationship into three levels as the spectrum of supply relationships and institutional trust, as in this illustration:

Spectrum of Supply Relationships and Institutional Trust



Source: *Burt, Dobler, Starling (2003)*

It shows that trust relates with supply relationship. Handfield and Nichols (2004) state that trust is the foundation of positive and productive buyer-supplier relations. This must be part of the company's relationship development process.

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