



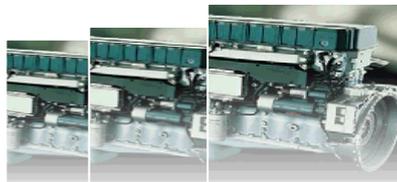
Blekinge Institute of Technology (BTH)  
School of Management

Master Thesis in Business Administration

# Strategic Partnership within Supply Chain

– A Pragmatic Model for Volvo Powertrain Corporation

**VOLVO**



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# ABSTRACT

**Title:** Strategic Partnership within Supply Chain; A Pragmatic Model for Volvo Powertrain Corporation  
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**Background and Problem Discussion:** One of the widespread conclusions in supply chain management research is that huge benefits can be achieved if suppliers are involved in the OEM's product development process as early as possible, since suppliers often possess vital product and process technology leading to significant improvements in product design and new product development process. The issue is a need for a model of supplier selection to support the contribution of suppliers in product development processes; whilst supplier attributes or performance metrics for traditional supplier selection do not seem to include specifications that are usually required in close relationships. What practitioners need in practice, is a simple-to-use methodology with producing logically precise results.

**Purpose:** The purpose of this study is developing a model of supplier selection to support the contribution of suppliers in product development processes, and eventually, developing a strategically integrated supply base for Volvo Powertrain Corporation (VPT). Among the first part of this study, a model of supplier evaluation and selection has been developed, considering attributes and success factors for integration with suppliers, and also examined in VPT with the aims of achieving mutual success in both products and commerce for VPT, as the focal company, and its supply chain members. The second part of this study presents a model to boosting the integrated partnership established on the basis of the first part endeavour.

**Theory:** The first part covers the theories emerges from a large number of stochastic studies concerning hypotheses proofing of relations between diverse aspects of hypothetical influential characteristics of partnerships and its performance. And the second part deals with theory of suppliers association.

**Analysis:** Collected data from suppliers of VPT as well as practitioners is analysed and compared with the academic studies in the first part. Second part, however, deals only with theory since it needs more time and effort which is proposed as prospect studies.

**Conclusion:** The conducted survey shows that two-way communication (or multi-way in more developed situations)\* and mutual trust are the most vital elements to partnership survival. It has been presented in this effort, and suggested to VPT, that the best practice in this respect is developing the supplier association in a framework of Plan-Do-Check-Act cycle (PDCA) constituted of key suppliers for a particular system and /or subsystem.

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\* As it will be indicated in this study, multi-way communication between members of a supplier association is developed to exploit more potential to achieve competitive advantages.

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## PREFACE

Many organizational purchases are view to be plain, routine and require only the monitoring of continued satisfaction with the product attributes (e.g. quality, delivery, price), yet, it requires a sound and pragmatic tool to evaluating and selecting of suppliers (just-in-time purchasing), with one of the benefits being a long-term, mutually beneficial relationship with fewer but superior suppliers. The objective is to find the best supplier base, not the highest quality, lowest price or the shortest delivery. In reducing the number of suppliers, companies usually reduce their current supplier base by cutting out all but one or two of their existing suppliers, and not looking outside their current universe of suppliers. For sure, companies who do not look beyond their existing supplier base, will have much less chance of ending up with the best supplier base.

Volvo Powertrain Corporation (VPT), as a division of Volvo AB, has launched a platform strategy through its new product development activities - called Heavy Duty Engines Program (HDEP)- so as decreases the number of platforms from 18 to 2. Hence, the related supply chain has to be reduced from thousands members to, less than 100 as a first target. Needless to say, VPT strictly needs a procedure, as a rule-of-thumb and in more extent, a precise procedure to dealing with evaluating and selecting suppliers for catching up the reduced supply chain and establishing strategic partnership with the right opted ones out of the present numerous supply base members. VPT's current supplier evaluation and selection process is on the basis of traditional methodologies, which is needed to develop to embrace other important criteria for strategic partnership member selection and to make a decision which balances both the short and long-term needs of VPT and target suppliers.

As it has been found in this effort, much of the previous research in the area of supplier evaluation and selection emphasizes conceptual and empirical decision support models. They may experience one or more shortcomings such as being mathematically too sophisticated, too subjective, requiring too many supporting data, etc. Meanwhile, what practitioners need is a methodology that is simple to use and understand, and yet, produce reasonably accurate results.

Strategic partnerships are strategic in nature and involve a commitment over an extended time period, and a sharing of information, risks and rewards of the relationships. As companies become involved in these sorts of partnerships with their suppliers, a new set of supplier selection criteria, equally or even more important as traditional criteria, comes into consideration.

The first part of this study tries to recap these criteria and presents an actionable procedure for purchasing practitioners, by finding, assessing and adopting proper

methodologies presented through literature. So, the first chapter focuses mainly on exploiting and assessing diverse proposed methodologies, traditionally and recently, in literature.

Chapter two presents a brief review of Volvo Business Partnership Program (VBPP) in which, decreasing and tiering the supply chain members, evaluation and selection of suppliers, conducting platform strategy for diesel engines, and other strategic and operational activities happen. The purpose of this chapter is to shed a light on focused spots during several conducted conferences, which have been organized by VPT with suppliers, and its alignment with VBPP whole vision.

Having developed methodology drawn from chapter one at hand, and specializing VPT's requirements in chapter two, chapter three will develop a step-by-step methodology to evaluating and capturing the best candidates in order to develop integrated partnership program.

Chapter four, afterwards, deals with supplier association concepts and its advantages as the latter-going effort of strategic partnership setting up. The process of integration will be discussed in detail through this chapter, and it will be emphasized that internal integration is fore activity in creating strategic partnership with suppliers, considered as external integration. Why supplier association? The question that will be addressed and analyzed across this chapter.

Chapter five, eventually, is designed to help VPT in creating its own version of a supplier association for the benefit of itself and its suppliers alike. In this context, a ten phase generic model will be discussed. It should be noted that this is not an exact formula for each company, but rather a guiding outline that will help to ensure successful implementation.

# 1

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## MODELS IN SUPPLIER EVALUATION AND SELECTION

### 1.1. Definition of Terms and Review of Literature

**A**cross this study, the definition of supply chain and supply chain management is the same as the most commonly referred by literature. On this basis, a supply chain is illustrated as:

*“All the organizations and activities associated with the flow and transformation of goods from the raw materials stage, through to the end user, as well as the associated information flows, both upstream (supply network) and downstream (distribution channel)”(Hanfield, 1998).*

This integrated process may contain number of various business entities (i.e., suppliers, manufacturers, distributors, retailers, and customers). Once one of these entities becomes part of a well-managed and established SC, it will have a lasting effect on the competitiveness of the entire SC.

Supply chain management (SCM), however, may be introduces as:

*“Integration and management of supply chain organizations and activities through cooperative organizational relationships, effective business processes, and high level of information sharing to create high-performing value systems that provide member organizations a sustainable competitive advantage.”(Hanfield, 1998)*

SCM has recently attracted significant interest from both researchers and practitioners in several directions. At the strategic level, larger companies are increasingly concentrating on “core” activities and “outsourcing” other functions to the network of suppliers.

Historically, an adversarial relationship between the buyer and the supplier often existed. However, recent business trends, including shortened product life cycles and increased rate of technological changes have given rise to a growing trend towards improved communication and cooperation between entities, as well as the possibility

of single sourcing rather than multiple sourcing for OEM\* as the focal company through the SC. OEMs have reduced their supply bases, and increased the reliance on the remaining suppliers and tried to develop closer and long-term relationships in the search for competitive advantage (Lamming, 1993). The ultimate goal of these efforts is to manage the suppliers throughout the entire supply chain for faster delivery, decreased production lead-time, reduced cost, and increased quality (faster, cheaper, better). When it is built on long-term relationships, a company's supply chain creates one of the strongest barriers to entry for competitors. Hence, many firms are now looking to their suppliers to help them achieve a stronger competitive position through a strategic partnership.

Strategic partnership is defined as:

*"An on-going, long-term inter-organizational relationship for achieving strategic goals." (Mentzer et al., 2000)*

The relationship between organizations is strategic when a firm perceives that it need the relationship in order to be competitive in the industry and that if the partner goes out of business, it would have to change its competitive strategy. On this basis, the number of partners offering a certain product or service cannot usually be more than one in strategic partnering (Mentzer et al., 2000).

The implications of these recent developments in SCM and strategic partnerships with few key sources, make the supplier selection decision even more important. If OEMs are less willing to change suppliers, the choice of an unacceptable supplier is more damaging than it was in the past. In addition, once an acceptable supplier is identified, the OEM has an opportunity to establish a long-term relationship with the supplier, which may provide strategic advantages.

Carrying these issues in mind, the objective of the first part of this study is threefold. First, the study provides a brief review of the relevant literature and research in the area of supplier evaluation and selection. Second, it discusses the difference in emphasis required in seeking a partnership type of buyer-supplier relationship, rather than a traditional, arms-length relationship. Third, through the use of a case study among Volvo Powertrain Corporation, the study explores the new, additional set of issues that becomes relevant to supplier selection when the firm seeks a 'partnership' type of relationship with a supplier.

## **1.2.Traditional Supplier Selection Approaches**

Traditional supplier selection methodologies suffer from a number of limitations. A set of candidate suppliers is assumed to already have been short-listed and they are then subjected to detailed evaluation using their attributes, chosen performance metrics, and given decision models. From the literature, traditional supplier selection processes do not seem to include suppliers' capabilities that should be used in initial selection for strategic partnership. A strategic partnership between a buying and a

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\* Original Equipment Manufacturer

supplying firm is defined as a mutual, ongoing relationship involving a commitment over an extended time period, and a sharing of information and the risks and rewards of the relationship (Ellram, 1990).

As firms become involved in strategic partnerships with their suppliers, a new set of supplier selection criteria comes into consideration, equally as important as or even more important than traditional criteria. This new set of criteria considers 'soft' factors that are difficult to quantify (Ellram, 1990). These soft factors include issues such as management compatibility, goal congruence, and strategic direction of the supplier firm. Effective partnership relations require a clear understanding of expectations, open communication and information exchange, mutual trust, and a common direction for the future. This last issue, a common direction for the future, implies that the partnership relation requires a long-term view.

On the other hand, the long-term orientation complicates the supplier selection process in itself. Current models of supplier selection mostly advocate an emphasis on quantifiable factors and known performance parameters. These models focus primarily on how a given supplier can meet the firm's needs today, and in some cases under alternative scenarios, based on price, quality, availability, and like factors. This short-term orientation reflects traditional buyer-supplier relationships, which tend to be short-term and focus mainly on cost. Yet, as mentioned former, strategic supplier selection needs a long-term focus. This focus suggests that while a supplier's current performance and capabilities are important, the supplier's potential and future direction should be given equal, if not greater, attention. If current performance does not quite meet expectations but the supplier is moving on the right track and is well-matched with the firm's top management, this supplier could have superior partnership potential than a supplier that at present meets specifications, but for whom the firm is only a comparatively small piece of business. Traditional supplier evaluation and selection models do not explicitly take such differences into account. What is needed as a starting point in selecting supply partners is an understanding of the issues that become important in selecting a supplier as a potential partner (Ellram, 1990).

One of the seminal traditional processes suggests that it is fairly easy to present an abstract list of at least 50 distinct factors (characteristics of suppliers) as being significant to consider in a supplier selection decision. But it presents a list of 23 more vital factors of supplier selection decision making (Dickson, 1966). These factors are depicted through Appendix A.

Traditional methodologies of the supplier selection process in the literature include the cost-ratio method, the categorical method, weighted-point evaluations, mathematical programming models and statistical approaches. A summary of these methodologies has been described in concise words here.

The cost-ratio method evaluates supplier performance using the tools of standard cost analysis. The internal costs, associated with quality, delivery, and service, are converted to a cost ratio, which expresses the cost as a proportion of the whole value of the purchase. Then this cost ratio is applied to the supplier's quoted price to obtain a net adjusted cost figure or total cost of each purchase to be evaluated (Timmerman,

1986). Normally, this method is used to compare alternate sources of supply or to evaluate an existing supplier, but it could be used to evaluate a new supplier.

The categorical method involves categorizing each supplier's performance, or expected performance, in specific areas defined by a list of relevant performance variables (Timmerman, 1986). The advantage of this approach is that it helps structure the assessment process in a plain and systematic way. However, a disadvantage with this technique is that typically it does not clearly define the relative importance of each criterion. Another disadvantage is the fact that decisions made using this system tend to be fairly subjective (Nydick *et al.*, 1992).

The most adopted approach has been linear weighting models. Linear weighting models place a weight on each criterion (typically subjectively determined) and provide a total score for each supplier by summing up the supplier's performance on the criteria multiplied by these weights (Weber *et al.*, 1991). Other approaches employed the analytical hierarchical process to create weights for such models.

Other formalized methods for supplier selection contain mathematical programming and statistical approaches, or a combination thereof. Within mathematical programming, linear, mixed integer and goal programming have been utilized\*.

The various methodologies suggested have traditionally used quantitative factors such as price, production capacity, financial position, etc. So far, few attempts have been made to develop an analytical framework, which combines qualitative and quantitative factors. One recent study by has developed a method, which considers both qualitative and quantitative variables using interpretive structural modeling which is a methodology for identifying and summarizing relationships among specific items, which define an issue or problem. The analysis develops the interrelationships of different criteria and their levels of importance (Mandal *et al.*, 1994).

Although these methodologies embrace some provision for subjectivity in the criteria to be used or the weights to be applied to purchasing criteria, there has been little provision for judgmental aspects of the supplier selection decision.

### **1.3.Recent Studies and Applications in Supplier Selection Methodologies**

On the way of conducting studies and developing the supplier selection procedures, mostly empirical, the world business community has witnessed a series of revolutionary changes over the last few years. These changes contributed to the globalizations of the world economy and firms that once concentrated on domestic sourcing are now seeking their supply bases around the world (Min, 1994). Among the development phase, studies presented some useful tools for international supplier selection dealing with a host of qualitative and quantitative factors, e.g. multiple attribute utility theory (MAUT), that can effectively deal with factors in multiple criteria and uncertain decision environment†. Theses efforts have mainly

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\* For more information, see Weber *et al* (1991).

† For more information, see Min, H. (1994).

considered supplier selection decision-making criteria in terms of financial, quality assurance, perceived risks, service performance, buyer-supplier partnership, cultural and communication barriers, and trade restrictions.

The relationship between the buyer and the supplier, however, has also had another change in its aspects during the past few years. Many firms are now looking to their suppliers to help them achieving a stronger competitive position. Although the classification of repeated transactions between a selling company and a buying company as 'a relationship' is not a new subject (Lamming, 1993) and was hinted in 1960's at the role of relationships that formal contracts are rarely the most important part of the inter-firm deals and there are other significant factors (Macualay, 1963).

The common factors those are important in the selection of a supplier under any circumstances, like factors considered in the traditional supplier selection approaches, should be considered as well such as quality, total cost, and cycle time. However, the intent of this study is to focus only on those factors that are unique due to the strategic partnership characters of the buyer-supplier relationship. A research study conducted by Ellram (1990) identified a number of issues as important in selecting suppliers with which to establish strategic partnership relations. The factors are grouped and shown in Table 1.1. As illustrated, some of the criteria are traditional factors used in previous studies, but others are longer term and more subjective or judgmental in nature.

The strategic contribution required of supply in the future is based on this conviction that suppliers and the way in which firms relate to them must provide a competitive edge. Co-operative agreements with suppliers, in its turn, require far greater top management and inter-functional contact within the purchasing organization as well as across the peer functions in the supplier's organization. Getting more from suppliers require a different approach and structure. This approach, however, is built on a sound definition of partnership characteristics, called attributes and success factors. While attributes describe the nature of strategic relationships and are related to the partners' attitudes and prevailing atmosphere in the relation, success factors are more concrete and could be exploited in developing guidelines for the implementation and management of partnership (Ellram, 1991).

Attributes describe the nature of partnering relations. Strategic Partnerships (which will be called hereafter partnerships for simplicity) are built on commitment, trust, and openness (Ellram, 1991). Commitment refers to the willingness of partners to make an effort on behalf of the relationship and the belief of the committed party that the relationship is worth working on to ensure that it lasts indefinitely (Morgan *et al.*, 1994). In other words, partnering relations are of a long-term nature. A high level of commitment provides a context in which both parties can achieve their individual and joint goals without raising the specter of opportunistic behavior (Mohr *et al.*, 1994).

**Table 1.1:** Supplier selection criteria

<b>Financial Issues</b>	
1.	Economic performance
2.	Financial stability
<b>Organizational Culture and Strategy Issues</b>	
3.	Felling of trust
4.	Management attitude/outlook for the future
5.	Strategic fit
6.	Top management compatibility
7.	Compatibility across levels and functions of buyer and supplier firms
8.	Supplier's organizational structure and personnel
<b>Technology Issues</b>	
9.	Current manufacturing facilities/capabilities
10.	Future manufacturing capabilities
11.	Design capabilities
12.	Speed in development
<b>Other Factors</b>	
13.	Safety record of the supplier
14.	Business references
15.	Supplier's customer base

Source: Ellram (1990).

Trust is a multilevel phenomenon that exists at the personal, organizational, and inter-organizational levels, so it could be said that only individuals exercise trust. There are always some short-term inequities in any relationship and thus a need for trust also exists. As risk increases, so does the need for trust, since trust and risk taking are directly connected together. Risks are multiplied when the products and services exchanged become more complex, more transaction-specific investments are needed, or there only exist a limited number of potential partners (Morgan *et al.*, 1994).

The need for trust varies in different economic exchanges. It has been mainly suggest in literatures that there must be an optimal level of trust, depending on the value of the relationship for the firms. If excessive trust is placed in a business partner, one may be misallocating precious resources or taking unnecessary risks that could have a substantial negative effect on the firm's performance. On the other hand, underinvestment in trust is also problematic. It may cause a firm to bypass opportunities for more efficient and mutually beneficial exchanges and creates significant added risks (e.g. opportunism) and costs (e.g. monitoring).

Openness refers to frequent interaction between parties. Interaction must occur at many levels and across many functions between firms (Ellram, 1991). It is necessary that interactions are not just problem-driven, but involve information sharing and are preventing difficulties. Of course, the nature of the information shared differs

according to the orientation of the partners: partners with a strategic partnering orientation share information that is both strategic and operational, whereas partners with an operational partnering relation only share operational information (Mentzer *et al.*, 2000).

Interaction must occur at different organizational levels in partnering relations. The involvement of all organizational levels and importance of active social structure have been connected to partnering and collaboration by many authors and highly experienced in VPT, and the role of top management has been specially emphasized. No doubt that top management support is always considered a prerequisite for every successful partnership. If a partnership is to overcome the inevitable divergence of interests between the participants, top executives have to share an understanding of the specific benefits of collaboration. Indirectly, the participation and support of top management symbolizes the organization's commitment to the partnering relation and its success, contributing to trust building among partner organizations (Mentzer *et al.*, 2000).

A partnering approach should also yield mutual benefits (Ellram, 1991), and these benefits should be shared proportionally with respect to the investments of the various parties, so does risks. Potential benefits could be divided into strategic, economic, and technological benefits.

The most frequently mentioned success factors of partnering relations, however, seems to be two-way information sharing, joint-problem solving, the partners' ability to meet performance expectations, clearly defined and mutually agreed goals, and mutual involvement in relationship development and planning.

A successful partnering relation enables the participants to achieve organizational objectives and to build a competitive advantage that each organization could not attain by itself. As it will be discussed later on, successful partnership can be described in term of fulfilling the mutual expectations of the relationship, and unsuccessful one in terms of not meeting the expectations held by one or both parties. Thus, the relationship success or performance can be viewed as the level of or fitness between partners' expectations (and requirements) and the relationship outcomes.

Just as knowledge about success factors is needed to implement and manage the partnering relation successfully, knowledge about relationship performance dimensions is needed to understand the range of outcomes possible in partnering relations, and thus, to evaluate the relationship success. Often the conceptualization of supplier or buyer performance is limited to easily identifiable bottom line cost savings for one party. Relationship performance is a wider view that incorporates the perspective of the other partner and measures the performance of a wider variety of relationship activities. Buyer-supplier relationship performance could be divided into financial and non-financial dimensions (O'Toole *et al.*, 2002). The financial factors are related to the economic performance of partners and include economic measures such as long-term profitability, prices, return on investment, purchasing volume, and running costs. Another dimension includes the non-financial outputs of relationship. These factors could be assessed from the business and user

perspectives. The user perspective includes user satisfaction and the business perspective includes factors such as flexibility, operational effectiveness, stability, joint value added projects and innovations (Mentzer *et al.*, 2000). Measuring these latter qualitative factors is out of the sight of this study. But it intensely recommended for VPT to conduct a study to develop some metric tools to quantify them, as the gauge of real success or perhaps failure of partnership lies on the extent of achieving targets set for these factors.

Evaluating the qualitative partnership characteristics, however, is a great challenge. One of the seminal works in this respect has been adopted in this study to quantify these qualitative aspects of partnership characteristics. This work proposes a new model of customer-supplier relationships with special interest in their new product development (NPD) processes (Hung *et al.*, 2003). Three types of partnership indices have been considered for each factor (both attributes and success factors):

1. **Satisfaction Index (SI).** The measure of the extent to which customer's requirement is satisfied by supplier capability (overlap between requirement and capability). The larger the value of SI, the greater potential for partnership.
2. **Flexibility Index (FI).** The measure of the extent to which the supplier capability exceeds customer's requirement (surplus of the supplier capability). The larger the value of FI, the more flexible the supplier to satisfy customer's changing requirements.
3. **Risk Index (RI).** The measure of the extent to which the supplier fails to meet customer's requirement (shortage of the supplier capability). The larger the value of RI, the more risky the partnership.

These indices, which must be evaluated one by one, measure the extent to which both the customer's requirements and the supplier capabilities match or mismatch, and therefore reflect a potential or risk of involving into partnership. The mathematical illustration of calculating indices is shown through Table 1.2. In this table,  $R_s$  stands for the set of supplier capability for a certain factor and  $R_c$  stand for the set of VPT requirement for a certain factor\*. Likewise, OSI, OFI, and ORI stand for the Overall SI, Overall FI, and Overall RI respectively.

It is noteworthy to express here that there are two different types of values for  $R_s$ : "the larger the better", and "the smaller the better". The former one deals with those partnership characteristics which the appraiser wills to be larger, for instance supplier capability in quality issues, while the latter one deals with those sorts of characteristics, which the appraiser wills to be smaller, such as different aspects of risk factor.

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\*  $A \cap B$  is the intersection of partnership characteristics A and B;  $A - B$  is the difference between set A and set B. For more information, see Hung *et al* (2003).

**Table 1.2:** Mathematical equations to calculate partnership indices

	Value Type		
	SI	FI	RI
<b>R<sub>S</sub>, the larger the better</b>	$\frac{R_S \cap R_C}{R_C}$	$\frac{R_S - R_S \cap R_C}{R_S}$	$\frac{R_C - R_S \cap R_C}{R_C}$
<b>R<sub>S</sub>, the smaller the better</b>	$\frac{R_S \cap R_C}{R_S}$	$\frac{R_C - R_S \cap R_C}{R_C}$	$\frac{R_S - R_S \cap R_C}{R_S}$
<b>Overall</b>	$OSI = \frac{\sum_{i=1}^N SI_i}{N}$	$OFI = \frac{\sum_{i=1}^N FI_i}{N}$	$ORI = \frac{\sum_{i=1}^N RI_i}{N}$

Source: Hung *et al.* (2003).

The intrinsic of this model of quantifying partnership characteristics (i.e. attributes and success factors), will be shaped by sharing customer requirements and supplier capabilities. Partnership indices are individually evaluated by using these mathematical equations. Ideally, a supplier with the highest SI, highest FI, and lowest RI is the best candidate.

This process of measuring leads to cardinal values\* (partnership indices), since the metrics narrate relative ranking of suppliers (bundles), a measure of customer's pleasure (VPT in this case). As a matter of fact, partnership indices are outcomes of a utility function of customer, combining different sets of utilities (suppliers products). Seeking the utility function, despite of being a desirable area to discuss, however, is out of the sight of this study. Noteworthy to say that in a large number of cases in this study, because of seeking a supplier association creation, the customer encounters to mono- or oligopoly markets, which do not present bundle of alternatives (against competitive market for commodity products).

\* A cardinal measure is one that tells the relative ranking of two or more things as well as how much more one rank is than other(s), against ordinal measure which tells just the relative ranking.

# 2

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## VOLVO BUSINESS PARTNERSHIP PROGRAM

### 2.1.A brief Review\*

Volvo Powertrain (VPT) has developed the Volvo Business Partnership Program (VBPP) in 2004 under the name of “Extended Enterprise” by purchasing department as a reaction to its situation regarding the market, internal engagements, and opportunities identified for VPT competitiveness. In May 2005, the name was turned to VBPP. The concept of this endeavor is to structure and improve the relationships with suppliers and to optimize the efficiency of mutual cooperation to explore additional competitive advantages.

The truck industry is mature and stable in general, yet, the power train area will experience a rapid development over the next 5 to 10 years. VPT has perceived that on one hand, there is a continuing pressure on cost, quality and delivery within the industry, and on the other hand, there are tougher regulations concerning emissions, resulting in a need for rapid development of new products and innovation. At the same time, there are new emerging competitors from low-cost countries such as China. VPT strategic response has been to launch a company-wide project, called Heavy Duty Emission Platform (HDEP), which is the largest heavy duty platform engagement all through the world with the aims of producing all the required engines for Volvo, Mack, and Renault on just two platforms. The purpose is to have high commonality in technology (design, development, expertise, tools, and techniques) supplied by the same supply base. VPT’s purchasing department is accountable to launch and lead this engagement through a matrix (cross-functional) organization structure, called Business Package Teams (BPTs). These BPTs have been covered with a spectrum of diverse expertise (6 individuals) from engineering, purchasing, cost control (finance), and leaders of engineering and purchasing. Obviously, each BPT is led by a BPT leader and responsible for meeting quality, cost,

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\* This section is a brief overview of documents, conferences presentations, and other related materials through the VPT intranet around VBPP, as well as outcomes of author’s interviews and meetings. A large part of this information has been put together in more detail by Marie Åhs as her master thesis at Management Department, Chalmers University. Reader may go through her report for more information on VBPP.

delivery, and flexibility (QCDF) targets. Supplier are directly involved in these teams respect to the launched product development projects.

The adaptable supply chain redesigning to the novel structure of purchasing strategy for new products and platforms, the supply base is to be reduced in size (as it was discussed in detail in chapter one). Reducing the supply chain members from X000 to 84 has performed the first step. In most cases, VPT opts single sourcing and long term agreements with these suppliers in order to reach the target high commonality, along with high volumes to keep down the prices while still attaining superior quality. On this basis, the collaboration vision of VPT is defined as “to turn our small supply base to an additional competitive advantage”.

## **2.2.Strategic Partnership in Volvo Business Partnership Program**

Undoubtedly setting up strategic partnerships with all these members will not be a simple task, and in some respects, will lead to a serious failure in cooperation among VPT as focal company and its suppliers, mainly upstream\*. Hence, the initiatives are to start with 2-3 suppliers as a pilot program. Pre-requisites from opted suppliers are mostly among those attributes described in detail through chapter one. At the next phase, more suppliers will be involved in the partnership program (supplier association) that is the main subject of discussion in the second part of this study. As a long-term goal, all key suppliers will be engaged in this preformed supplier association.

Involvement from supplier’s top management is strictly pointed through VBPP. They are expected to be involved in person and make the program as their organization’s top priority. As well, allocating, mobilizing, coaching, and monitoring the best resources and project progression are other important aspects of their efforts in order to achieve best practices in quality, cost, time, and flexibility. In this regards, VPT’s purchasing department has started a practice with review meetings with suppliers twice a year to discuss around achievements and more improvements.

VPT has an intention to host two conferences each year to support VBPP. Suppliers and employees from VPT and other companies within Volvo Group are invited to take part. Every conference is focusing on a separate issue that VPT has identified as being important for collaboration with suppliers. The author has had the opportunity to be the moderator for one of the most vital issues (product development), and participated in the relevant conference around product development and engineering in April 2006, conducted in Göteborg Congress Hall.

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\* In this particular industry, downstream is out of the sight of supply chain since it is not as important as upstream, to the contrary of passenger car industry.

# 3

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## DEVELOPING SUPPLIER EVALUATION AND SELECTION MODEL

As it was mentioned in chapter one, there are lots of factors may be considered as supplier selection criteria, which are mostly common factors that are vital subjected to diverse circumstances, and mainly considered in the traditional supplier selection approaches such as quality, cost, and time. The purpose of this study is not to focus on all the substantial factors, but merely on those unique factors due to the strategic partnership relationship.

### 3.1. Attributes and Success Factors

In developing supplier evaluation and selection model in this study, the author found that the most complete and recent research is conducted by Ellram (1990), which has been adopted as an outline, i.e. the most important characteristics to setting up strategic partnership has been considered as attributes and success factors as depicted through Table 1.1.

For each of these partnership characteristics, a mathematical simulation has been utilized as well to convert the qualitative factors into quantitative ones. The structure of this model is the same as explained in chapter one, proposed by Hung *et al* (2003). Partnership indices are evaluated on the basis of VPT's requirements and supplier capabilities for each characteristic. The calculated overall indices for each supplier, in terms of overall satisfaction, flexibility, and risk indices determine the extent to which both VPT's requirements and the supplier's capabilities match or mismatch and hence, reflect the potential and/or risk of setting up a strategic partnership with that particular supplier. A supplier may have a surplus or a shortage of the capability to meet VPT's requirement. Doing so, finally VPT will have a reliable information source to run its decision making process on selecting appropriate supplier.

At the first stage of developing the model of supplier evaluation and selection, it should be kept in mind that the strategic partnership will be benefited of mutual activities. In other words, the model requires both VPT's and supplier side attitude and willingness. Therefore, this study has focused on both attitudes in VPT (BPTs, managers, directors, etc.) around their related suppliers, as well as suppliers'

thoughts around close cooperation and its required soft and hard infrastructure among strategic partnerships\*.

A set of survey questionnaires developed and distributed. It had been requested through these questionnaires from BPT leaders to investigate on attributes and success factors, in terms of ranking questions from 1 for the worst condition, up to 5 for the best practice. Each questionnaire, which takes account of the attributes and success factors of strategic partnership, is to be ranked for each characteristic per supplier (see Appendix B).

Furthermore, the attitudes of suppliers who are members of decreased supply base (say 84 suppliers for the case of VPT) should be taken into account. On the basis of VPT's Engineering team members' meetings (which author has been participating too), it had been decided to invite the most prioritized 20 suppliers out of 84 considering roughly the higher amount of spent and performance history in transactions, on the basis of their direct contact person's experience in VPT, to participate in VBPP's engineering stream two days event. Invitations sent to appropriate individuals of these suppliers and eventually, it was requested for their participation registration in engineering stream event of VBPP through VPT's official website.

During the first day of VBPP event, hold on 11th of April 2006, the plan was informing suppliers what the expectations were so far, what has been achieved, and what will be prospect plan and expectations in cooperated product development activities for new and /or existing products. The activities and associated outcomes were on the basis of Volvo's GDP (Global Development Process), which is Volvo's common project steering tool. It has been continuously improved and is based on years of experience.

The GDP provides the structure needed to identify, develop and launch new products fast and efficient, while providing competitive solutions with a high level of quality, through cross-functional work and global thinking, utilizing common processes, platforms, technology and parts and is the tool to use in all VPT's product development projects. The GDP includes best practices and years of practical experience from each of the Volvo family truck companies, Volvo 3P, Volvo Bus, Volvo Powertrain and Volvo Parts. It describes what activities must be considered from the time an idea for a product change or a new product is considered through development, industrialization and delivery to the customer.

The GDP is defined in six phases, each of which is intended to indicate a certain focus in the project work. The phases are (Volvo Group AB, GDP Guide-book):

- **Pre-Study Phase.** Define the scope of the project by balancing project prerequisites, developing requirements and alternative solution concepts.
- **Concept Study Phase.** Analyze alternative concepts and select one for development. Sign off the Project Description.

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\* Noteworthy to point that the word "infrastructure" has embraces as both soft and hard factors in this study, rather than just hard as often used in literature.

- **Detailed Development Phase.** Define and approve the technical solutions to be implemented and the project's delivery commitments from all areas. Sign off the Project Description.
- **Final Development Phase.** Build, test and refine the product solution and processes.
- **Industrialization Phase.** Install, prepare and verify the industrial system. Launch product and Aftermarket. Sign the Product Release Approval.
- **Follow-up Phase.** Hand-over product to line organization, summaries project experiences and close project.

Each phase starts and ends at gates. Gates are the GDP checkpoints, where project management confirms that gate criteria are met for the current gate. The project steering committee decides if the gate is to be opened or not, i.e. if the project shall be allowed to carry on forwards or not. Of course, gates and gate criteria can be combined, added or deleted to suit the unique needs of each project. The project steering committee will approve the tailoring of the GDP.

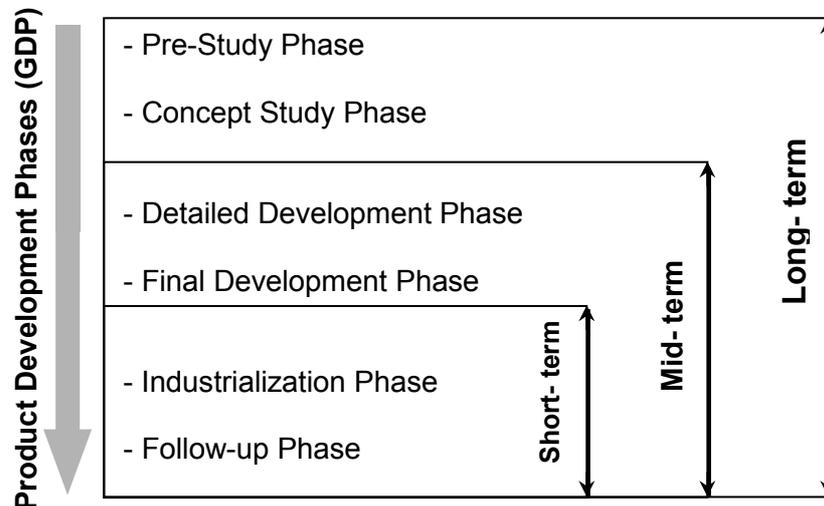
At Gates preceding a product decision point, the project steering committee opens the gate and recommends a decision to the project decision body, which then approves or rejects the project and approves or rejects funding for the period up to the next product decision point.

During the second day of VBPP event, 12th of April 2006, which involved engineering workshops, participants were managed to split up into smaller groups; each group encompasses agents from one, two or three suppliers from diverse organizational levels as well as their appropriate counterparts from VPT. To achieve more qualified outcomes from workshops, each group had VPT's representatives as at least one director, and two BPT leaders per each supplier. The non-conglomerate homogenous diversification of individuals from suppliers and VPT, made a rather perfect environment for discussion on short, mid, and long-term plans and deliveries for engineering and product development activities, as shown through a graphical interpretation in Figure 3.1. The focus of this study, however, is on long-term cooperation (here called AE -advanced engineering) in strategic partnership.

Suppliers and VPT's representatives in each working group were requested to brainstorm around success factors in partnership. The outcome was compatible in nearly all respect with what expected. In general, the main characteristics and prerequisites, which have been pointed out by supplier as building blocks of creating strategic partnership atmosphere, were as followed:

- Information sharing
- Joint problem solving
- Precise resource allocation
- Sharing risks (financial and non-financial)
- Shared planning
- 3-way communication (Volvo- Supplier- Supplier)
- Sharing GDP (product development process) with suppliers

- Long-term relationship
- Yearly technology seminars
- Openness
- Joint technology roadmap definition/reviewing



**Figure 3.1:** GDP phases in short, medium, and long term cooperation

A rough appraisal of these characteristics shows that some of them are those attributes that predict the pillars and atmosphere in which partnership will be built like long-term relationship commitment. Some other characteristics, yet, are those which should be considered over the life time of partnership, such as openness. And also a number of them reflect the relationships between more than two preliminary parties, like 3-way communication, which will be discussed through following chapters.

Anyway, the questionnaire were needed a small amount of modification on the subject of new information collected from workshops. A set of modified survey questionnaire has been presented in Appendix B.

### 3.2. Numerical Indices of Attributes and Success Factors

In a sample case for one of the suppliers, the average result for each attribute and success factor was as depicted through Table 3.1. As well, the mathematical calculation result of satisfaction, flexibility, and risk index related to each characteristic has been illustrated.

**Table 3.1:** Partnership Characteristics Ranking For a Supplier

	<b>Attributes / Success Factors</b>	<b>R<sub>C</sub></b>	<b>R<sub>S</sub></b>	<b>R<sub>S</sub>∩R<sub>C</sub></b>	<b>SI</b>	<b>FI</b>	<b>RI</b>
1.	Commitment	5,0	4,0	4,0	0,80	0,00	0,20
2.	Trust	5,0	4,5	4,5	0,90	0,00	0,10
3.	Openness	5,0	3,5	3,5	0,70	0,00	0,30
4.	Involvement / Compatibility	5,0	4,0	4,0	0,80	0,00	0,20
5.	Sharing Benefits / Risks	5,0	3,0	3,0	0,60	0,00	0,40
6.	Technology Roadmap	4,0	4,0	4,0	1,00	0,00	0,00
7.	Financial Issues	4,5	3,5	3,5	0,78	0,00	0,22
8.	Technological Issues	3,5	3,7	3,5	1,00	0,06	0,00
9.	Other Factors	3,0	3,8	3,0	1,00	0,21	0,00
					<b>OSI= 0,84</b>	<b>OFI=0,03</b>	<b>ORI=0,16</b>

Considering the model of assessing the capabilities of this typical supplier in terms of satisfaction, risk, and flexibility index (referring to Table 1.2), for the first characteristic, commitment for instance, the calculation is as shown below:

$$SI = \frac{R_s \cap R_c}{R_c} = \frac{4,0}{5,0} = 0,80$$

$$FI = \frac{R_s - R_s \cap R_c}{R_s} = \frac{4,0 - 4,0}{4,0} = 0,00$$

$$RI = \frac{R_c - R_s \cap R_c}{R_c} = \frac{5,0 - 4,0}{5,0} = 0,20$$

And respectively, the overall indices have been calculated on the basis of simple averaging.

Concerning the definition of each index, it may be commented the result of overall indices as: the supplier's capabilities in different areas of partnership requisites can satisfy VPT's requirements up to 80%. Similarly, the flexibility of this typical supplier in developing partnership with VPT is just 3%, while the risk taking by VPT in establishing partnership with this supplier is 16% (the probability of supplier failure to meet VPT requirement). Performing the same procedure for all suppliers in the same field will bring a reliable perspective of what VPT has in its hand (or options) as supply base, and between the assets, which one (or two) is more reliable to pick for setting up the strategic partnering relationship. As it is illustrated through coming chapters, this integrated, saturated supply base will be the core part of future supplier association.

# 4

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## SUPPLIER ASSOCIATION

Interest in the field of supply chain management study has progressively increased from 1980s when the benefits of collaborative, rather than adversarial, working relationships within and beyond the boundaries of organization were first identified. Since then, a multitude of definitions has been proposed concerning the concept of the supply chain. These definitions can be categorized as focused on either the internal supply chain, concerned with managing the conversion process between departments of a single organization or the externalisation of relationships with customers and suppliers by the enterprise (Ellram *et al.*, 1993). For the purpose of this thesis, the definition proposed by Robert Hanfield mentioned through chapter one has been used. From the various definitions proposed, it is possible to summarize that the concept of supply chain management is concerned on organizational restructuring and extends to the development of a company-wide collaborative culture, but also embraces a strong sense of integration of all activities which manage the timing and synchronization of material flows.

The process of organization alignment and the development of the supply chain management capability needed to exploit competitive advantage from the system of materials supply (Stevens, 1989). This process is a form of backward integration, taking place initially within the focal enterprise to forge alliances between the distributions and manufacturing activities in order to compete in competitive marketplace (internal integration). As manufacturing aligns to the demand of the distribution system, the backward integration process slowly shapes the purchasing activities. Once the purchasing activities have been structured and managed to gain higher customer service for manufacturing, the process of integration turns into externalised with suppliers (external integration).

The integration of the supply base represents a source of competitive advantage. This is achieved when suppliers are focused on their customers' market needs and can efficiently change their behaviour as a result. At this stage, new relationships and means of influencing the strategies and operating practices adopted within the supply chain need to be established and managed collaboratively. In contrast with the classical approach, the challenge to control and align the activities of suppliers is achieved through influence rather than the exercise of adversarial approach.

#### 4.1. Stages in Developing Supplier Integration

Four stages in this evolutionary process of restructuring are identified (Stevens, 1989):

1. **The baseline organization.** This organization operates the classical system of management, with the motivation of profit maximization and a high level of functional specialization. The company cannot adapt quickly to changes in the consumer market and has a low ability to exploit materials flow or market information.
2. **The functionally integrated company.** This organization has begun to erode the hierarchical structure and short-term financial focus by concentrating on customer service criteria and sales order processing. The major competitive advantage of this organization is in the distribution efficiency of the system and the collaboration between the sales function and the distribution function.
3. **The internally integrated company.** This organization has continued to restructure and align the activities of manufacturing and purchasing to create a systems approach to customer service. The company has reduced the number of administrative functions required and operates effective interfaces between departments to optimise information exchange and hence the overall performance of the company. The planning horizon has also extended from the short term to the medium term and involves a limited interaction with suppliers. At this point the organizational structure may become product-focused and involve a high level of cross-functional management.
4. **The externally integrated company.** This organizational state involves the externalisation of the alignment process and the integration of the supply base with the demands of the consumer in a transparent system of materials and information exchange. The company seeks deliberately to manage the interfaces between companies to generate a flexible and responsive system of long-term collaboration. At this point the company has completed the restructuring of its internal supply chain and has recognized the importance of external supply chain management strategies and the need to synchronize the supply process. The company operates internal cross-functional management structures, which may be product related, and typically develop supplier networking groups.

The model would suggest that the lean internally integrated company has exhausted the competitive advantage to be derived from the company itself and, therefore, tries to exploit the advantages of integrating suppliers and using the continuous improvement of quality, cost and delivery performance to the focal organization as a means of exploiting market changes. As the integration process extends throughout the enterprise, the policies adopted by the purchasing department become concerned with the evaluation of supplier performance and the integration of material flows, in a timely fashion, to the manufacturing operations

(Porter, 1985). Under such conditions, these interests will also include the concurrency of activities such as design as well as the development of long-term partnerships with strategic suppliers. As a result of this approach suppliers can invest in the capabilities needed to exploit future potential sources of competitive advantage. However, the weakness of this model is that it does not offer a practical mechanism for the integration process to be externalized.

From the 1980s, three distinct ideas of supplier collaboration have emerged. The first one emphasizes the development of long-term partnerships and trust such that the benefits and risks of the relationship can be shared (Ellram, 1991). The development of a structured process of information exchange among the focal company and its supply chain, such that inventory can be substituted with information in order to boost the performance of suppliers through the chain, has been the main point of attention for the second theme (Merli, 1992). The third approach originates from the empirical study of Japanese pattern manufacturing organizations and their “lean” supply networks (Lamming, 1993).

Advocates of the third approach argue that the higher performance and competitive advantage of the Japanese sub-contracting system has been gained by a high level of supply chain integration and a structured approach to managing a smaller number of direct suppliers at each tier in the flow of materials. These high levels of supply chain collaboration have been created by policies to work with suppliers both individually (dyadic relationships) and collectively.

One of the major weaknesses of the partnership and co-makership models of supplier integration is the amount of human resources which may have to be dedicated to the process of slowly, and individually, creating supply chain relationships. The implicit assumption within these first two models is the availability of a large quantity of skilled resources, which can be employed to work with suppliers and ensure the alignment of these external resources with the needs of the focal purchasing organization. This is often not the case (Rich *et al.*, 1997). However, the main disadvantage of these two approaches is that they are not supported by an appropriate pragmatic methodology. Just one of the approaches dealing with creating a group of suppliers (or supplier association) for a particular system/assembly of their productions needs reasonable resources concerned with lean networks of resources, which advocated in literature. The articulation of this collaborative strategy has been a highly structured and tiered-based supply chain. The focal company’s purchasing department of the supply chain is supplied by a rather small number of direct suppliers (tier one suppliers), who provide entire systems/assemblies rather than component parts. The component suppliers, who no longer service the material requirements of the focal company, instead provide parts to the direct suppliers (as tier two and three suppliers). This new structure of supply chain structure allows the externally integrated organization to evolve and maintain the control associated with vertical integration but without committing the organization to in-house technologies. Figure 3.1 demonstrates the tiered approach to the supply chain (Rich *et al.*, 1997). In other words, in this structure, by developing a series of linking pins, tier one suppliers to the focal company are also customers of

the tier two and tier three suppliers. This master and servant role enhances communication and the responsiveness of the supply chain, but also allows a much lower amount of resource to be assigned to supply chain management within each firm in the total supply network (Rich *et al.*, 1997). The close working relationships, characterized by the relationships with direct suppliers, are also fostered at lower levels in the supply chain to enable the benefits of collaboration to be extended throughout the network (Smitka, 1991).

In spite of being supported the implementation of this new structure of supplier base in Japanese automotive industry (which this approach has been developed) by owning the whole or a partial of a supplier by its customer, its claimed that the approach can also be adopted where there is no such an inter-organizational owning collaboration between different tiers of a supplier base members. The benefits associated with the Japanese approach to supplier networking arise not simply through a lessening in the logistics support required by the purchasing organization but in the ability to process information quickly, direct the efforts of the entire supply chain quickly and develop innovative supplier partnerships (Rich *et al.*, 1997).

The role of purchasing department of focal company\* would be the continuous improvement in their relations with suppliers and to develop criteria for checking the relative strengths and weaknesses of the suppliers in terms of their performances. Therefore, the operational performance required of suppliers, reflecting the needs of the consumer market and the lean purchasing organization, are continually prioritised through the use of supplier evaluation systems, including the introduction of measures reflecting the ability of the supplier to develop the capabilities needed to support future trading strategies.

The attention paid to supplier integration, co-ordination and development as well as information exchange within this system was facilitated by both dyadic activities between the purchasing organization and a supplier and complemented by the development of suppliers as a group. The latter activity was facilitated by the use of the supplier association which will be discussed in detail as the next topic.

#### **4.2. The supplier association**

The supplier association, or Kyoryoku Kai, was instrumental in the development of high performance from the Japanese supply chains and core to the international competitiveness of many Japanese companies. A supplier association may be defined as:

*“A mutually benefiting group of a company’s most important subcontractors, brought together on a regular basis for the purpose of co-ordination and co-operation as well as to assist all the members to benefit from the type of development associated with large Japanese assemblers: such as kaizen, just in*

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\* For tier one suppliers, the focal company will be OEM, whilst for tier two suppliers, the focal company will be that tier one company who supplied by these, and so forth.

*time, kanban, U-cell production and the achievement of zero defects (Hines 1994)."*

These associations enabled breakthrough changes in supplier behaviour and performance. The associations represented the organizational nexus for jointly co-ordinating the entire subcontracting system, serving as a forum for discussing corporate strategy and co-ordinating investment. All of this, however, required not only adaptation among firms, but also the sharing of detailed business strategy, engineering and cost information (Smitka, 1991).

The supplier workshops and meetings set up in association involve both high level strategy sharing meetings as well as meetings for operational decision-making teams. Therefore, meetings are held at all level of each business such that decisions could be taken with almost immediate effect.

The structure of the supplier association is an important aspect, which enables the responsiveness of the supply chain within the collaborative system (Rich *et al.*, 1997). As it was mentioned before, these are key suppliers to the purchasing organization, whose performance has a direct impact on the competitive position of the company, who create the supplier association. Actually, these supplier identify eventual performance of focal company in terms of catching better, cheaper, and faster products in competitive market, i.e. they define a large portion of value adding processes to focal company, as well as themselves for sure. Furthermore, by joining to other associations with lower-tier suppliers, the effects of their performance will transfer and penetrate through linking pins to the whole supply chain, facilitating achieving lean supply chain for focal company as a whole. The creation of these information and knowledge exchange channels through the supply chain by creating links between members of supplier association will be a great mechanism to grasp competitive advantages through the rivalry market.

#### **4.3.Benefits in Supplier Association Creation**

Advantages that supplier will catch as members in supplier association may fall into different areas as followed.

- **Having Frequent Meetings.** As discussed, there are meetings between supplier association members at different levels, peers, engineering, finance, and so on. Having relaxed and free-to-propose ideas, creates an environment in which, suppliers will be in direct contact with their direct and indirect customers. This type of direct, personal relationships between individuals will allow the lower tiers to participate effectively in the development and coordination processes.
- **Joint Problem Solving Activities.** Another benefit lied in the supplier association is the continuity of the meetings of members. The brainstorming sessions through these direct-contact meetings boosts joint problem solving processes within the association. The solutions raised from these meetings for tackling problems, after application, will lead to superior performance of members. So, the average performance of the whole supply association will improve gradually by taking place improvements in its individual members.

- **Joint Target Setting and Control Activities.** As mentioned, the structure of the association assists the direct access to all members and facilitates the coordination and development of their activities. The association allows the purchasing department to focus on group activities and maintain a high level of control and direction over present and future developments.
- **Creation of Trust and Information Sharing environment.** The supplier association makes the joint-working environment accompanied with trust and information/knowledge sharing between parties. As well, the ideally trustful atmosphere will allow all the members to associate with the decision making processes. Initially, the early activity of the supplier association is spent simply creating the group, exchanging market information, evaluating individual areas of poor performance and establishing the credentials of other suppliers (Rich *et al.*, 1997). Needless to say that such a trustful environment will be created gradually not at once, specially if the trust grows from the lower levels of relationships (e.g. adversarial). However, once individuals have grown accustomed to meeting and understand the role, which each member can play, in terms of sharing resources or leading the efforts of groups of suppliers, the association can begin to focus on the means of achieving competitive priorities.

The exploration and exploitation of suppliers in the supplier association will begins with tier one suppliers, who are in direct contact with the purchasing department of focal company. There are, surely, huge improvements in total performance of association in the beginning stages. However, lower tier supplier will gradually take and play their role as the first group matures and may grow slower in marginal returns. Thus, once the first wave of competitive advantage of the direct suppliers has been exhausted, and the suppliers have become integrated with the purchasing organization, attention can be turned to the development of “daughter” associations with the suppliers’ own suppliers (Rich *et al.*, 1997). The process of externalisation of the supplier association and the integration of lower tier of supplier creates the extended linking pins structure and ultimately a fully responsive system through the focal company’s supply chain.

# 5

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## DEVELOPING SUPPLIER ASSOCIATION MODEL

Developing supplier association enables rapid changes in supplier base performance, as it has been debated through chapter four. In order to a successful implementation of the applying the supplier association creation approach, however, VPT is to consider critical components of the success of this program. In terms of creating any successful program, it should contain four critical components, namely (Rummler *et al.*, 1990):

- A set of tools, for diagnosing and eliminating deficient performance
- An engine, for continuously improving systems that are performing adequately
- A road map, for guiding an organization in a new direction
- A blueprint, for designing a new entity

Considering each of these components within the supplier association implementation approach, it can be illustrated as Table 5.1 (Hines, 1994).

**Table 5.1:** The components of a successful supplier association model

<b>A set of Tools</b>
<ul style="list-style-type: none"> <li>▪ Benchmarking Present Competitive Position</li> <li>▪ Half-Life Metrics</li> <li>▪ Four Field Mapping</li> <li>▪ Buyer-Supplier Relationship Questionnaire</li> <li>▪ Cross-Functional Teaming</li> <li>▪ Quality Function Deployment</li> <li>▪ Selected Development Tools</li> </ul>
<b>An Engine for Improvement</b>
<ul style="list-style-type: none"> <li>▪ The Supplier Association</li> </ul>
<b>A Road Map</b>
<ul style="list-style-type: none"> <li>▪ The Generic Supplier Association Creation Model</li> </ul>
<b>A Blueprint for Success</b>
<ul style="list-style-type: none"> <li>▪ The Strategic Competitive Positioning Model</li> <li>▪ The Supply Chain Positioning Matrix</li> <li>▪ Case Examples</li> </ul>

Source: Hines (1994).

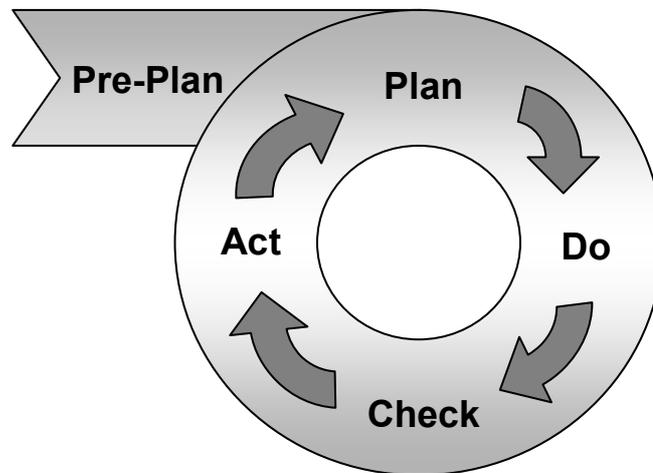
A generic model for the creation of a supplier association may be considered as a continuous improvement activity, through a PDCA (Plan, Do, Check, Act) loop. This loop is depicted in Figure 5.1. As it could be seen in this figure, the effort of shaping a supply association begins with pre-plan phase, but there is no end, as it is a continuous activity of doing improvements.

The phases in this continuous improvement cycle contains some activities, which are presented in Table 5.2. Each activity is discussed in detail.

### **5.1.Pre-Plan**

The benchmarking of present competitive position will show the current position of VPT and its explored and adopted competitive advantages. In other words, this activity illustrates in which point VPT stands and has achieved competitive position. To do so, VPT needs a tool to assess its current position. This tool is called Strategic Competitive Positioning Model, as described though Table 5.3. This table shows VPT's strategic position. As a matter of fact, on the basis of VPT's willingness to develop strategic partnership with its key suppliers, the assessment at this stage should confirm VPT's position at the stage of strategic partnerships. In other words, the characteristics illustrated in Table 5.3, under strategic partnership category, should be entirely satisfied. This is the first step to appraise internal organization.

By having VPT's strategic position at hand, the next effort is to study its relationship pattern with identified key suppliers (not for strategic partnerships yet, but as candidates). This action will be done again by identifying some tool, named Supply Chain Positioning Matrix, which is illustrated in Table 5.4. By going through this table, VPT will specify in which stage it stands in relationship with supplier(s); i.e. price competition, quality competition, close cooperation, or strategic partnerships. As well, it can identify what sorts of development it need to perform to improve its relationships with suppliers from lower stages to upper ones up to strategic partnership level.



**Figure 5.1:** Continuous improvement model for creating supplier association

**Table 5.2:** Activities in different phases of supplier association creation

<b>Pre-Plan</b>	<ul style="list-style-type: none"> <li>▪ Benchmarking present competitive position</li> <li>▪ Selecting appropriate coordination and development tools</li> <li>▪ Creating cross-functional team</li> <li>▪ Selecting appropriate suppliers</li> </ul>
<b>Plan</b>	<ul style="list-style-type: none"> <li>▪ Benchmarking supplier position</li> <li>▪ Jointly target improvements</li> <li>▪ Focus coordination and development efforts</li> </ul>
<b>Do</b>	<ul style="list-style-type: none"> <li>▪ Undertake group activities</li> </ul>
<b>Check</b>	<ul style="list-style-type: none"> <li>▪ Measure improvements</li> </ul>
<b>Act</b>	<ul style="list-style-type: none"> <li>▪ Refocus size of group and target areas</li> </ul>

Source: Hines (1994).

**Table 5.3:** Strategic Competitive Positioning Model

<p><b>Stage One: Price Competition</b></p> <ul style="list-style-type: none"> <li>▪ <i>Characteristics</i> <ul style="list-style-type: none"> <li>– Low technology manufacturing and material used</li> <li>– Competition on cheap prices only</li> <li>– No added value services</li> </ul> </li> </ul>
<p><b>Stage Two: Quality Competition</b></p> <ul style="list-style-type: none"> <li>▪ <i>Prerequisites</i> <ul style="list-style-type: none"> <li>– Stage One</li> </ul> </li> <li>▪ <i>Characteristics</i> <ul style="list-style-type: none"> <li>– Limited use of high technology manufacturing techniques</li> <li>– Limited use of precision materials</li> <li>– Competition by high quality PPM or ZD products</li> <li>– Limited value adding processes available in the firm</li> <li>– Vertical integration</li> </ul> </li> </ul>
<p><b>Stage Three: Close Cooperation (Coordination and Development of Suppliers)</b></p> <ul style="list-style-type: none"> <li>▪ <i>Prerequisites</i> <ul style="list-style-type: none"> <li>– Stage Two</li> </ul> </li> <li>▪ <i>Characteristics</i> <ul style="list-style-type: none"> <li>– Extensive use of high technology manufacturing techniques</li> <li>– Extensive use of precision materials</li> <li>– Competition by close cooperation with customers, management ability and JIT deliveries and production</li> <li>– Many value adding processes available in supply chain</li> <li>– Always seeking way of continual improvement</li> <li>– Close proximity to suppliers and customers</li> <li>– Long term/lifetime relations</li> <li>– Use of Activity Based Costing</li> <li>– Zero Industrial Relations problems</li> <li>– Vertical disintegration</li> </ul> </li> </ul>
<p><b>Stage Four: Strategic Partnerships (Development of Subcontract Network/Lean Production)</b></p> <ul style="list-style-type: none"> <li>▪ <i>Prerequisites</i> <ul style="list-style-type: none"> <li>– Stage Three</li> </ul> </li> <li>▪ <i>Characteristics</i> <ul style="list-style-type: none"> <li>– Member of customer subcontract team, probably organized into a Kyoryoku Kai association</li> <li>– Facilities available for product design for customers</li> <li>– Extensive use of own mutually dependent subcontract network</li> <li>– Creation of firm specific advantages</li> <li>– Active technology transfer with customers and other member of the subcontract team</li> <li>– Increase in product diversity and customer choice</li> <li>– Real JIT production</li> <li>– Maximization of value adding processes in network but minimization by OEM or by lower tier customer</li> <li>– Close long term relations with low cost sources of finance, probably in a Keiretsu type arrangement</li> <li>– Extension of supplier coordination and development to lower tier firms</li> </ul> </li> </ul>

Source: Hines (1994).

**Table 5.4:** Supply Chain Positioning Matrix

		<b>Price Competition</b>	<b>Quality Competition</b>	<b>Close Cooperation</b>	<b>Strategic Partnerships</b>
	<i>Impact on Suppliers</i>	<i>Stage 1</i>	<i>Stage 2</i>	<i>Stage 3</i>	<i>Stage 4</i>
1	Buying Criteria	Lowest price	Lowest cost	Maximum mutual benefit	Maximum network benefit
2	Purpose of Supplier	To supply goods the customer does not make	To supply goods the customer cannot make	To provide possible benefits and advantages	To provide mutual competitive advantage
3	Relationship type and length	Adversarial/short	Arms length/variable	Close/long	Strategic/ lifetime
4	Customer Involvement in Supplier Activities	Little or none, from purchasing	Sporadic, by purchasing and /or quality	Frequent from many functions	Often from many process improvement teams
5	Interaction with Suppliers	One off or infrequently	Annual negotiation or quality audit	Frequent problem solving activities	Often seeking areas of competitive advantage
6	Overall Relationship Description	Traditional/reactive	Developing/reactive or proactive	Progressive/proactive	Network/ interactive
7	Quality Requirements	Minimal or none	Quality control	Quality assurance/TQM	TQM spread to own suppliers
8	Delivery Requirements	Minimal	Timely	Pseudo JIT	True JIT spread to own suppliers
9	Cost Requirements	Lowest price by tender	Lowest cost by negotiation	Stable/none inflationary	Target costing/ Kaizen reductions
10	Design Requirements	None	Limited (customer designs)	Design ability with customer	Integrated design with customer and suppliers
11	Technological Requirements	None	Limited (customer technology)	High with joint sharing with customer	Essential with joint sharing with customer and suppliers
12	Coordination by Customer	None	By occasional one-to-one meeting or standard letters	Yearly supplier conferences	Kyoryoku Kai (cascading down tiers)
13	Development by Customer	None	Quality control instructions/audit feedback	One-to-one consultancy/audit problem solving	One-to-one and group activities with Kyoryoku Kai
14	Reliance on grading	None	Some reliance on reactive scores	Heavy reliance of reactive and predictive scores	Some reliance particularly on predictive scores
15	Data Interchange	Little/infrequent at operational level only	Limited/sporadic at operational level only	Detailed and frequent at operational level/occasional at strategic level	Detailed and frequent at strategic and operational levels
16	Cost Transparency	None	Occasional but very limited	Transparent at highest tier buyer-supplier level	Transparent throughout supplier network
17	Level of Pressure	Low/medium	Medium/high	Very high	Very high and transmitted to own suppliers
18	Number of Suppliers	Very high and unstable	High and relatively stable	Low and very stable	Very low and very stable
19	Asset Specificity	None/very low	Low/medium	High	Very high and high/very high with own suppliers
20	Tiering Structure	None	Flat pyramidal	Steep pyramidal	Network format

Source: Hines (1994).

Although the stages of this model are presented as discrete and sequential, VPT may find that some of its competitive positioning cut across two or more of the four model stages. If this dispersion is very great, VPT will want to consider its strategies in more detail, particularly in supplier area. But, most probably, it falls mainly in one stage. The outcome of this benchmarking procedure will identify the strategic positioning of VPT, as well as its strategic relationships type with suppliers, which will be utilized in identifying the coordination and development tools concerning each particular supplier, to improve the relationships from one stage to the next. A summary of these tools is presented in Table 5.5.

**Table 5.5:** Summary of supplier coordination and development tools

Stage of reached Strategic Competitive Positioning	Coordination Tool	Development Tool
Price Competition	None	None
Quality Competition	One-to-one meetings and standard letters	Quality control instructions and audit feedback
Close Cooperation	Yearly conferences and one-to-one meetings	One-to-one consultancy & audit problem solving activities
Strategic Partnerships	Supplier Association	One-to-one & group activities within supplier association

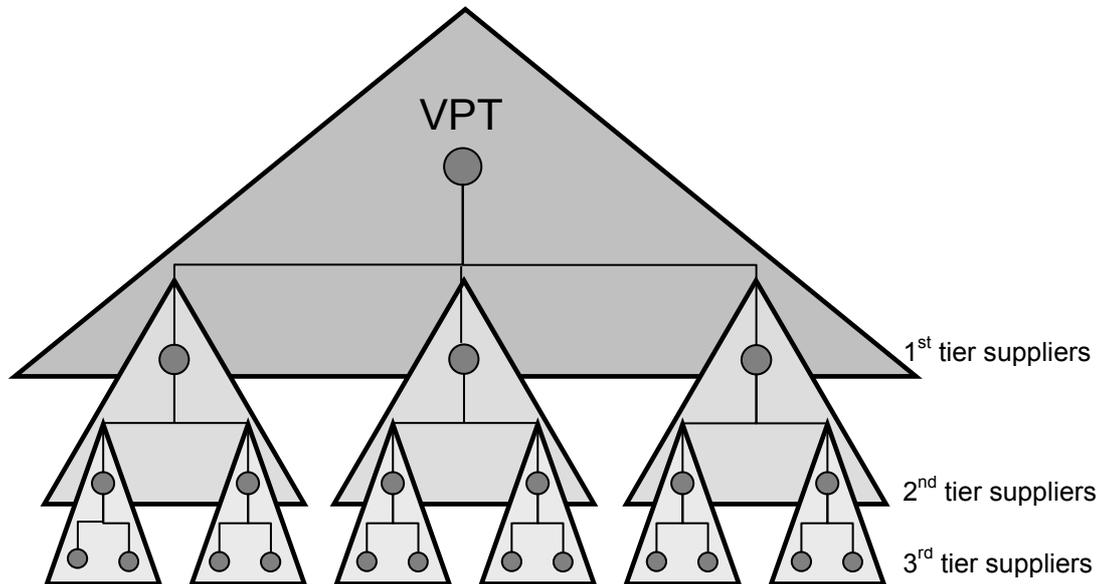
Source: Hines (1994).

In spite of developing strategic partnership program in VPT relationships with its key suppliers as its shell, the author believes that the main part of the relationships fall into the third stage of strategic competitive positioning, that is close cooperation. This close cooperation has been undertaken with a reduced supplier base (84 suppliers). VPT has established periodic conferences with these 84 key suppliers as well as one-to-one meetings to focus inter-company communication and improvements as supplier coordination and development tool, which is one of the characteristics of close cooperation. It is proposed to VPT to consider activities to carry out its progress to really catch the stage 4, i.e. strategic partnerships, which VPT can use in supplier association for the coordination tool, as indicated in Table 5.5.

One of the most important aspects of supplier association is that each supplier (key supplier) will be involved in the group with other suppliers in 2nd and 3rd tiers. The supplier association will act as the main vehicle for the multi-directional exchange of strategies as well as development assistance. Generally speaking, the purchasing department of VPT is suppliers by a rather small number of direct suppliers, let's say system, sub-system, assembly, or sub-assembly suppliers rather than component suppliers. The development assistance in this new structure of supply chain will be set up through linking pins all through the supply chain, as depicted in Figure 5.2.

As it was shown in Table 5.2, the next step of the PDCA cycle in creating supplier association is developing an appropriate cross-functional team. This activity has properly done in VPT in the form of business package teams (BPTs). Each team is

constructed of diverse skills from different departments/sections such as engineering, purchasing, financial, and so forth. It is easily recognizable that the structure of BPTs has been considered as a key part of VPT's strategy rather than just as a purchasing team.



**Figure 5.2:** Supply chain structure in supplier association model (Rich *et al.*, 1997).

As the next step, selection appropriate suppliers, the approach developed in chapter one is adopted. It is proposed to VPT to start with a small group of suppliers, no more than 15 (as suggested in literature), which makes the association focused and manageable at the early stages. Undoubtedly, the strategy of single-sourcing (mono-sourcing) for each system/assembly will be applicable in this stage.

### 5.2.Plan

The first step of plan phase of PDCA cycle starts with benchmarking of selected suppliers as well as VPT itself. This benchmarking will be on the basis of VPT's requirements and suppliers capabilities in their performance in product, process, and/or people related areas. As a matter of fact, the outcome of applying such a benchmarking will be identifying the gaps in these areas, which should be planned to fill in cooperation activities and/or individual efforts. The result can be illustrated through a radar chart (arachnid graph), as illustrated among an example in Appendix D.

As a result of this radar chart, the gap of VPT's requirements and supplier's capabilities in all areas will be identified. The next step, as shown in PDCA cycle, is to close the gap.

It is mostly pointed through literature, and as the experience of author from previous programs alike in automotive industry, that the best way to close the gap is developing a joint program to do so. Not surprisingly, one of the most vital building blocks that suppliers pointed out during VBPP workshops for establishing strategic

partnership was joint problem solving, joint plan development, joint technical activities, and so on.

So far so good! VPT has the final target of performance in its supplier base (or in supplier association), suppliers' capabilities (supplier association members) respect to VPT's requirements and in comparison to the best practice in the truck industry, as well as a plan for development of those capabilities, which have shortage concerning VPT's needs. In the meantime, some important metric tool is still missing to enable VPT and other association members to measure the improvement in diverse areas. The most appropriate tool to do so, which has been adopted in most large well-known companies is Half-Life concept, developed by Art Schneiderman\* (Schneiderman, 1993). This tool allows the supplier association members to sensibly target their improvement efforts. Needless to say, those sorts of gaps are aimed to fill which VPT's required performance is larger than the present performance, i.e. the risk index (RI) is higher than zero, and the satisfaction index (SI) is lower than one. In the case of supplier performance exceeding required amount, there will be no risk (RI=0) and the flexibility index (FI) is higher than zero. In this case, VPT will entirely satisfied by the supplier's capabilities and the satisfaction index will be one (SI=1)†.

Schneiderman found by monitoring the progress in continuous improvement programs in his organization that if the improvements were plotted on a semi-logarithmic paper, it would be a near straight line. The significance of this analysis, however, in that the rate of improvement is consistent and can be expressed in terms of the time taken to halve the problem. For example, if a 10 percent reject rate can be improved to 5 percent in nine month, then it can be halved again to 2.5 percent in another nine months. This process is called Half-Life concept because of its similarity to measure of decay in radioactivity compound, where the half-life is the amount of time required for the radioactivity to decay to half its value. In other words, when the half-life concept is applied to the benchmarking gap analysis, parties in supplier association can make sensible decisions on what may really be possible and gain a clear understanding on how long it will take to catch up.

However, through more careful analysis of improvement data, Schneiderman was able to use this tool as a completely predictive metric. He did this by dividing the achieving improvements by they degree of organizational and technical complexity, as depicted in Figure 5.3. For any improvement process, it could be view as either of low, medium, or high technical complexity concerning. As well, organizational complexity has the same ranking. A low organizationally complex task is one that simply involves one department or work unit, while a medium one is involving two or more departments (cross-functional teams), and finally, a high complex organization is when not only it need cross-functional teams, but also cross-company cooperation.

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\* Art Schneiderman was Vice President of Quality and Productivity for Analog Devices in the late 1980s.

† These indices are developed to measure the overlap of supplier's capabilities with VPT's requirements. Chapter one has delivered detail information in this respect.

According to this study, there are nine different time periods required to achieve success. For instance, for a low technical improvement involving just one department, it is depicted that a half-life improvement should be reached in one month. At the other extreme, however, the half-life improvement for an inter-company highly technical complex improvement is 22 months. Strategic partnership of VPT and suppliers in a supplier association, because of a great deal of cooperation and collaboration between companies, hence, will take the high level of organizational complexity.

		Months		
		Low	Med	High
Organizational Complexity	High	14	18	22
	Med	7	9	11
	Low	1	3	5
		Low	Med	High
		Technical Complexity		

**Figure 5.3:** Half-Life Targets according to organizational and technical complexity (Schneiderman, 1993)

One word of caution that should be given concerning the half-life concept is that after three and eight half-life improvements (i.e. an improvement by a factor of between 8 to 256), it becomes very difficult to sustain the improvement and indeed the effort required to do so may not be worthwhile in cost benefit terms.

If the half-life improvement time is known by using this table, anyhow, and the time available for a particular improvement type, then the exact target for the improvement can be given by referring to the simple semi-logarithmic plot, as Schneiderman proposes (Figure 5.4).

As a simple example, the reduction in supplier defects product (PPM) could be considered here. Suppose that the supplier supplies a complex system or assembly, and then if VPT decides to have a strategic partnership relationship with this typical supplier in supplier association, then the relationship will be of a high technical and high organizational complexity. Be reference to Figure 5.3, it can be gauged that a half-life improvement can be made every 22 months. As a result, a target for the next 12 months could be given by reference to Figure 5.4 to be around 34% reduction in the existing defect rate. Similarly, if it is known that the defect rate reduction of 50% will be required, then VPT can count on the timing of this degree of improvement to be around 21 months.

Each improvement area needs its own half-life concept and diagram. Half-life concept has proved to be reliable for all the organizations, where it has been refined and fine-tuned for that particular company.

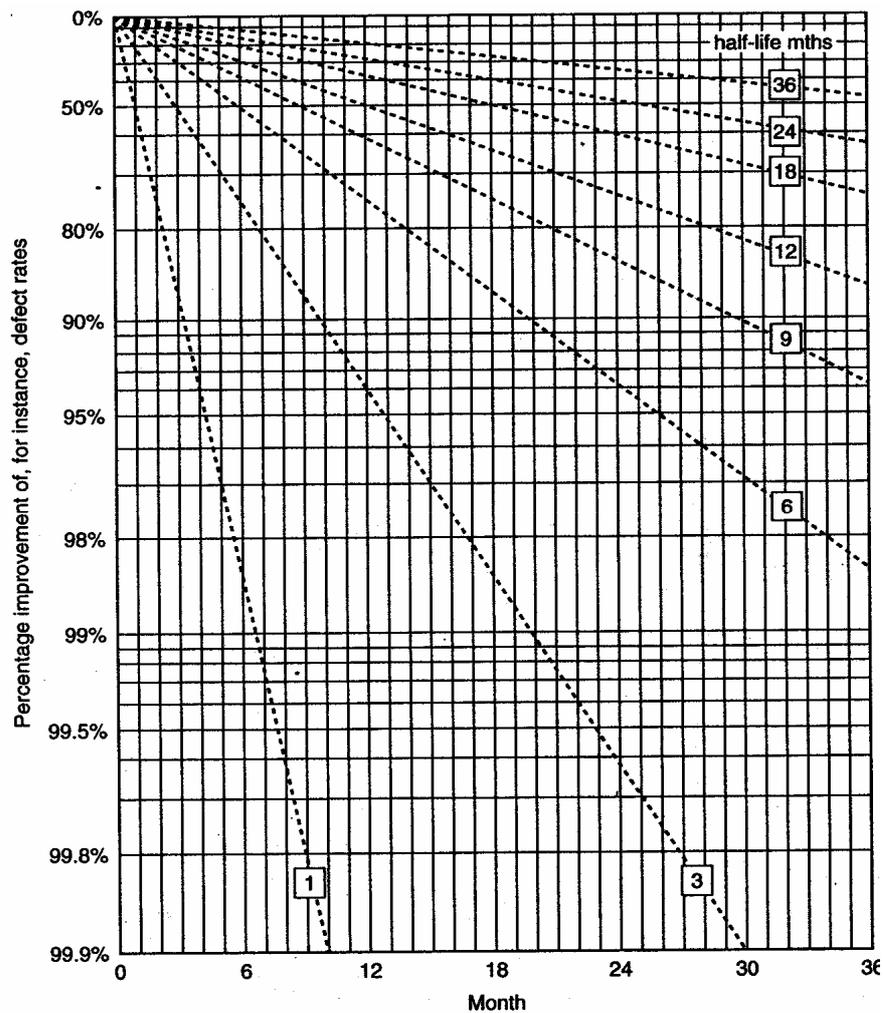


Figure 5.4: Half-Life improvement targets (Schneiderman, 1993)

In this stage of efforts, the plan should be developed by BPTs, to determine in advance who does what and when as well as controlling the flow of information or who needs to know what and when. This can be achieved by developing a detailed Gantt chart embracing the answers to all these questions. Also, an appropriate tool, called Four-Field Mapping (or Cross-Functional Process Mapping)\*, could be used here to address all these required information. Anyway, four essential fields are to be addressed in using these tools:

- Value adding team members involved in the cross functional process under consideration,
- The logic phases of the process broken down with distinct entry and exit criteria for each phase,
- The task flows within each process phase,
- The control standards: guidelines designed to ensure a uniform rigour throughout the complete process.

In the context of continuous improvement, the plan phase may fall in PDCA areas in itself, as followed:

\* For more information, see Dimancescu (1992).

- **Plan.** The process mapping tool allows the process to be effectively planned before any work starts. This allows each team member to know when he or she will be involved and what he or she needs to do. Timescales can be usefully added to facilitate diary planning.
- **Do.** The process planning tool helps to improve the speed and quality of process improvement.
- **Check.** During and after the implementation of the process mapping it is important that the implementation team continually check not only the success of the individual project, but also the process by which this is achieved. This should be part of the normal review process.
- **Act.** Where possible, improvements can be made they should be noted in the Four Fields Map being used so that the map can be improved for future usage.

### 5.3.Do

The doing stage forms the activities of BPTs. The most prevailing activities may be considered for VPT as mentioned through literature as success factors, however, are as followed.

- Yearly conferences organized by VPT:
  - Sharing future strategic direction
  - Detail operational plans
  - Future product and marketing strategies
  - Developing new process or plant
  - Financial results
  - New business opportunities
  - Areas of concern in the supplier area
  - Making awards to exemplar suppliers
- Four, five series of seminars per year at lower level:
  - Strategic information sharing
  - Operational information sharing
  - Sharing tools and techniques
- Line staff meetings at operational level:
  - Discussion about utilized tools and techniques in supplier association
- Regular newsletter publishing, to keep supplier association members aware around what is going on in association in VPT and suppliers.
- Organizing visits from exemplar companies in order to give the opportunity of benchmarking from best practices for other suppliers of association.

### 5.4.Check

In the check stage of developing supplier association, the outcome of the whole efforts of association members are qualified and quantified. As it was discussed through chapter one, VPT and suppliers have their own individual as well as jointly agreed target. In this stage, however, every entity will measure the satisfaction of reached targets in comparison with the initial settings of final targets. Again it was discussed in chapter one that these measures will be of financial and non-financial

terms. As the PDCA cycle is running continuously, so do these measurements. Every member of supplier association, hence, will be aware regularly of the extent of catching up the desired targets.

The regular appraising of grasped goals, definitely, should be performed in jointly activities, why in that case the information sharing between parties will help to improve achieving goal in better ways for the next run of PDCA cycle.

### **5.5.Act**

Each run of PDCA cycle ends with act stage. It should not be forgotten that the desired goal of creating supplier association and all its enclosed activities are for the sake of grabbing competitive advantage and survival in the competitive market. VPT as a frontier in trucks diesel engine industry has a more sensitive situation; not only to seize the opportunities for getting the edge, but also to stay at the edge. Sometimes it is argues that catching is much easier than holding. Keeping these in mind, at the last stage of each run of PDCA, the performance of each entity will be assessed, those information which have been generated through the previous stage, check. The main goal of this stage is resize the supplier association, inviting more suppliers in association, or giving up some members. These changes may apply on concerning the new situation of VPT requirements following changes in market place or customer wants.

Following resizing of the supplier association and setting up all the requirements again for the next run, the PDCA wheel will be driven again and new activities, in the same structure but sometimes entirely different in context, will be conducted. The PDCA cycle of supplier association will run continuously and exploit more and more advantages of all parties. Eventually, with the sound and exact running of supplier association creation and PDCA cycle, each party will reach to the sensation of win-win condition, which is the vital survival aspect in today's rivalry atmosphere.

# 6

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## CONCLUSION

A model for supplier evaluation and selection was developed in the first part of this study. This model, beyond the traditional approaches of supplier or vendor selection, has considered more criteria those are more imperative than traditional criteria to opt suppliers. This consideration has been applied in order to generate a pragmatic, simple-to-use, and yet precise approach for Volvo Powertrain Corporation (VPT). VPT may utilize supplier selection approach in Volvo Business Partnership Program, to explore and exploit suppliers' competencies in order to catch competitive advantage in truck, particularly diesel engine industry. The main recognizable aspect of the developed approach in this study is focusing attributes and success factors in supplier selection for establishing strategic partnership with VPT. On the basis of literature (academic and partition studies), VPT's individuals' attitudes, and suppliers' thoughts a set of structured close-ended questionnaires has been developed, embracing questions in ranking attributes and success factors of nominated suppliers. Having a tool at hand to convert qualitative factors to quantitative ones, VPT will enable to measure the extent of each supplier's capabilities in terms of three numeric indices: satisfaction, flexibility, and risk indices.

The second part of this effort, however, has focused on creating supplier association model for applying among VPT's supplier chain. The supplier association model boosts creativity, joint-problem solving, joint-target setting, quality, cost, and time to market through whole supply chain. As well, this model has a significant impact on lean resource allocation and usage in the supplier base.

It is proposed to VPT to consider supplier association model in order to create its lean supply chain for prospect products in continuous improvement based activities to boost the trust and information/knowledge sharing between suppliers, which have been stressed by almost all suppliers as success factors in their relationships with VPT as well as other suppliers in VPT's supply chain. The supplier association assists the responsiveness of the supply chain members within a collaborative system, since the strategic partnership is created with key opted suppliers whose performance has a direct impact on the competitive position of VPT. By joining to other associations with their lower-tier suppliers, the effects of key suppliers' performance will transfer and penetrate through linking pins to the whole supply chain of VPT. The creation of

these information and knowledge exchange channels through the supply chain by creating links between members of supplier association will be a great mechanism for VPT to grasp competitive advantages through the rivalry market.

# 7

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## CONDUCTING PROSPECT STUDIES

It was mentioned through chapter one that understanding the nature of attributes and success factors, as well as knowledge about their implementation in partnership are some basic infrastructure of creating and managing partnership in the right way. Another dimension of managing the partnership, however, is to understand the range of outcomes possible in partnership relations to evaluate the extent of success or probable failure.

The traditional approaches for measuring the performance of any relationship focus mainly on easily identifiable bottom-line cost savings for each party, while the performance of partnership is much wider than just bottom-line cost saving; it may include improvements in operational effectiveness, stability, innovation, technological development, creativity development, and so forth. No need to say that there are financial factors as well, such as long-term profitability, prices, ROI, purchasing volume, and running cost.

Put a gauge on each non-financial factor, in its turn, calls for more detailed research that is recommended to go on in line with this study. Development and application of these measurement tools to assess the extent of success in partnership will be too vital after the first loop of PDCA cycle in creation of supplier association.

# 8

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# 9

## APPENDICES

### Appendix A. Supplier selection criteria, according to Dickson (1966)

**Table 9.1:** Traditional Supplier Selection Criteria (Dickson, 1966)

<b>Extreme Importance</b>	
1.	Quality
2.	Delivery
3.	Performance history
4.	Warranties and claim policies
<b>Considerable Importance</b>	
5.	Production facilities and capacity
6.	Price
7.	Technical capability
8.	Financial position
9.	Procedural compliance
10.	Communication system
11.	Reputation and position in industry
12.	Desire for business
13.	Management and organization
14.	Operating control
<b>Average Importance</b>	
15.	Repair service
16.	Attitude
17.	Impression
18.	Packaging ability
19.	Labour relations record
20.	Geographical location
21.	Amount of passed business
22.	Training aids
<b>Slight Importance</b>	
23.	Reciprocal arrangements

## Appendix B. Survey Questionnaire for Attributes and Success Factors in Strategic Partnership

**Table 9.2:** Questionnaire for attributes in partnership assessment

SUPPLIER:	
PRODUCT:	
APPRAISER(s):	
DATE:	

### PARTNERSHIP ASSESSMENT

#### Attributes

Section 1. Commitment	RESPONSES					1	3	5 (Best Practice)
<b>Q1.</b> At what level is the supplier's willingness to make an effort on behalf of the relationship, and believe that the relationship is worth working on?	1	2	3	4	5	The supplier cannot / won't manage to act in the framework of partnership, because of the opportunistic attitude, not believe in worthiness of partnering,...	The supplier's prime attitude is toward individual goals. Supplier sees the mutual benefits as its secondary target.	Both VPT and supplier can achieve their individual and joint goals without raising the specter of opportunistic behavior.
	<input type="checkbox"/>							
<b>Q2.</b> Does the supplier's management have a favourable partnership attitude?	1	2	3	4	5	The top management of the supplier will unlikely support and empower the partnership program.	Supplier's management has a favorable attitude on partnership program and will most likely support it.	The supplier's top management has a great attitude toward creating, following and empowering the partnership program.
	<input type="checkbox"/>							

Section 2. Trust	RESPONSES					1	3	5 (Best Practice)
<b>Q1.</b> In the case of partner scarcity, is the supplier trustful to make partnership?	1	2	3	4	5	It is unlikely possible to make a partnering based on a long-run trustful relationship.	The supplier is most likely trustful to help VPT maintaining its marketing position.	The supplier is quite trustful to assist VPT keeping and improving its competitive advantages for a long-term partnership.
	<input type="checkbox"/>							
<b>Q2.</b> Will the supplier hold up its end of the partnership?	1	2	3	4	5	The supplier unlikely organizes its scarce skilled managerial and technical resources for the partnership program.	The supplier most likely specifies its scarce resources for partnering from different levels of organization.	The supplier organization and management attitude support the partnership program at the personal, organizational, and inter-organizational levels.
	<input type="checkbox"/>							

Section 3. Openness	RESPONSES					1	3	5 (Best Practice)
<b>Q1.</b> Is the strategic information will be shared between two parties (VPT and supplier)?	1	2	3	4	5	Strategic information sharing is unlikely achievable between VPT and the supplier at diverse levels.	Strategic information sharing is achievable just in some lower levels of both parties (functional, business), not at the top levels (corporate).	By frequent interaction between VPT and supplier at all levels and functions, the strategic information will be shared toward preventing problems, not problem-driven actions.
	<input type="checkbox"/>							
<b>Q2.</b> Is the operational information will be shared between two parties (VPT and supplier)?	1	2	3	4	5	Operational information sharing is unlikely achievable between VPT and supplier at required organizational levels.	Operational information sharing is achievable at moderate level. Some operational information is not possible to distribute between VPT and the supplier.	By frequent interaction between VPT and supplier at required levels and functions, the operational information will be shared toward preventing problems, not problem-driven actions with no obstacle.
	<input type="checkbox"/>							

Section 4. Involvement/Compatibility	RESPONSES					1	3	5 (Best Practice)
Q1. Does the top management of the supplier have attitude / supportive role for involving different organizational levels?	1	2	3	4	5	The supplier's top management will unlikely have a supportive action towards partnership, despite of his/her/their belief.	The supplier's top management will attempt to organize its firm towards partnership program, but it is likely unachievable at some levels.	Supplier top management's vision (as a symbol of organization) will shape different organizational level towards partnership program.
	<input type="checkbox"/>							
Q2. Is it possible to involve supplier's different organizational levels with their counterparts at VPT (organizational culture)?	1	2	3	4	5	It is unlikely to create communication links between key people of the supplier with their VPT's counterparts.	The communication is achievable at some levels of VPT's and supplier organizations, especially between key people.	The supplier's organization has a favorable personality fit and ability of key people to communicate effectively at their respective levels and to work together with VPT.
	<input type="checkbox"/>							

Section 5. Sharing benefits and risks	RESPONSES					1	3	5 (Best Practice)
Q1. Does the supplier's management believe on following joint synergies and sharing benefits (strategic, economic, technological) as well as risks?	1	2	3	4	5	The supplier's management has an insignificant synergic attitude on sharing risks and benefits. The prime goal is economic benefits.	The top management of the Supplier will follow strategic, economic and technological benefits, but the economic is still the prime. He/she/they believe in sharing benefits and risks.	The supplier's top management is aware of and follows the partnering mutual benefits and risks, and proportional sharing of benefits respect to the investments of both sides.
	<input type="checkbox"/>							

Section 6. Technology Roadmap	RESPONSES					1	3	5 (Best Practice)
Q1. Is the supplier willing to modify and fit its strategy to VPT's strategy and future plans?	1	2	3	4	5	It is unlikely to achieve shared objectives and future technology plan between VPT and the supplier.	It is likely to fit the supplier's strategic outlook and future plan by providing some incentive or motivation for suppliers to work towards VPT's technology alignment.	There is an initial fit between supplier and VPT in terms of strategic outlook and future plan. It is most likely to keep this fit as strategies change over the time during the partnership program.
	<input type="checkbox"/>							

**Table 9.3:** Questionnaire for success factors in partnership assessment

SUPPLIER:	
PRODUCT:	
APPRAISER(s):	
DATE:	

## PARTNERSHIP ASSESSMENT

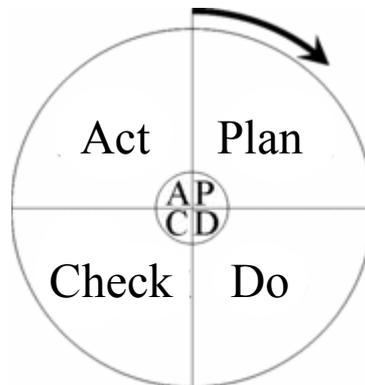
Section 1. Financial Issues	RESPONSES					1	3	5 = Best Practice
<b>Q1.</b> How the supplier has performed its financial issues historically (Economic Performance)?	1	2	3	4	5	The supplier has not a good economic performance by low magnitude of the cash flow still to come discounted to present value.	The magnitude of the cash flow discounted to present value is reasonable at supplier side, and it is most likely to move towards best practice.	The supplier have a favorable economic performance by high magnitude of cash flow discounted to present value.
	<input type="checkbox"/>							
<b>Q2.</b> How the supplier will perform its financial issues in the future (Financial Stability)?	1	2	3	4	5	The supplier is on unstable financial footing: high debt-to-asset ratio, high debt-to-worth ratio, and low current ratio.	The financial stability of supplier is at the moderate level, but it will be most likely the supplier can catch the best practice in near future.	The supplier is quite financially stable: low debt-to-asset ratio, low debt-to-worth ratio, and high current ratio.
	<input type="checkbox"/>							

Section 2. Technology Issues	RESPONSES					1	3	5 = Best Practice
<b>Q1.</b> How is the supplier's current manufacturing facilities / capabilities and engineering expertise?	1	2	3	4	5	The supplier is not at a reasonable level of manufacturing and engineering facilities.	The engineering and manufacturing capabilities are reasonable, but require some improvements.	The supplier is at the acceptable level of scale, equipment conditions, operating environment, and good general knowledge of its operations.
	<input type="checkbox"/>							
<b>Q2.</b> How is the supplier's future technological potential?	1	2	3	4	5	The supplier has rather no added value to the technological issues of VPT.	The supplier has added value at the early stages of partnership. It is likely to be able to continue to add value over time during the partnership.	The supplier can continuously add value to the relationship overtime, not just during the early stages. It can participate in VPT's new product design.
	<input type="checkbox"/>							
<b>Q3.</b> Does supplier have a speediness development process?	1	2	3	4	5	The development process of the supplier is not quick response to the market change signals.	The supplier's development process is rather quick response to changes in VPT's requirements.	The supplier has the ability to move fast, so the new products and technologies can be brought to market quickly, and it can help VPT to compete more effectively in its market.
	<input type="checkbox"/>							

Section 3. Other Factors	RESPONSES					1	3	5 = Best Practice
<b>Q1.</b> Does supplier have reasonable safety record?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	Safety issues have never been as vital concerns of supplier.	Safety issues have always been as important characteristics of supplier's activities, but it could not be mentioned as supplier's reputation	Safety has always been an important goal, to which extent that can reflect in VPT reputation.
<b>Q2.</b> Does supplier have reasonable business references (confirmation of trust)?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	Regarding to the business records, the supplier is unlikely to be trustful for long-term partnership program.	The supplier has reasonable business history and has been always kept its word.	The supplier has always had great performance records with other customers concerning to its business history.
<b>Q3.</b> Does the supplier consider customer-base issues as an important part of its business?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	The supplier has insignificant respect to the customer-based issues against VPT, and it is likely to involve its technology to the key rivals.	The customer-based issues will be most likely an important matter in the supplier's business against VPT.	The supplier has favourable customer-based issues against VPT and does not dealing directly with VPT's key competitors. It involves its proprietary technology in the partnership program.
<b>Q4.</b> Do the supplier's key personnel have the required training to initiate and successfully operate required processes?	1 <input type="checkbox"/>	2 <input type="checkbox"/>	3 <input type="checkbox"/>	4 <input type="checkbox"/>	5 <input type="checkbox"/>	The supplier has not defined processes and relevant key people; the personnel have not been properly trained to participate in partnership program.	The operations and processes are defined at the supplier's side, but the relevant people have not been trained to perform the partnering project.	The relevant personnel to the operations and processes to be shared in partnering are entirely trained and qualified to perform the partnering program.

## Appendix C. Plan, Do, Check, Act (PDCA) Cycle

PDCA, which is called Deming Cycle, Shewhart cycle, or Deming Wheel, is an iterative four-step quality control strategy as shown in the picture below.



**Figure 9.1:** Plan, Do, Check, Act (PDCA) cycle

Each phase of this cycle, i.e. Plan, Do, Check, Act, consists of activities as illustrated here:

- Plan
  - Establish the objectives and processes necessary to deliver results in accordance with the specifications.
- Do
  - Implement the processes.
- Check
  - Monitor and evaluate the processes and results against objectives and specifications and report the outcome.
- Act
  - Apply actions to the outcome for necessary improvement. This means reviewing all steps (Plan, Do, Check, Act) and modifying the process to improve it before its next implementation.

Made popular by Dr. W. Edwards Deming, Father of Modern Quality Control, but always referred to by him as the Shewhart cycle. Later in Deming's career, he modified PDCA to Plan, Do, Study, Act (PDSA) so as to better describe his recommendations. In Six Sigma programs, this cycle is called Define, Measure, Analyze, Improve, and Control (DMAIC).

PDCA, as a continuous improvement tool, should be repeatedly implemented, as quickly as possible, in upward spirals that converge on the ultimate goal, each cycle closer than the previous. This approach is based on the understanding that our knowledge and skills are always limited, but improving as we go. Rather than enter “analysis paralysis” to get it perfect the first time, it is better to be approximately right than exactly wrong. Over time and with better knowledge and skills, PDCA will help define the ideal goal, as well as help get us there.

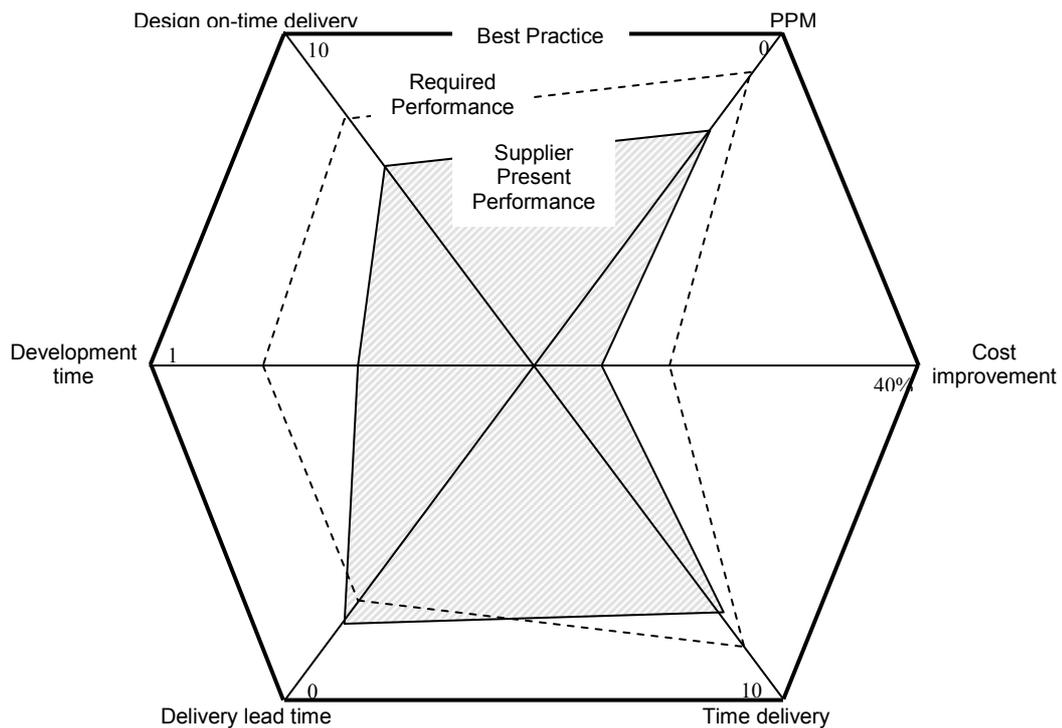
## Appendix D. The Use of a Radar Chart (Arachnid Graph)

Assume that at the delivery side of supplier capabilities the benchmarking analysis has yielded the results as shown in the following table:

**Table 9.4:** Capabilities of an exemplary supplier in delivery

	Design on-time delivery (%)	Development time (Year)	Delivery Lead-time (Hour)	On-time Delivery (%)	Cost Improvement (%)	PPM*
<b>Supplier Capability</b>	68	2,5	12	96	12	100
<b>VPT's Requirement</b>	75	1,5	16	99	20	10
<b>World Best Practice</b>	100	1	0	100	40	0

The radar chart according to this table is depicted as following figure:



**Figure 9.2:** Radar Chart for Capabilities of an exemplary supplier in delivery

\* Part Per Million Defects, a quality measure tool for metering the number of rejected defective parts.

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## ABBREVIATIONS

AE	.....	Advanced Engineering
BPT	.....	Business Package Team
FI	.....	Flexibility Index
GDP	.....	Global Development Process
HDEP	.....	Heavy Duty Engine Program
MAUT	.....	Multiple Attribute Utility Theory
OEM	.....	Original Equipment Manufacturer
OFI	.....	Overall Flexibility Index
ORI	.....	Overall Risk Index
OSI	.....	Overall Satisfaction Index
PDCA	.....	Plan, Do, Check, Act
PPM	.....	Part per Million
QCDF	.....	Quality, Cost, Delivery, Flexibility
RI	.....	Risk Index
SC	.....	Supply Chain
SCM	.....	Supply Chain Management
SI	.....	Satisfaction Index
VBPP	.....	Volvo Business Partnership Program
VPT	.....	Volvo Powertrain