

SUSTAINABLE SUPPLY CHAIN: KEY PERFORMANCE INDICATORS  
THESIS

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SUSTAINABLE SUPPLY CHAIN: KEY PERFORMANCE INDICATORS  
THESIS

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# **ABSTRACT**

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by

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**SUPERVISING PROFESSOR: DR. CECILIA TEMPONI**

With the high levels of global competition and economic challenges, the supply chain capabilities and outsourcing relationships are some of the competencies that organizations are using to compete against each other. Supply chain effectiveness and efficiency analysis is an approach to improve their overall performance. The purpose of this thesis is to: identify the key factors to evaluate when selecting suppliers, describe supplier selection approaches, define specific areas subject to performance evaluation and integrate all into a theoretical model that will serve as a guide for organizations to create a competitive advantage based on supply chain capabilities and outsourcing relationships. The thesis was divided into three main sections to accomplish this goal.

The first stage is focused on the factors that should be considered when selecting an outsourced supplier and what the selection approaches are in order to assure that these

factors are efficiently analyzed. Eight factors are identified and the applications of three supplier selection approaches are explained. The second stage of the research represents a study conducted to identify the areas where performance evaluation tools should be implemented. Key Performance Indicators (KPI) and other metrics must be implemented to continuously analyze how the efficiency and efficacy of the supply chain may be improved. Analysis of scheduled orders, production activity, delivery processes, customer satisfaction and finance and logistics are the five important areas identified and their connection with the buyer-supplier relationship is explained. The third stage is focused on the introduction and explanation of a proposed theoretical model that would serve as a guide to efficiently manage the performance of the buyer-supplier relationship.

It is concluded that firms should closely evaluate their interaction with their supplier throughout all the relationship stages: time of supplier selection, establishment of the relationship and evaluation of the performance. A firm may find a competitive advantage from this evaluation that will provide the opportunity to overcome the high level of competitiveness in today's business world.

## **INTRODUCTION**

The supply chain management (SCM) has become one of the most important areas of corporate decision-making where most corporations base their strategy (Janvier-James 2012). From deciding whether to obtain supplies and inputs from internal resources or outside suppliers, to the continuous evaluation of the supply chain performance as a whole, each decision-making analysis can make the difference between holding a sustainable competitive advantage or struggling to keep up with threatening competitors (Sezhiyan and Nambirajan 2011). As an avenue to improve the efficiency and the effectiveness of the supply chain performance, organizations have been focusing their SCM capabilities on how to measure their overall performance and how the outsourced suppliers affect it.

The objective of this research is to define a framework for organizations to use that will bring the opportunity to effectively capitalize on performance measurements. Research shows that there are several considerations regarding buyer-supplier relationships and overall performance that organizations have yet to incorporate into a managerial model. This research proposes that organizations can find the source of a competitive advantage by developing a performance evaluation system where the performances of the supplier and the buyer are strongly linked. Even though each

organization is different in nature, the performance evaluation system is an adaptable framework that allows them to better understand the essence of their overall performance.

This research attempts not only to define what the areas of focus are in order to benefit from evaluating performance, but also to create a theoretical model to implement a performance evaluation system. Among all the areas and processes that are part of the supply chain network, there are specific ones of particular importance in terms of the potential they bring to the SCM to improve the overall performance once they are subject to analysis. If these areas were analyzed in an isolated manner, creating a competitive advantage would be near to impossible. Instead, by continuously and efficiently analyzing them and defining the existing connections an organization may be able to find a tangible source of competitive advantage through its supply chain capabilities.

The paper will be organized as follows. Chapter one will explain the inherent importance of the supplier selection stage and how to efficiently accomplish it by using three specific approaches that have shown outstanding results. Chapter two will set and define the areas where the KPI and measurements should be placed and utilization of the five main processes within the supply chain, as explained in the SCOR model. Chapter three will cover the insights of the buyer-supplier relationship and how it affects the overall performance. Chapter four will introduce and explain the proposed theoretical model. The fifth and final chapter of this research presents the conclusions and the recommendations for future research in this field.

Research Objectives:

- Describe the most important supplier selection approaches, based on a selected set.
- Describe the importance of the buyer-supplier relationship to the overall performance of the supply chain.
- Propose a theoretical model to help organizations to find a source of competitive advantage within their SCM capabilities.

# CHAPTER I

## SUPPLIER SELECTION

One of the first steps in supply chain management for a corporation is to list the suppliers who can fulfill its required demand for resources. It then becomes necessary to identify a methodology for selecting them from among the different options. The supplier selection involves many variables: tangible and intangible performance evaluations, qualitative and quantitative aspects and short-and-long-term relationship willingness; to name a few (Bhuta and Huq 2002, 126). The overall variables that must be evaluated when looking for the best-fit supplier are not the only important conditions.

There are many technical components suppliers must have in order to be considered as strong candidates to supply chain managers. The combination of the overall evaluation and technical performance will give the supplier selection team a better picture of which supplier is the best candidate to satisfy their needs and aligns with the company's corporate strategy. The analysis of suppliers may vary depending on the location of its contribution to the supply chain management. Some specific factors that are common for supplier selection at different levels as well as different supplier

selection methodologies are: finance, consistency, relationship, flexibility, technological capability, customer service, reliability and price. After defining these factors for each alternative, it is necessary to analyze them through supplier selection methodologies.

Three methodologies that will be explained later are selected based on widely recognized benefits among different industries.

### **Evaluation Factors**

#### **An Overall Analysis of Suppliers**

Research demonstrates that among all the elements in the supplier evaluation process, there are eight factors that are required for evaluation. When it comes to deciding which supplier is the one that holds the best combination of characteristics to fit not only with the technical requirements, but also with the company's strategy, they play a key role. Supply chain managers must evaluate: finance, consistency, relationship, flexibility, technological capability, customer service, reliability and price to make the right decision when signing a contract with the best candidate supplier (Choi and Hartley 1996, 333).

#### **Financial Analysis**

The finance factor first involves evaluating the willingness of the supplier to openly discuss its financial status and past records. If the candidate is willing, then it is time for the supplier selection management team to evaluate if the candidate is under financial risk or if their financial statements represent a threat to the company (Wagner et

al. 2011, 150). As part of the assessment of the risk involved by selecting any specific supplier a financial performance evaluation is developed to discover any financial default record and/or dependency that could risk not only the supply chain capability as a whole, but also its financial condition (Micheli 2008, 918).

### **Consistency Analysis**

In order to avoid production discrepancies and variability from the supplier, the buyer should then evaluate the supplier's consistency. This evaluation must assess the supplier's abilities to maintain a consistent performance to ensure an accurate estimation for the buyer-supplier's long-term relationship (Ting and Cho 2008, 116). It consists of analyzing the supplier's capability to meet deadlines, deliver specified quality levels, be consistent in the conditions established at the beginning of the contract and provide reliable channels of communication throughout the supply process. Because the supply chain is a series of processes that are continuously linked to each other, it is extremely important that the components supplied from upstream stages hold the same level of overall performance to assure consistency and optimality along the supply chain (Qu et al. 2009, 6883).

### **Relationships Analysis**

The supply selection management team also evaluates past and current relationships with some supplier's clients. The more similar the supplier's clients are to the buyer, the more accurate evaluation the buyer can develop. These evaluations will give the management team a clear idea of how this supplier operates in terms of communication openness, long-term relationships, honesty and value-based operations

management. By projecting their future relationship, the analysts cannot only infer the levels of trust and cooperation that will define the basis of the relationship between buyer and supplier, but also identify how the future relationship would add to the value already in place on both sides (Chatain 2010, 76). The creation of value through the buyer-supplier relationship is a competency that could later materialize as a competitive advantage.

### **Flexibility Analysis**

The reason behind why flexibility is such an important factor is that nowadays the uncertainty that involves the supply-demand law has reached its highest level. There are four types of supply chain flexibility: supplier flexibility, manufacturing, distribution and product development (Mendoca and Giménez 2007, 1115). Because the supplier under evaluation could be offering input to any of these four areas, the evaluation of the capability to be flexible takes on an important role. Through the evaluation, the analyst should look for specific capabilities such as the ability to change production volumes and specifications, rapidly set up for new products, and adapt logistics to satisfy new conditions.

### **Technological Capability**

There is always a technical core capability that needs to be evaluated before engaging with the supplier. The level of specification and details that are involved in these evaluations will depend on where the supplier plays its role in the supply chain and the type of industry and field where the company is competing. If the supplier was a part of the product development, their technical capabilities would vary from the technical

capabilities of a shipping supplier. Therefore, there is not a guide to evaluate general technical capabilities for all kinds of suppliers; this evaluation is indeed customized to each candidate.

### **Customer Service Analysis**

It is important to also evaluate the way the supplier aspirants treat their customers; because a healthy relationship between buyer and supplier is based on a reciprocal relationship. As important as how the buyer relates with the supplier, is how the supplier relates with its client the buyer. There are two main aspects that need to be precisely analyzed: after-sale support and the supplier representative's competence (Choi and Hartley 1996, 333). Customer service is an important player in building trust. Consequently, the customer service performance should be aligned with the buyer's customer service principles.

### **Reliability Analysis**

The reliability factor stands to measure not only the product or service reliability itself, but also the capacity that the supplier has to engage in activities for the long run. The SCM supplier selection analysts can determine the level of trust they can place in the supplier based on how much the supplier trusts its capacity to maintain standardized levels of quality in its services and products. This reliability measurement includes analysis of qualitative and subjective data from the relationship between the supplier and its customers, who could be similar to the evaluating team.

## **Price Analysis**

Not surprisingly, price is a key factor to evaluate when considering the incorporation of a new player in an orchestrated supply chain process. Despite the high level of importance that this evaluation may have it is quite simple. The evaluation is mainly based on the comparison between different suppliers under similar situations and conditions and the reaction of these suppliers when prices change.

The relative importance of these eight factors will be dependent upon the industry and corporate specifications. It would also depend upon the external conditions, such as a situation with high rivalry between competitors, the amount of power end customers have, and the amount of power that suppliers have. Research shows that for some industries, such as the automotive industry, the price factor is rated as the least important factor; whereas, the potential for close and long-term relationships as well as the technological capabilities are ranked as top priorities when choosing a supplier (Choi and Hartley 1996, 333). It may seem odd; but, once the buyer-supplier relationship is built upon transparency and trust, the cost of losing clients is lower than the cost of paying higher rates compared to a relationship that is based solely on price.

## **Supplier Selection Models**

Known as “vendor selection”, the supplier selection problem has been a common factor present in most supply chains since the 1960’s. Research literature shows different traditional approaches such as the cost-ratio method, the categorical method, weighted-

point evaluations, mathematical programming models, and statistical approaches. None of these methods, which have been around for decades, dominate the others in terms of their pros and cons. The appropriateness of these methods will depend on the specifics of the supplier type and the industry (Chen and Huang 2007, 575).

The study would begin with the development of the aforementioned traditional approaches by collecting and analyzing data such as process improvement techniques, mathematical techniques and optimization of workflow and assembly line efficiency. Known as Operation Research Management (ORM), ORM has developed many techniques that serve as the data collector and set the analysis principles of these data (Craighead and Meredith 2008, 710). The SCM uses these techniques developed by ORM and integrates them with managerial techniques to simplify the decision-making process.

The different data arrangements and treatments that the SCM analysts can make to these data vary from a wide array of options and combinations. Though there are common methods that can be easily adapted to fit analysts' needs and the available data, all of them may be improved to better satisfy specific decision-making processes.

There are many types of supplier selection methodologies that take place in different levels of the supply chain, from the upstream stages to the final activities. These methodologies vary in both the required data and treatments of it. Even though the ultimate goal is to pick the best supplier to fill the needs in the supply chain and be aligned with the company's corporate strategy, there are different approaches that guide the decision-making process. The Analytical Hierarchy Process, the Total Cost Approach

and the Multiple Attribute Utility Theory are the three managerial techniques that are explained next.

### **Analytical Hierarchy Process**

Created by Saaty in 1980, the Analytical Hierarchy Process (AHP) is a powerful tool in solving complex decision-making problems. The hierarchy in this process begins with more uncertain and uncontrollable factors to the more controllable and certain ones and its structure is similar to a family tree. The decision-making problem is structured hierarchically at different levels. The structure begins with the goal or the problem to solve, then the different criteria and at a lower level all the alternatives that can satisfy the criteria. In the supplier selection decision-making process, the goal is to select the best supplier; the criteria are the factors to be evaluated and then the alternatives are all the suppliers that the SCM is considering.

The method is based on the decision-makers' opinions. They rate the importance of each criterion in a discrete scale ranging from one to nine by using judgments and by comparing the relative importance of one criterion over another. Then all the criteria's values of importance are organized in a matrix that is then mathematically treated by the AHP software. The result shows the hierarchy of each criterion from the most important to the least important. Once each defined criterion has been positioned in the hierarchy structure, then all alternatives are compared for each criterion. After all comparisons are complete, in terms of how each alternative best fits each criterion, the SCM team will be able to choose the best supplier option (Sevкли et al. 2007, 122).

Although this method allows decision-makers to narrow down options until they finally pick the best one, this could be a limitation for some firms due to the condition that the ranking of the decision variables are based upon the decision-maker's preferences. It gives the opportunity to have different outcomes using the same data depending on who analyzes the data and how these evaluators perceive and process information. The evaluators should be wisely selected and they must be aligned with the corporate strategy in order to ensure consistency (Chan, et al. 2008, 3825).

Even though the AHP provides the SCM with a logical framework to determine the benefits of each alternative, it is a subjective decision-making process. It lacks the capability to guide the evaluation process to an uncertain solution, due to the difficulty, that the decision-maker faces when analyzing both quantitative and qualitative data and then expressing his or her perception into numbers in the discrete scale. As suggested by Chan (Chan et al. 2008, 3825) a fuzzy set theory algorithm will improve this method. The larger the decision-making group, the more accurate the decision.

### **Multiple Attribute Utility Theory**

Known as MAU, this approach is a multi-criterion decision-making method that uses the utility that each alternative offers, in contrast to the analysis of the cost that each alternative represents. This methodology is often used in companies that are value driven more than cost driven.

The methodology starts by setting a matrix where alternatives are individually organized by rows and columns that represent the performance measure for each criterion. There are two possible scenarios when assigning the performance value to each

specific criterion: a known performance based on available data and unknown performances. Whereas the first scenario does not represent a challenge, the second one does. When data are not available, the most accurate method to estimate values of performances is to quantify them by range or probability distribution analyses (Butler et al. 2001, 800).

The MAU gives the SCM an appropriate framework for evaluating “What if” scenarios by using probability analyses. Because the SCM may not know the supplier or have access to information, these analyses are often necessary due to the great amount of uncontrollable and unpredictable performance variables that come into play when predicting supplier performance.

The selection team evaluates all possible combinations of scenarios and gives the decision-makers an option that seems to be the most efficient and favorable one. Depending on the level of risk the company is willing to take, it is common to see buyers select suppliers at the highest cost, due to the greater likelihood that the supplier will maintain a stable, long-term relationship (Bhutta and Huq 2002, 126).

The MAU methodology may be combined with different approaches in order to improve the selection process due to industry characteristics. The most common one is when companies are driven by the Just in Time (JIT) manufacturing system that was designed by the Japanese in the early 1970s and then spread throughout the industrial world. By using JIT, SCM teams set the supplier’s requirements when needed with a safety margin avoiding high costs associated with inventories, logistics and surplus. Yet, it is a risky system if the supplier role is not well understood by both the supplier and the

buyer (Bayo-Moriones et al. 2008, 1042). The MAU methodology is then combined with the multi-objective programming method.

On top of the MAU analysis process, the multi-objective programming approach includes a scenario analysis of all the variables related to the JIT system facilitating the decision-making process. This is a very complex analysis of variables but by using these methods the supply management team would have the opportunity to obtain the big picture drawn from the details.

### **Total Cost of Ownership**

The Total Cost of Ownership (TCO) is a cost-based approach that not only includes the evaluation of the suppliers prior to their selection, but also helps to predict and evaluate their future performance. This methodology is complex and requires the evaluation team to first define which costs are of more importance to the company in terms of acquisition, use and service of the product offered by the supplier. The principal feature that the TCO approach holds is that by using TCO the SCM will be aware of the hidden transaction costs associated with the supplier-buyer relationship (Zachariassen and Arlbjørn 2009, 3 ).

The cost analysis starts with the beginning price as the quoted price that each supplier will charge for the specific services or products that the suppliers are being asked to deliver. The methodology continues by assigning which factors are the most relevant for the company when evaluating the suppliers and then a cost to each of these selected factors is assigned. After assigning and adding all the factors' costs, each supplier will have a specific total cost. Once all the considered costs are summed up, they are divided

by the number of units offered by each supplier. By comparing total costs, the supply selection management team will then select the supplier that represents the lowest cost for the company, which is the supplier with the lowest unit cost.

Even though this methodology has several similar approaches such as the life-cycling cost, zero-based pricing, cost-based supplier evaluation and cost-ratio method, these methods have not enjoyed the popularity of the TCO over the years due to their complexity and situation specific approaches (Bhutta and Huq 2002, 126).

The TCO is intended to base the decision-making process on the cost that any given supplier represents for the company by engaging with them. The performance of this approach will depend on how accurate the evaluators assign cost to non-monetary factors. Non-monetary factors include all the qualitative and subjective aspects that are taken into consideration in the evaluation. Some aspects that are hard to convert into costs are: customer service, social policies, company values and culture, on-time delivery capacity and flexibility capacity.

Notwithstanding the difficulty to transform subjective perceptions into costs, this methodology holds an advantage for the buying firm. When a company is cost driven, the TCO represents a good opportunity to easily understand how favorable any supplier-buyer relationship would be in terms of cash flows (Bhutta and Huq 2002, 126).

There are important criteria to evaluate when selecting a supplier, some examples are: Finance, consistency, relationship, flexibility, technological capability, customer service, reliability and price. The SCM managers can find the supplier that best fits with its specifications among all the supplier options the SCM may encounter in the

marketplace by using, among others, managerial approaches such as AHP, TCO and MAU. Table 1 and Table 2 list the key criteria and how each approach evaluates them to give the SCM the best option. Table 2 lists the advantages and disadvantages of using each explained approach.

**Table 1 Selected Supplier Selection Approaches**

<b>Buyer Goal: Select the best supplier option to satisfy current needs</b>					
<b>Approach</b>	<u>Financial Performance</u>	<u>Consistency</u>	<u>Relationships</u>	<u>Flexibility</u>	<u>Technological Capability</u>
<b>Analysis Process</b>					
<b>AHP</b>	Assigns the importance of the financial performance comparing to the other criteria	Assigns the importance of the consistency performance comparing to the other criteria	Assigns the importance of the relationship performance comparing to the other criteria	Assigns the importance of the flexibility capability comparing to the other criteria	Assigns the importance of the technological capability comparing to the other criteria
<b>TCO</b>	Analysis and definitions of the cost associated with the current financial performance	Analysis and definitions of the cost associated with the level of standardization in processes	Analysis and definitions of the cost associated with the current relationship performance	Analysis and definitions of the cost associated with how flexible the supplier is in different areas	Analysis and definitions of the cost associated with capable is the supplier to meet technical specifications
<b>MAU</b>	Assigns a value that represents the utility offered by the supplier due to its financial performance	Assigns a value that represents the utility offered by the supplier due to its level of standardized processes	Assigns a value that represents the utility offered by the supplier due to its relationships management	Assigns a value that represents the utility offered by the supplier due to its flexibility	Assigns a value that represents the utility offered by the supplier due to its technological capability

Table 2 Table 1. Continued. Selected Supplier Selection Approaches

<b>Buyer Goal: Select the best supplier option to satisfy current needs</b>				
<u>Customer Service</u>	<u>Reliability</u>	<u>Price</u>	<u>Results</u>	<u>References</u>
<b>Analysis Process</b>				
Assigns the importance of the customer service performance comparing to the other criterions	Assigns the importance of the realiability comparing to the other criterions	Assigns the importance of the price structure comparing to the other criterions	<b>The best fit will be the supplier with higher appreciation in the criterions that had more importance among all</b>	Sevkli, Koh, Zaim, Demirbag and Tatoglu (2007). Choy, Chan, Kumar, Tiwari and Lau (2008).
Analysis and definitions of the cost assoiciated with how the supplier manages customer services	Analysis and definitions of the cost assoiciated with the level of trust the supplier offers	Analysis and definitions of the cost assoiciated with the supplier's price structure	<b>The best fit will be the supplier with the lowest unit cost implication</b>	Zachariasen and Arlbjorn (2011). Bhutta and Huq (2002).
Assigns a value that represents the utility offered by the supplier due to its customer service management policies	Assigns a value that represents the utility offered by the supplier due to the level of trust it generates	Assigns a value that represents the utility offered by the supplier due to the price structure	<b>The best fit will be the supplier which is more beneficial for the company based on how much it benefits the company by each criterion</b>	Butler, Morrice and Mullarkey (2011). Bhutta and Huq (2002). Bayo-Moriones, Bello-Pintado and Merino-De-Cerio (2008).

**Table 3 Analytical Hierarchy Process, Total Cost of Ownership and Multiple Attribute Utility theory Approaches Comparison**

<b>COMPARISON</b>		
<b>Methodology</b>	<b>Advantages</b>	<b>Disadvantages</b>
<b>AHP</b>	Simplicity. Qualitative and quantitative variables are analyzed.	Based on perceptions. Demands great number of people. Fuzzy set Theory is needed
<b>TCO</b>	Unhide costs associated with the buyer-supplier relationship. Takes all costs into analysis.	Complex. Cost may cover valuable benefits. Important trade-offs must be done.
<b>MAU</b>	Analysis of benefits instead of costs to achieve long term relationships. Probablity Analysis.	Complex. Demands great number of people.

As shown on Table 2, the three supplier selection approaches have advantages and disadvantages when applied. A major difference among the three is how each one evaluates the possibility for a long-term relationship with the suppliers, which is a key factor when searching for a competitive advantage from the supplier-buyer relationship. In terms of the accuracy of each methodology, the AHP methodology uses more subjective decisions based on perceptions and rankings, instead of observed data to back up decisions. . By giving the SCM team a better understanding of the benefits offered by each option, the decision will be based toward a long buyer-supplier relationship. The TCO holds a short-term and situational advantage over the other two. By analyzing the total cost that each option would carry, the SCM team will have a better decision-making

guide if the company is temporary or has an absolute cost-driven strategy. In terms of the long-run analysis, the MAU methodology holds the advantage over the other two.

## **CHAPTER II**

### **AREAS OF APPLICATION**

For a supply chain to be efficiently integrated there all processes and activities must reveal an exceptional and constant performance. Because these outcomes vary from strictly operational processes to specific strategic decisions they are hard to control. The most appropriate way to assure consistency in desired outcomes in the supply chain as a whole is to continuously evaluate them with specific metrics for each area (Gunasekaran et al. 2001, 71).

Using metrics to measure different types of performances within the supply chain areas may hurt the SCM team's decision if the metrics are not used where they are crucial. In order to define specification about the evaluation system, it also is important to define the different management levels throughout the supply chain. There are three levels that have to be well defined and differentiated. All the components of the supply chain can be evaluated at the operational, tactical and strategic levels (Gunasekaran et al. 2001, 71).

Evaluating operational performance gives the SCM team a picture of how the production processes have been and are currently affecting the company as a whole. Operational performance will also indicate how production processes may affect the company in the future. The collection of data that occurs at the operational level is then

analyzed by the management to evaluate whether the performances obtained are in concordance with the tactics that support the supply chain strategy. Evaluating bottlenecks in the production flows, or level of work in progress in different stations are examples of operational metrics. If the evaluations of these performances are neglected, the top management may make decisions that are not necessarily smart from a production standpoint.

Research shows that there are five important areas throughout the three levels where the use of metrics is needed to analyze the performance that will allow the firm to capitalize on the buyer-supplier relationship and the supply chain efficiency as a whole. These areas are an analysis of scheduled orders, production activity, delivering processes, customer satisfaction and finance and logistics costs (Gunasekaran et al. 2001, 71).

### **Areas of Application**

#### **Analysis of scheduled orders**

Accepting orders is the very first step for many companies in different industries. Evaluating these upstream activities provides a good opportunity to set the performance expectations of downstream activities (Selcuk et al. 2007, 2507). Within this particular process of accepting and scheduling orders, there are some specific metrics that can be successfully used. The entry method is the first process to be evaluated. It is important to understand how the company is converting the customers' needs into feasible product/service specification. The second step in this evaluation is the order cycle time, also known as "order lead-time".

The evaluation of all the components of the order lead-time includes the specific performance measurement of the time of order entry, order planning, order production and delivery of finished goods (Gunasekaran et al. 2001, 71). The mentioned activities are affected by and affect all levels of the supply chain. From production specific activities to customer satisfaction, the study of the cycle time represents an opportunity to make the supply chain more efficient and to develop a competitive advantage.

The last aspect to evaluate within the schedule order process is how the customers participate and perceive the order process, until orders are ready and delivered. Mainly based on customer satisfaction, the goal of this evaluation is to analyze how the customer participates in the process. There are several steps where the order may be delayed that can be improved for a higher customer satisfaction.

### **Analysis of Production Activity**

Once the orders are scheduled and the production department has all the inputs needed to convert the customer requirements into finished goods, it is time to evaluate the performance of all the outputs in the production stages. There are three main capacities that should be evaluated: the array of products and services offered within the production stage, the capacity utilization and the effectiveness of scheduling methods (Gunasekaran et al. 2001, 71).

The array of products and services offered is an important element in the way that many resources may be underused representing a decreased participation in add-value activities. Human resources must be adequately staffed to efficiently manage product and

service demand. Holding a large number of offerings may reduce the innovation capacity of a company to develop new solutions to customers' needs. Under the analysis of the production activity there is a key performance that should be measured in order to improve efficiency by reducing unnecessary resources. The capacity utilization is the percentage of the capacity of the existing resources within the production department that are used to address demand. The study of this percentage will help in emphasizing resources that can be reordered or removed to achieve a more efficient supply chain. By efficiently adjusting the capacity of one resource, other resources will be positively impacted (Meyer et al. 2011, 1303).

The last set of metrics are developed to measure the effectiveness of scheduling techniques. Scheduling an activity involves coordination with several departments. The activities completed by specific people using specific inputs are not the only important measure. Also important is whether these activities followed the dates and places as initially scheduled. Improvement in scheduling can certainly represent a step toward the improved efficiency of the whole supply chain.

In the analysis of production activity, the most used Key Performance Indicators (KPI) among different industries which are involved in certain type of production activities or service creation are: capacity utilization, units produced for all services and products, number of orders delayed for schedule conflict and quantity of resources used in each unit.

## **Analysis of the Delivery Processes**

Delivery is equally as important as it is to accept an order and produce it. The shortening and improvement of the delivery-lead time may represent a competitive advantage (Izui et al. 2009, 2821). Delivery is the last step of the production stage and a formal drive for customers to feel satisfied by the company. To assure customer satisfaction when delivering the product, several activities must be completed through consideration of the expected ranges of outputs and quality standards. There are specific KPI to measure these activities.

On-time delivery, accomplishment of specifications commitment, planned vs. actual cost, warehouse cost and quality level are among the most significant KPI used in production industries. The most important action is to measure the same finished product from different points of view as it involves different resources. This data will allow the SCM team to find patterns among the delivery processes. The ultimate goal of evaluating the performance of the delivery process is to better understand the customer satisfaction at specific levels for each delivered order.

## **Analysis of Customer Satisfaction**

In order to have all the logistics, costs, activities and resources make sense, it is essential to link all efforts with the customer satisfaction. If customers are not satisfied and willing to engage again with the company, none of the variables within the supply chain will matter and SCM would seem like a costly, useless practice. The SCM team should engage in Customer Relationship Management (CRM) practices in order to move

toward customer satisfaction. CRM symbolizes a strategy for the company that includes the analysis of all client-interaction activities and beyond to increase the level of satisfaction. By increasing the level of customer satisfaction, the SCM will achieve operational costs reduction, higher profits and customer relationships that are easier to manage (Zamil 2011, 22).

Customer satisfaction can be specifically measured at three main stages up to downstream and beyond. Customers show either satisfaction or dissatisfaction from the very beginning of their interactions with the company. The first stage where customer's needs are met is during the order process with the company representative. This initial interaction serves as a forecast of how the rest of the interaction will proceed, and that is why using metrics to understand the company's performance at this stage is crucial. KPI often used in this stage are: level of customer involvement, capacity to accept customer's specifications, customer satisfaction with cost and time, level of customization needed and level of duplicated customer orders.

The second stage that affects the customer's perception of the company is when the customer receives the finished product or experiences service. As mentioned before, this stage may be influenced by the production time, the inherent quality in the product, the product specification and the actual price. Whatever the perception is, the company needs to be sure that all the metrics are in place to understand the performance in these different elements of the customer relationship. The SCM in collaboration with the customer services department should create a customer satisfaction profile. This profile is composed of the level of satisfaction regarding quality, delivery time, specification

accomplishment and actual cost. By creating this profile for each customer, the SCM team will be given enough data to understand the trends that are dominating the customers' satisfaction.

The third stage is after the customers receive the product or service. To better understand long-term customer satisfaction the SCM Team should evaluate whether future customers reaching the company have been referred by existing customers. Analyzing the reason behind why the new customer starts a relationship with the company will give the SCM team a better understanding of its strengths.

### **Analysis of Finance and Logistics cost**

Finance and logistics are close enough to be linked to every activity that takes place within the supply chain and also are co-dependent. The way assets are represented in every process of the supply chain must be measured. The return and turnover in assets is a key point of analysis for the finance department, but it is equally important for the production department. For example, a machine that represents a high cost and is underused represents a problem for both departments.

Most of the time, the logistic tactics are attached to the financial health of the company making the evaluation of the financial performances a core activity when measuring performances throughout the supply chain. There is a delicate dividing line between financial and logistic evaluation. The most important feature that the key performances indicators may present here is the opportunities they bring to the SCM team to better understand how to avoid failures in either one. There are many financial

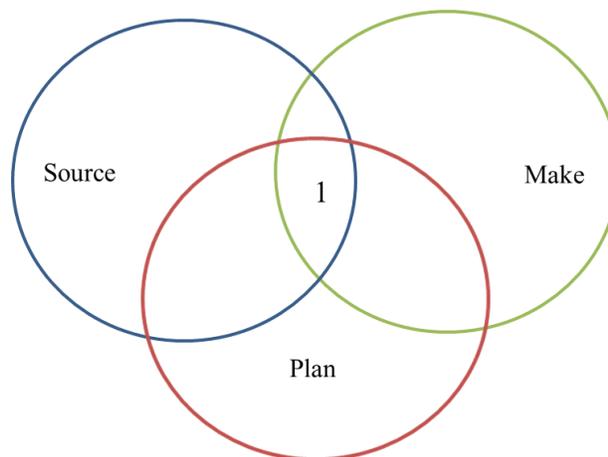
ratios and logistics costs that can be easily measured using specific KPI such as opportunity costs, cost of work in progress, cost associated with reworks, shortage and surplus inventory costs, maintenance activity, ROA for each machinery and other assets and inventory turnover ratio. The use of these KPI will allow the SCM team to better allocate the right cost to specific orders based on ordinary and extraordinary situations.

To make sense, all of these measures that are applied within the five areas need to be organized and structured within a framework. Among all the SCM models to improve the supply chain efficiency, such as Enterprise Resource Planning (ERP), Business Process Reengineering (BPR), Balance Score Card (BSC), there is a reference framework model that best integrates the areas with production activities (Chan and Wang 2010, 3825). The Supply Chain Operations Reference (SCOR) model has been widely adopted by most of the companies around the globe engaging in supply chain performance measurement activity. Developed by the Supply Chain Council in 1996, the SCOR model divides the supply chain activities into five main supply chain processes: Plan, Source, Make, Deliver and Return (Zhou and Benton 2007, 1348). Even though the SCOR model is extensively detailed and complex, the scope of this research is limited to the use of the SCOR model as a framework to the evaluation of performance throughout the supply chain.

It is important to understand the relationship between the five areas explained above with the three levels of action using a main framework such as the proposed one, the SCOR model. The use of the model as the framework is further explained for each area.

## Analysis of Production Activity and the SCOR model

Denoted as the number one area of analysis, the production activity involves three activities of the SCOR model that are: Source, Plan and Make. When the sourcing and planning departments are assigning resources (source activity) such as time, inputs and labor, previous information regarding the production department capacity should be analyzed. The relationship between the production department (make activity) and the planning department (plan activity) is so strong that it makes these two departments co-dependent. Therefore the most efficient way to actually analyze the production activity is under the combination of these three SCOR activities. The numbered intersections from Figure 1 to Figure 6 identify each area of application and their relationships with the SCOR model explained above. Figure 1 shows the relationship.

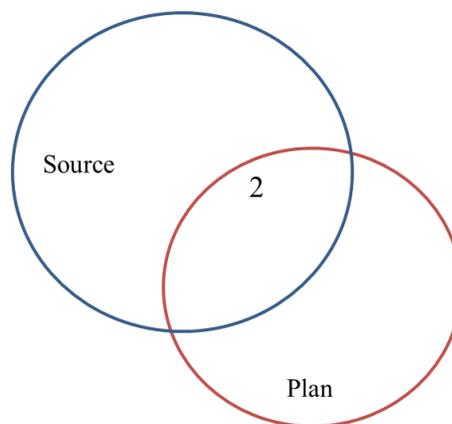


**Figure 1 Analysis of Production Activity and the SCOR Model**

## Analysis of Buyer-Supplier Relationship and the SCOR model

The supplier may have a late involvement within the supply chain stages, however, most of the time the existence of suppliers within the supply chain occurs early in the process when some resources and inputs are outsourced to third parties. Called the number two area of analysis, the analysis of the buyer-supplier relationship involves two SCOR activities: Source and Plan.

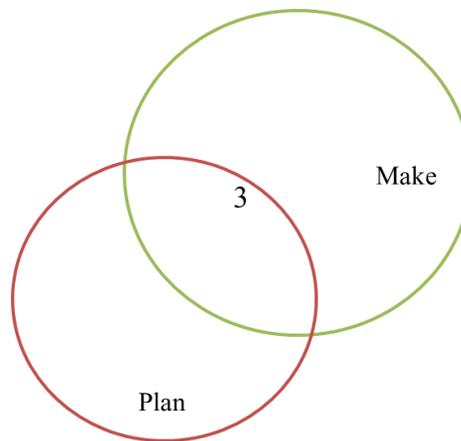
This analysis is tied to these two activities for the main reason of interdependence. The planning department can actually plan based on what is available. This condition is satisfied if the information flow between the buyer and the supplier is adequately efficient. It is important that the buyer has the updated information of the status of all resources available (source activity) in order to efficiently allocate them into production (plan activity). Figure 2 shows the relationship.



**Figure 2 Analysis of Buyer-Supplier Relationship and the SCOR Model**

### **Analysis of Scheduled Orders and the SCOR model**

Referred as the number 3 area of analysis, the analysis of scheduled orders is a crucial stage within the production process and will help set the customers' expectations. It is based on availability of resources (plan activity) and capacity of the production department (make activity). Consequently the analysis needed to set the production time for an order is based on the intersection point between the planning and the production activities. Figure 3 shows this relationship and the location of this area of analysis.

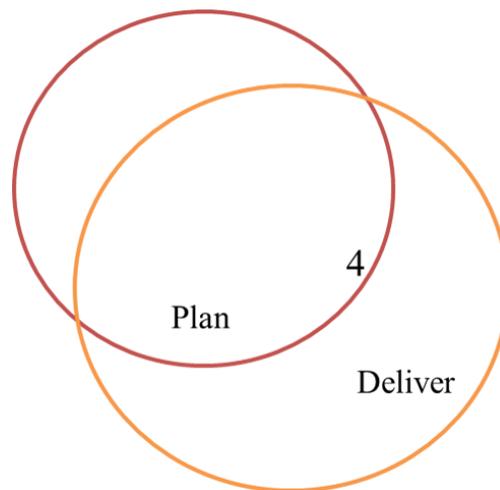


**Figure 3 Relationship Between the Analysis of the Schedule Orders and the SCOR Model**

### **Analysis of Delivery and the SCOR model**

Analysis of Delivery Process is the area of analysis number four and it takes place in between two SCOR activities: plan and delivery. The planning department not only plans the upstream activities in the supply chain, but also plans the downstream activity.

The delivery process requires many inputs and resources that the planning department controls (plan activity). Independent of the shipping terms and whether the delivery process is carried out by third parties (deliver activity), the finished products must reach their customers in an efficient manner. Figure 4 shows the relationship between the analysis of delivery and the SCOR activities.

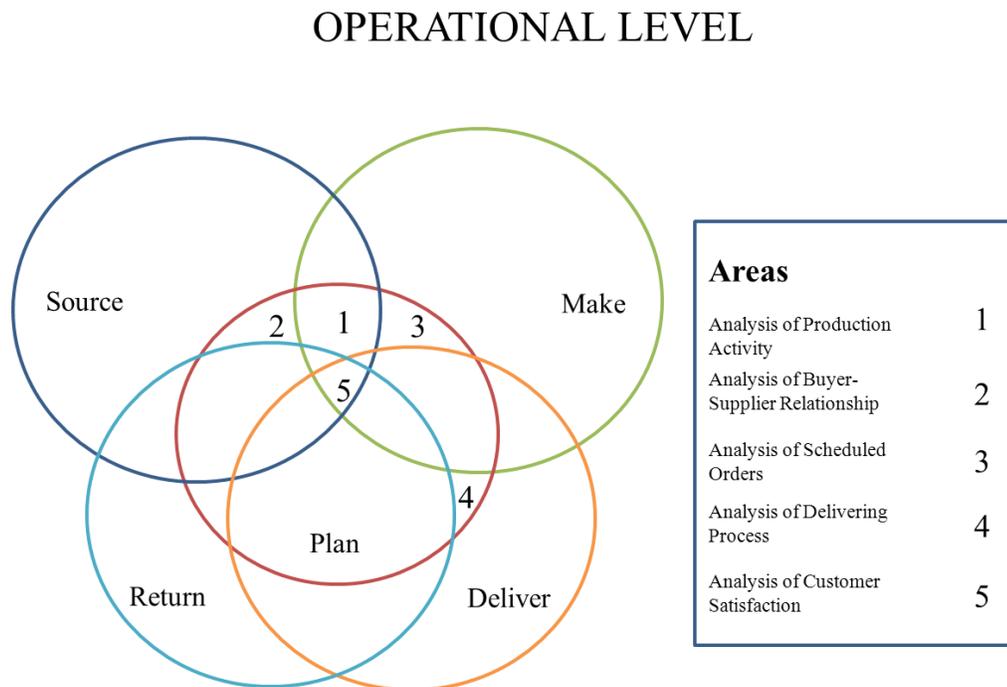


**Figure 4 Relationship Between the Analysis of Delivery and the SCOR Model**

### **Analysis of Customer Satisfaction and the SCOR model**

The last area is composed of all the activities included in the SCOR model and is dependent on all other areas where the KPI is implemented to assure an efficient performance and expected quality standards. The analysis of customer satisfaction begins with the customer's first interaction with the company (plan activity), continues with the customer satisfaction during the production process (source and make activities) and ends with the customer satisfaction by the order delivery time (deliver activity). The interaction and the possibility to influence customer satisfaction do not necessarily end

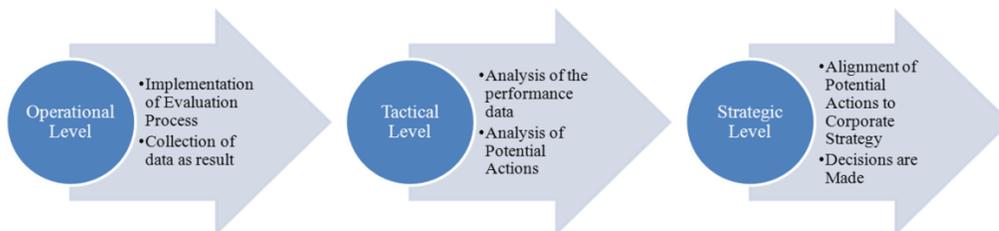
there. Customers may return the finished product based on imperfections, quality levels, difference between actual and planned cost and other reasons. The interaction between customers and the company is carried out by the planning department who determines the best way to improve customer satisfaction, whether by accepting the returned order (return activity), changing delivery conditions such as offering a discount in the price, or by reproducing the order. Figure 5 shows the relationship between the analysis of customer satisfaction and the SCOR activities. Due to the high level of interdependence in this area of analysis, Figure 5 shows the relationship between all areas of analysis and all the SCOR activities at the operational level.



**Figure 5 Relationships Between the Areas of Analysis and the SCOR Model**

At the operational level, the SCOR Model sets the processes where the KPI should be implemented and these processes take place in areas that need to be continuously evaluated to allow the SCM to improve the efficiency and efficacy of the supply chain. All the metrics used within these areas are implemented at the operational level of performance of the supply chain. The metrics and KPI mentioned are some of the most applied tools within different industries. Because each company is unique in the way businesses and operations are handled, there is no way to structure a recipe or a must-have list of KPI in general. The selection of the best KPI to use is based on the explained process to efficiently design a performance evaluation system for each company.

The analysis of the results obtained follows a logical hierarchical process from the operation level all the way up to the corporate level. Once the KPI have shown results, the treatment of the data collected takes place in a more analytical environment where the potential actions to handle the results are analyzed in order to align them to corporate strategy. Figure 6 shows how this process is carried throughout all the levels.



**Figure 6 Process to Implement performance evaluations throughout all Levels of SCM**

This performance evaluation approach using the SCOR model to better organize the different levels of SCM throughout the five areas has the ultimate goal of guiding the SCM team to better perform the buyer-supplier relationship. The understanding and application of metrics and evaluation systems within these five areas represent the possibility for the SCM to continuously improve the supply chain performance and make the buyer-supplier relationship a truly engaged efficient interaction. From the strategic board to the operational day-to-day basis, the evaluation of the above mentioned performances are of vital importance to reach, maintain and find a competitive advantage in the supply chain. On top of these important performances, there is an element that is not controlled uniquely by the SCM but highly dependent on the performance developed within the five areas mentioned. This element is the buyer-supplier relationship. Once the analysis of the five areas has been developed, the SCM team will have the opportunity to better understand this relationship, a source of competitive advantage within the supply chain.

### **Buyer-Supplier Relationship**

As important as it is to continuously evaluate several performances within the supply chain operations, it is also important to specifically monitor the performance of the suppliers. This performance does not depend only on the supplier, but also on the capacity of the buyer to manage the suppliers' outputs. Suppliers hold a crucial portion of the company success and that is the reason behind the company's willingness and compulsion to assure their performance is at least as expected and agreed. Measuring suppliers' performance brings the company the opportunity to overcome the weaknesses

within the performance outputs and better predict the course of actions within the buyer-supplier relationship. To measure the suppliers' performance is to evaluate the effectiveness and efficiency with which a supplier completes a given task based on pre-established performance objectives (Prahinski and Benton 2004, 39). Effectiveness is a measure of whether or not the objectives were accomplished; whereas, efficiency is a measure of how well the resources were utilized.

To effectively quantify the efficiency and effectiveness of any supplier action there are three main stages that have to be clearly defined and implemented (Hald and Ellegaard 2010, 888). These stages are: the design of the supplier performance evaluation system, the implementation of the system and the use of the results of the system. Even though these three are all of high level of significance and importance, the design of the supplier performance evaluation system is the stage that holds the most critical part. This stage is crucial because the goal-setting phase and definition of objectives of the evaluation systems are defined here. If the objectives are not clearly defined then no matter what data have been collected, the SCM team would not be able to use it with the intention of improving buyer-supplier relationship.

## **CHAPTER III**

### **BUYER-SUPPLIER RELATIONSHIP PERFORMANCE**

A great challenge for supply chain managers is to maintain a desired level of performance throughout all activities at any given period of time. Overcoming this challenge will bring consistency in the performance of the supply chain, thereby achieving long-term stability. The buyer-supplier relationship management represents a difficult challenge for managers at different stages of the supply chain, especially when managing relationships with outsourced suppliers (Won et al. 2007, 444). On the one hand, activity management that depends on the managers' ability to efficiently coordinate and prosecute plays an important role in the capability to obtain a long-term stable performance. On the other hand, controlling the suppliers' performance is probably the hardest activity since it depends on the suppliers' ability to maintain a consistent performance and effectively communicate with their counterpart. Therefore, managers should capitalize on this potential source of competitive advantage (Reuter and Foerstl 2010, 46).

To maintain a long-term performance within the supply chain, it is highly important to establish a strong link with all the involved suppliers (Won et al. 2007, 444). This link between the SCM team and the suppliers is not only important to

monitor the performance of the expected outcomes, but also to make better decisions based on the supplier's information and objectives.

To capitalize on this relationship, a mutual communication channel must be established between the buyer and supplier. As important as it is for the buyer to understand and use the supplier's performance information, it is equally important for the supplier to do the same. This kind of communication demands a high level of collaboration between the two entities the supplier and the buyer. To establish this relationship, it must be a part of the corporate strategy on both sides.

From the supplier standpoint, this represents an excellent avenue to explore the possibility of establishing better performances. The suppliers involved in this type of activity will experience an improved relationship not only with a specific buyer, but also with their suppliers if they decide to extend these practices to their upstream activities. Research shows that by establishing strong linkages with suppliers, customers and with all internal stakeholders, the SCM team will face performance improvements throughout the supply chain (Soosay and Hyland 2008, 160).

By having this collaborative type of relationship, the supply chain is more likely to perform at higher levels of quality and to experience more objectives accomplishments. Increasing the overall performance of the supply chain will increase the value of the company as a whole. Though there are many ways to explain in detail how to establish a truly collaborative type of buyer-supplier relationship, the focus of this research is specific. It focuses on the integration of the suppliers with the SCM team in

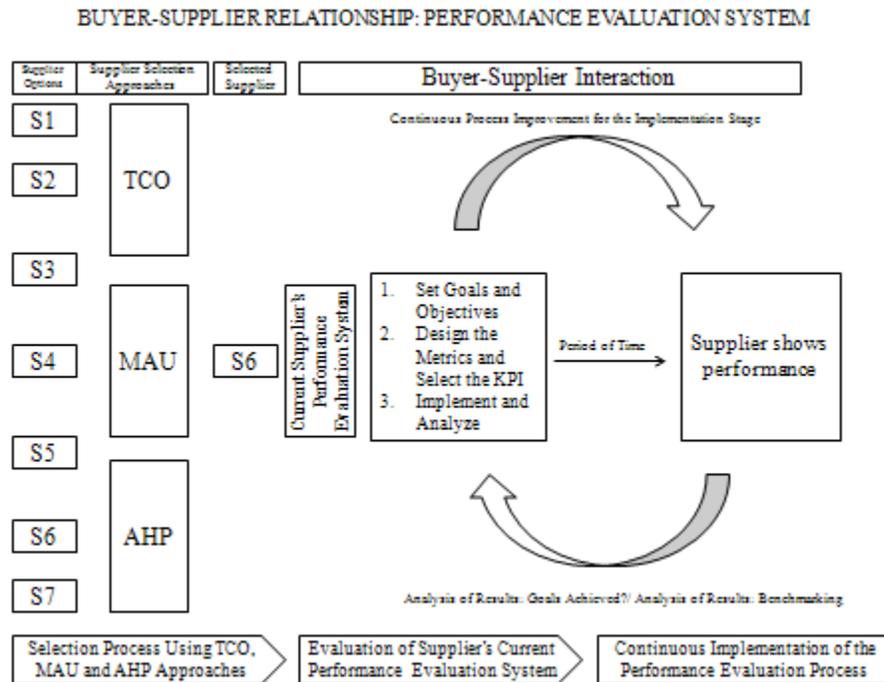
all the stages of the performance evaluation systems as a source of a competitive advantage. Integrating the performance evaluation system will allow the SCM to better understand what needs to be measured, what the metrics are and when to implement the evaluation system in a way that establishes a long-term relationship.

## **CHAPTER IV**

### **PROPOSED THEORETICAL MODEL**

Besides the proposed performances to be measured in chapter I and chapter II, a theoretical model is recommended to establish strong linkages with the suppliers, and make these linkages consistent over time. This will give the buyer a tangible source of competitive advantage from the SCM and also give the supplier the opportunity to engage in a long-term relationship with its clients and suppliers.

The proposed theoretical model shown in Figure 7 is divided in three stages that are so strongly linked that they are consequently co-dependent. The three stages are: supplier selection process using AHP, MAU and TCO approaches; evaluation of the selected supplier's current performance evaluation system and the continuous implementation of the customized performance evaluation system. An illustration of the proposed method will be set via a hypothetical automobile production company which has to choose one out of 7 possible suppliers.



There are seven suppliers candidates and three supplier selection methodologies identify as follows:

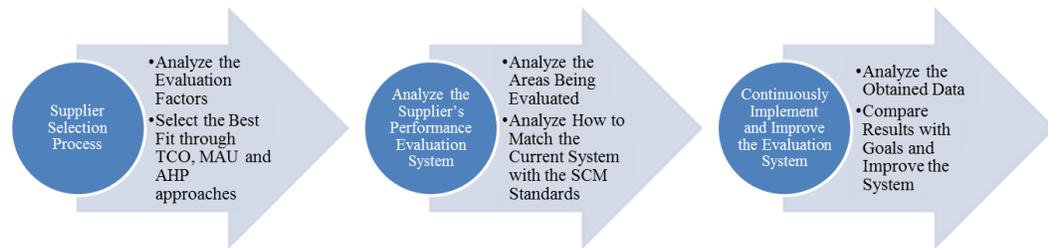
**Supplier Candidates:**

- S1: Option of supplier #1
- S2: Option of supplier #2
- S3: Option of supplier #3

**Supplier Selection Methodologies:**

- TCO: Total Cost of Ownership
- MAU: Multiple Attribute Utility Theory
- AHP: Analytical Hierarchy Process
- S4: Option of supplier #4
- S5: Option of supplier #5
- S6: Option of supplier #6
- S7: Option of supplier #7

**Figure 7 Proposed Theoretical Model for a Sustainable Buyer-Supplier Relationship**



**Figure 8 Implementation Process Flow**

Figure 8 shows these three stages and their main components. The proposed theoretical model is designed to improve the buyer-supplier relationship from its onset. Since the model serves as a guide to select the best supplier candidate, strengthening the decision-making process of supplier selection will improve the buyer-supplier relationship. The relationship will perform better if the buyer has a clear process of engagement, which begins with the evaluation of the explained factors.

Once the supplier has been selected, the buyer firm should then evaluate the current evaluation system; if any. Most of the suppliers that would excel in the selection process would have or attempt to have an internal performance evaluation system. The model proposes that analyzing what the evaluation system is based on and how the system performs is the natural next step. The SCM team should engage in a deep analysis of the measurements, metrics and analyses used in the supplier's system and integrate it

with the buyer's performance evaluation system. Note that it is assumed that the selected supplier engages in a performance evaluation system. If this assumption is not true, then the buyer's SCM team should work on adapting the buyer's evaluation system to the supplier performance.

The third stage is to continuously implement and improve the performance evaluation system. This stage is of high importance due to the analyses that may be developed. The model proposes that the buyer should not only engage in a continuous evaluation of performance, but also in a continuous evaluation of the system itself. The SCM team should evaluate whether the system allows them to collect the data needed in an accurate manner without interfering with the daily activities and whether the results are the expected ones.

By evaluating internal performance and implementing the proposed model, buyer companies would develop an easier method to improve not only the performance that depends on its capabilities, but also the performance that depends on the interaction with suppliers. This proposed continuous improvement process would serve as a source of competitive advantage that will positively affect the performance of the company as a whole.

To explain the application of the theoretical model a production firm in the automobile industry will be used to demonstrate how the proposed model could fit into one of the most complex manufacturing industries.

The hypothetical automobile production company serves the global automobile market by offering a wide range of options and it has been growing at an abnormal pace compared to previous years. The company designs, assembles and sells the automobiles within its facilities throughout the globe and outsources many services and manufacturing inputs. After the automobile design has been approved, the SCM team designs the supply chain network that would satisfy the demand for production of the new product.

In order to keep up with demand and emergent markets, the company has just designed a new vehicle that is meant to target the challenging student market. From the corporate level, it has been decided that the point of difference for the new product is the customization capability, which requires a very adaptive and reliable supply chain network. The SCM team has finished the supply chain network design and is now looking for the best suppliers in the market. The applications of the three stages of the model are explained next.

- Supplier Selection Process Using the Theoretical Model

Due to the specifications of the new automobile, the firm needs a new supplier of environmentally friendly tires. The firm has publicized its search for suppliers and seven tire firms have contacted the automobile maker to start the evaluation process. The automobile maker, which for the purpose of this research is going to be named Cars Inc., decides to start evaluating each of the seven potential suppliers. Cars Inc. begins this process by customizing the eight factors and then evaluating them by using the method they feel most comfortable with out of the three given options.

By hierarchically organizing these factors and by analyzing the total value that each of them will represent to the process and the cost that each one incurs, Cars Inc. finishes its selection process by choosing the optimal supplier, supplier number six.

- Designing the Evaluation System

By following the steps of the proposed theoretical model, once the supplier is selected, the next step is to evaluate the current evaluation performance system that the supplier uses as part of its internal performance control. Two main outputs may result; the supplier may have a current performance evaluation system or may not. Even though the difference between these two results may be seen as a great discrepancy, the design of the performance evaluation system will be the same. Cars Inc. should first define the objectives and goals of the performance evaluation system regardless of the existence of an evaluation system on the supplier side. The second step within the design process is to define the metrics and KPI that will be used to better set the evaluations. Cars Inc. may choose from adapting the ones used by the supplier, if any, or by defining new ones. This stage is of particular importance since the selection of the metrics and KPI will play a critical role when the SCM collects the data. An inaccurate selection of these evaluation tools may give the SCM incorrect or useless data, increasing the possibility of future wrong decisions.

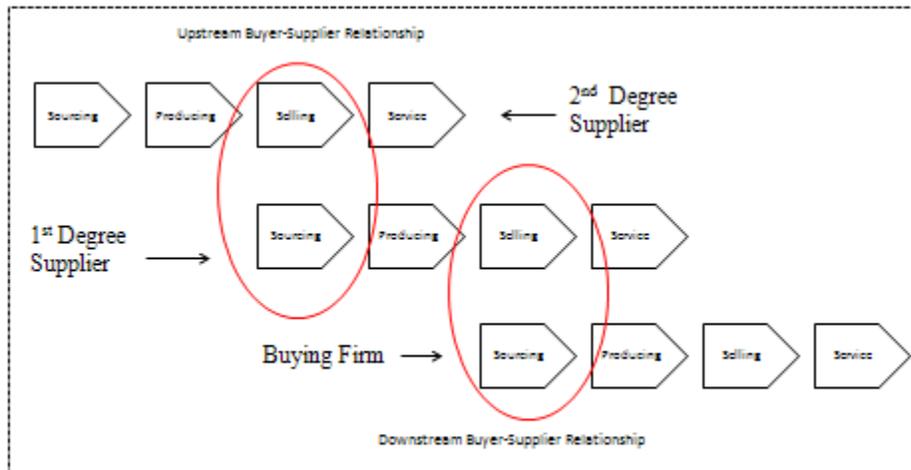
- Continuous Implementation of the Adapted Performance Evaluation System

Once the evaluation tools have been defined and the performance evaluation system is ready to be applied, the system is implemented through a collaborative

process. It is important to start implementing the system from the very first interaction between the supplier and the SCM team even though they may still be adapting to it.

The following step in the model is a continuous process that involves a high level of mutual information flow between the two entities. The ultimate goal of this process is the evaluation of the system itself. The accuracy of the metrics and KPI, the best time to implement them and the effectiveness of the relationship are some of the factors that would be analyzed during implementation of the system. It is important for the SCM team to evaluate the system as well as the performance of the supplier. The accomplishment of set goals and objectives, and benchmarking are the proposed ways to evaluate the supplier's performance.

The performance of a buyer not only involves the performance of its direct suppliers, but also that of their supplier (Choi and Wu 2009, 45). Managing the structure of the supplier chain plays an important role when evaluating and improving supplier performance (Choi and Kim 2008). Therefore it is proposed that the implementation of the model occurs between a buying firm and its suppliers, as well as adopted by the SCM team of the direct supplier to improve their suppliers' performance.



**Figure 9 Supplier-Buyer Relationship at different degrees of connectivity. The proposed theoretical model evolved from the research conducted by Choi and his associates throughout the years.**

In the example used previously, the further application of the proposed theoretical model would be for the environmentally friendly supplier to apply the model throughout its supply chain network. Thus Cars Inc. would benefit from the assurance that the performance is being evaluated and improved up to the time that the very first inputs are produced. The more frequently the proposed theoretical model is applied throughout the suppliers' supply chain, the greater the effect on its performance. This model may serve as an extension of the research done by Choi and his associates throughout the years in the buyer-supplier relationship field.

### **Limitations of the Proposed Theoretical Model**

1. The model has not been implemented and tested in the real industry.

The proposed theoretical model lacks proof of implementation in an industrial

situation. Even though it has been based on research results done in the supply chain management field, the model is a theoretical proposition yet to be proved in the industry.

2. The number and quality of the potential suppliers will directly affect the performance of the proposed theoretical model.

The first stage in the proposed theoretical model is designed for the buyer to make the best selection of a supplier and establish a relationship. If the buyer only has one available choice and/or the selected supplier does not have a current performance evaluation system, then the proposed theoretical model will need to be adapted to better fit the situation.

3. Some level of subjective decision-making process is required.

As explained in the first chapter, all three recommended approaches to better select the supplier utilize subjective evaluation at some point during the process. Also the selection of the metrics and KPI for the performance evaluation system includes some subjective reasoning. Therefore, even though the proposed theoretical model would be implemented several times under the same situations but with different SCM teams, the outputs may change each time.

4. A High level of information flow and treatment is needed.

The proposed theoretical model is based on high levels of accurate information flow. The performance and outputs are highly linked to the fact that from the initial stage both the suppliers and the buyer are freely sharing the information needed as input for the model.

5. The continuous evaluation of the model demands dedicated SCM efforts.

In order to better implement the proposed theoretical model, the SCM should be highly committed.

## **CHAPTER V**

### **CONCLUSION**

In the search for a competitive advantage, organizations are increasingly involved in outsourcing supply chain activities. By substituting internal supply capabilities with external alternatives buying firms are trying to improve their effectiveness and the efficiency of their supply chain as a whole. To do this organizations have to go through three important stages to outsource supplying capabilities.

The first is the selection of the supplier that best fits the organization structure. The selection process is of significant importance and may be done by a combination of different approaches and techniques with numerous factors to be evaluated. As described in Table 1, there are a set of specific key elements that combined with three specific selection approaches, allow the buying firm to better select the best-fit supplier among all the candidates for a certain outsourced supply.

The second is where to measure and evaluate the performance of the selected supplier. Even though each firm is different in nature, five specific areas have been proposed as a set of performances that should be carefully evaluated in order to analyze the overall performance of the supply chain. Combining these five areas with the SCOR model, the SCM will have a better picture of where to implement the metrics and KPI.

The evaluation process is also evaluated at the three different levels within the supply chain; operation, tactical and strategic level.

The third stage is to define the performance evaluation system. Organizations look for long-term buyer-supplier relationships. This type of relationship requires a high level of collaboration between the two entities in order to remain stable. As described in Figure 7, a three-stage theoretical model has been proposed to help buying organizations improve their supply chain performance by truly collaborating with their suppliers.

There are multiple reasons why organizations are engaging in closer relationships with their suppliers as a way to improve their effectiveness and efficiency compared to their competitors. The majority of these reasons aim for an ultimate goal: to hold a competitive advantage in the supply chain network management.

### **Recommendations for Future Research**

This research has explored ideas and concepts relating to the supply chain management and serves as a gateway to further discussion on this issue. All the different key elements identified highlight the conditions and collaboration efforts that help to establish a long-term buyer-supplier relationship. A more extensive and case-study type of research could expose greater understanding of how this collaboration affects the whole supply chain network. By reason of time constraint and the nature of this research, the data was obtained from past research in the field of supply chain management.

Future research should also classify the buyer-supplier relationships by industries and how they vary in order to better address the type of information that needs to be

disclosed, the timing structure of the evaluations and the process to design and apply a performance evaluation system. A case-study type of research will bring more insights into the relationship between the supplier's supply chain and the overall performance of the buying firm (as described by Choi and Wu 2008).

The proposed theoretical model should then be tested in real-type activities in different industries for a defined period of time that allows the SCM team to evaluate its effectiveness. Further improvement of the model is then highly recommended in order to give the industry a real performance-managing tool that allows it to build a competitive advantage from the supply chain management.

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## **VITA**

Ricardo Videtta was born in Caracas, Venezuela on November 26, 1987 to Denisse and Pablo Videtta. Upon completion of his high school education at Caracas, Venezuela, he embarked on his professional education. He attended Universidad Catolica Andres Bello and received a Bachelor of Science in Industrial Engineering in 2009. First as an intern and then as an engineer he was employed as a project manager for a machinery retailer in Caracas, Venezuela. By August 2010, he entered the Graduate College of Texas State University-San Marcos. During the following year he was employed as a Graduate Instructional Assistant in the Department of Finance and Economics in the McCoy College of Business Administration.

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