

THE SUPPLY CHAIN MANAGEMENT AND OPERATIONS AS KEY TO FUTURE COMPETITIVENESS FOR RESEARCH, DEVELOPMENT AND MANUFACTURE OF NEW VEHICLES

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Abstract

The future production of new types of transportation for land, sea and air, based mainly on research, development and innovation in new materials and new types of energy according to environmental standards, will be very difficult unless they are structured around their advanced concept development through relationships management between all actors in a supply chain for manufacturing and distribution. The future of design and development of new vehicles also must incorporate innovative models for the supply chain Management, composed of key business processes that cut across the global supply chain and where the critical success factor is the degree of integration of these processes between customers and suppliers throughout the value chain, linking all actors involved in research and development, prototyping, manufacturing, marketing and aftersales. The future of the new products will also depend on efficient and competitive processes, so it will be essential to design an information management and product flow throughout the supply chain, closely linking the processes of customer relationship Management, suppliers management, order fulfilment, flow manufacturing in a Lean environment and research, development and innovation to the merchandising of the new products. In the future, we need perfect plants for the production of new vehicles and will depend on the degree of efficiency and profitability across different supply chains, this is, the competence won't be between companies, but between supply chains, and if we design an efficient and competitive chain from the same initial development, then will have lasting, safer and greener new vehicles.

Keywords: *supply chain management, lean manufacturing, integrated processes, relationships, efficiency*

1. Introduction

The field of research, design and development of new types of vehicles on land, sea and air, is facing a major challenge that must address a looming innovation in the fields of new materials, energy and biofuels and increased safety, and all meet the environmental requirements becoming more demanding from the administration and society itself, and it will be necessary to design and launch of new models of the supply chain Management and operations, not only with advanced models of relationships but integrating currently referred to as green supply chains, from the beginning of any phase of research to the receipt of any new vehicle on the market or end user.

We must not only innovate in materials, combustion technologies or new types of sustainable energy, all oriented towards sustainability, but we must take into account that this is essential to move towards innovation in new models of relations between all agents involved in every stage through manufacturing and final delivery, and disposal at the end of the cycle of life, because the challenges of developing new vehicles in its entirety should be directed also toward management models and competitive operations in future markets, encouraging them more than now the efficiency and profitability of global sustainable processes.

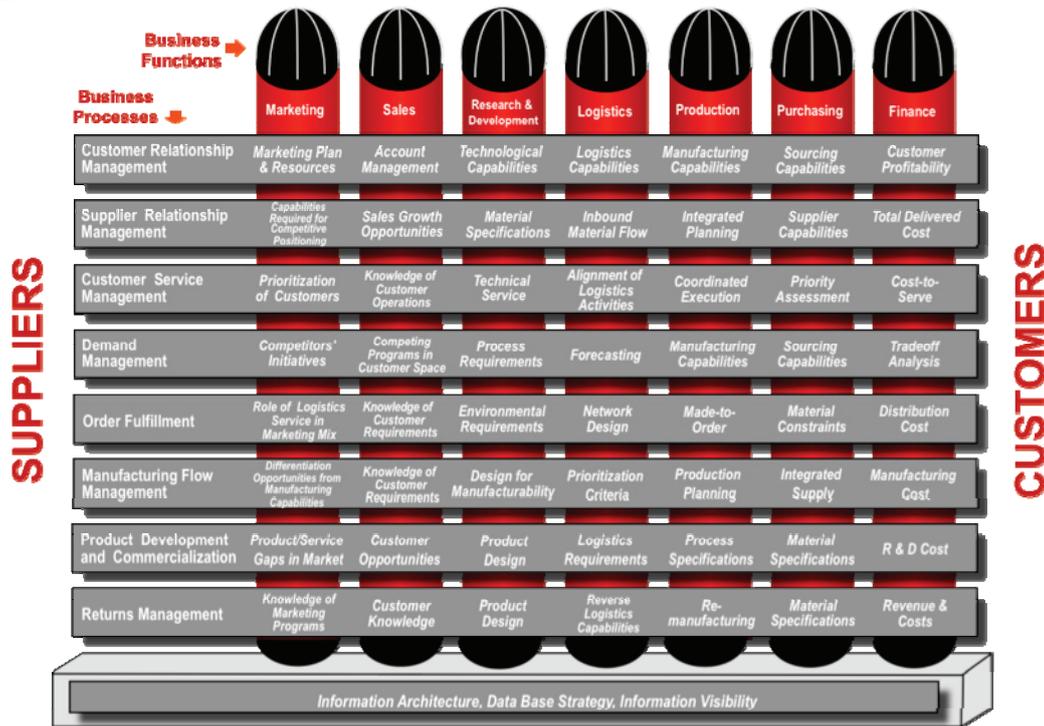
The current supply chains are integrated by different agents with individual strategies to research and development oriented to become more competitive in their area of operation, but

without a clearly defined alignment with the other actors of the same chain, so that the missed time and opportunities are huge, remain indispensable relationships new models between suppliers and customers arising in models of long-term partnerships by multiplying the results in the quality of new products, new processes efficiency, sustainability and profit in new markets.

The supply chain of the future, taking into account sustainability parameters, reduction of CO2 emissions, reduced energy consumption, new materials, ... as well as traditional measures such as stock availability, total cost reduction and financial performance, is defined as the integration of key business processes from end user through original suppliers that provide products, services and information that add value to customers and other stakeholders.⁽¹⁾

We need to develop new types of vehicle on land, sea and air to integrate the concept of sustainability, we need a concept of the future business model that is based on innovative supply chain management relationships between all involved for the sustainable development of all the products in the global cycles of life, achieving long-term partnerships that can be competitive in new markets, mainly based on the deepening of the necessary linkages between key business processes to be cross in the global supply chain.

Then we will detail what should be the key business processes to integrate the different actors in supply chain research, sustainable design and development of new vehicles in the future, in order to provide society competitive products in cost and quality and safeguard the future generations.



Note: Process sponsorship and ownership need to be established to drive the alignment of the supply chain vision and eliminate the functional barriers that artificially separate the process flows

Fig. 1. Functional Involvement in the Supply Chain Management Processes

Source: Douglas M. Lambert, Editor, *Supply Chain Management: Processes, Partnerships, Performance, Third Edition*, Sarasota, FL: Supply Chain Management Institute, 2008, p. 8.

2. The Research, Development and Innovation

The process of research, development and innovation new products operates generating a structure that develops and placed on the market new products, working with suppliers and

⁽¹⁾ Definition of the Global Supply Chain Forum, dedicated to provide the opportunity for leading practitioners and academics to pursue the critical issues related to achieving excellence in Supply Chain Management

customers.

The research and development require planning and implementing effective and efficient supply chain, and properly managed is a source of sustained competitive advantage (long-term success for the organization). If we reduce time to market, whether a new product platform, the expansion of new products in existing families, improvements in existing products or new products for new markets, it is necessary:

- Coordinate multiple activities included in the product development
- Coordinate the activities of procurement and delivery, by developing a smooth integration with suppliers and customers
- Use the indicator Time to market as a critical measure of process (reduction)
- Define other indicators that relate the development and marketing activity with the financial impact for the organization and other members of the supply chain.

The organization must be clear about the process to reduce time to market of new products, as the future of business depends on the speed and success to sell new products in existing markets or new, and therefore, the appropriateness its supply chain for this purpose. The supply chain must adapt to strategies for the research and development of new products, we must be clear about the activities of generating ideas, planning the development of new products, industrialization, the launch.

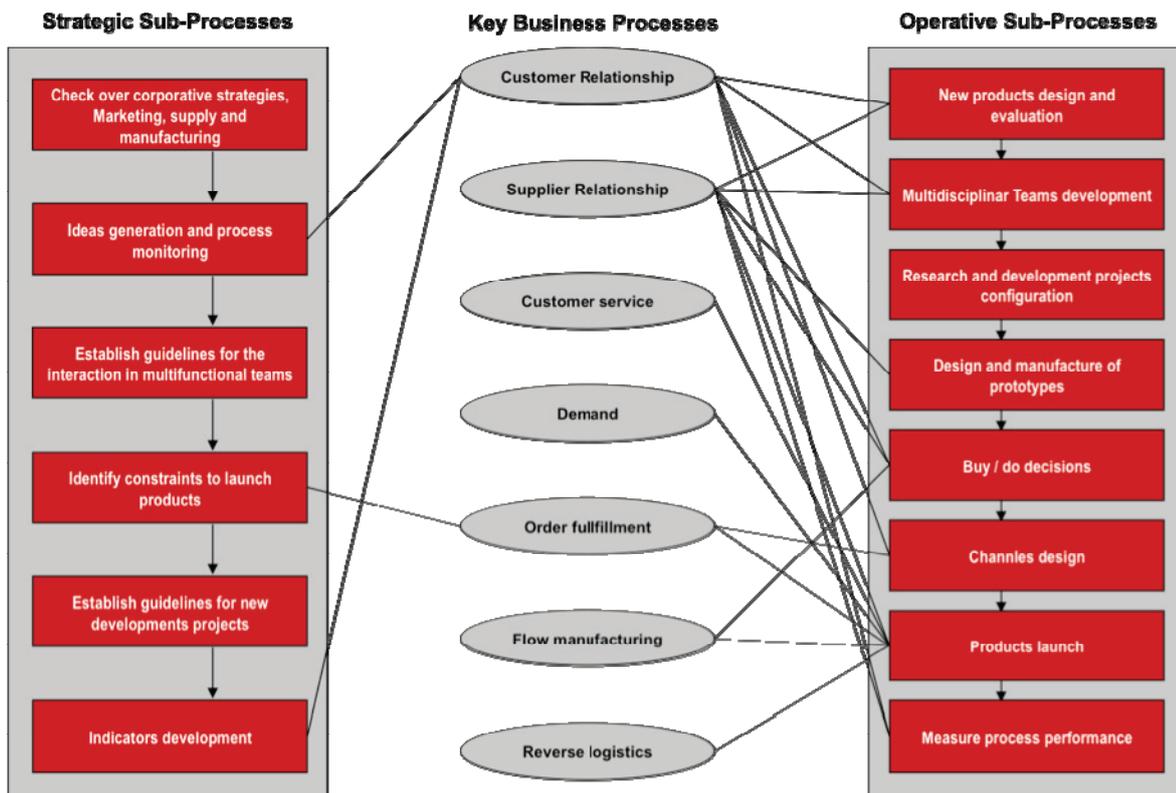


Fig. 2. The integration of the R&D process with the key business processes

Source: Douglas M. Lambert, Editor, Supply Chain Management: Processes, Partnerships, Performance, Third Edition, Sarasota, FL: Supply Chain Management Institute, 2008, p. 146.

3. The Demand Management

The research and development and innovation, and its subsequent manufacture and

distribution, of new vehicles will be designed to cover the requirements of a society's demand for safer and durable vehicles, addition to the requirements of the governments to meet goals reducing the carbon footprint.

The demand Management process aim is to coordinate the research, development and innovation, supply, manufacturing and distribution with the expected demand by reducing uncertainty as much as possible of the variability of the same, so we are prepared to respond quickly to any request for an unforeseen demand. Much of the variability of demand is inevitable, but we have an organization ready and flexible to reduce the impact of reductions or dramatic increases in demand.

Proper management of demand determines the level of provision required by integrating all processes, analyzing the sources of data using different forecasting systems (VMI, Collaborative Planning Forecasting and Replenishment, traditional,) and reviewing the effectiveness of results. The type of product and process delimited us the kind of foresight to make, as new products include a long-term forecasting difficult and used traditional methods such as DRP pair reduce forecast errors and standard products have a low level of uncertainty using innovative methodologies in order not to overstate inventory. Undoubtedly, collaboration with key customers reduces demand uncertainty, being a direct source for its calculation. Having defined the forecasting methods and sources used, we define the information flow of data needed and consensus procedures with other key processes, creating a flow of communication that it has a direct impact on business strategies and the members of the global supply chain. Streamlined information flow will allow us to synchronize sales and purchases, distribution and storage decisions, knowing fully our capacity and our manufacturing flexibility and responsiveness, acting where the supply chain is not ready to absorb the expected demand.

4. The Customer Relationship Management

The proactive company promotes activities to develop and maintain relationships with customers, based on the segmentation of the same in terms of their strategic value over time, increasing satisfaction and loyalty by customizing products and services. The process of relationship with customers is critical because of the pressure of competition, recognizing that not all customers are equal from the standpoint of our benefits, and knowledge of our ability to retain customers affects the profitability the organization, so it must be carried out by a multidisciplinary team able to coordinate strategic operations supplier - customer, who can mobilize all areas of the organization to allocate resources in a manner consistent with the profit potential of each relationship, displaying turn operational teams for each customer account / customer segments we have defined. It should define rules for deciding which customers deserve customized contracts and which customers are grouped into segments and provided with standardized contracts, using segmentation criteria such as profitability, growth potential, size, aspects of competitive positioning, access to knowledge of the market share objectives market margin levels, levels of technology, resources and capabilities, strategic alignment, distribution channels, buying behaviours, ..., it is important to note that the assimilation of this key process should enhance the benefit of each supplier and customer, so the profitability reports for each are required.

The customer relationships to integrate with other key business processes allow us to specialize and concentrate on design, development and manufacturing so that they jointly manage the environmental risks and costs of compliance with existing or new rules, to improve products and processes as well as quality and productivity, make decisions towards green economies and create brand differentiation and customer royalty.

5. The Customer Service Management

Customer service covers the whole range of activities that our organization administers and

manages defined contracts in the process of relationship with customers, manages a centralized point of contact where the client can learn everything you need (technology information) and develop guidelines for incident response service proactively. The proper process of customer service in the organization must integrate the onset of proactive communication when identifying incidents, coordination of the resolution / response effect emerged on the client, identifying and communicating to the sales force opportunities for increased sales, the feedback about our organization and the outcome of our products and the assurance that the company is fulfilling the contract agreed with the client.

In this way, we must develop a service infrastructure to meet the commitments included in contracts, with clear objectives, indicators with which we will measure the customer service process, the system alerts and signals that we use to initiate and coordinate response actions all across the entire supply chain.

6. The Manufacturing Flow Management

Manufacturing management in a supply chain management must integrate the culture and concepts of Lean Manufacturing, culture and way of thinking and acting directed towards the elimination of the 7 types of waste: overproduction, waiting and delays, material transport, stocks and inventories, process optimization, zero defects and displacements.

Lean is basically everything about getting the right things at the right place at the right time, in the right quantity while minimizing waste, being flexible and open to change. The manufacturing flexibility reflects the ability to manufacture a range of varied products in the agreed deadlines, responding to changes in the market in the shortest time and lowest cost. So we need to be closely related to areas such as logistics (internal and external), procurement (purchases), relations with suppliers, customer information, research and development, innovation.

The development of new products of the future must be accompanied by new processes also more cost effective, changing the behaviours and operations along the value chain, and can only be achieved if we integrate the concept read in all the key processes through the supply chain.

We define the capabilities, requirements and benefits we have to, know that if benefits are below the expectations of customers, miss opportunities, and if we are above them, we may be consuming resources that customers do not give us proper compensation. The organization's competitive advantage depends on the manufacturing cost, quality, delivery, reliability, so it is absolutely essential coordination and integration with other key processes in the supply chain. In addition to having a manufacturing system able to adapt to changes in demand, we have to anticipate future changes (new products, materials, technologies, ...) with new requirements (knowledge, environmental, legal, ...).

The manufacturing processes management must be integrated by the best suited cost and flexibility focused and oriented to customer, with a product and information flow integrated into the supply chain management with appropriate human resources and planning and production scheduling management agreed on a multidisciplinary team with information on all key processes. The current production should be identified with the concepts of lean manufacturing in an environment of continuous improvement evolving, implementing and assimilating the by the personnel tools such as 5 S, SMED, TPM, Six Sigma, Kanban, Kaizen, having into account the principles of Lean Manufacturing are:

- Perfect quality to the first - Detection and solution of problems at their source with a goal of zero defects
- Minimisation of waste - Optimized use of scarce resources (capital, personnel and spaces), deleted all tasks, operations, processes and functions that deliver value.
- Continuous improvement - Reducing costs, improving quality, increasing productivity and information management
- "Pull" Processes: Customers are starting, not just manufacturing, but all key organizational

processes

- Flexibility – Produce Just in Time a variety of products without sacrificing efficiency due to lower production volumes
- Building and maintaining a long term relationship with suppliers and customers through agreements to share the risk, cost and information

7. The Logistic Management

Key process for proper integration of all others, and channeling the product and information flow. Currently, the increasing competitiveness of enterprises depends directly on the optimization of logistics flows, taking into account the need to buy from low cost countries, the logistics of supplying adequate to provide the raw material at the right time, and not before so as not to increase our stocks and inventory costs, optimizing internal logistics, manufacturing flow, minimizing intermediate stocks and streamlining the flow of operations and product, finished product warehouses management, optimizing the rotation by lean production, and an appropriate distribution logistics to customer requirements to serve in time, quality and cost, finally, today, everything is logistic, this is, the proper management of the supply chain.

The profitability depends on the degree of thoroughness with which they have assimilated the operation in a lean manufacturing environment for the entire management of the supply chain, receiving, manufacturing and issuing orders Just in Time, this is, tight stocks to a minimum, reduced maturation period of product and delivery times, finished product almost non-existent ...

8. The Supplier Relationship Management

The current market and the need to reduce costs requires us to establish close relations with a (small) group of key suppliers, as defined by the value they bring to the organization over time, and establish more traditional relationships with the rest.

As discussed above, the company that it wants to increase its competitiveness innovating in its product and process must integrate their key suppliers in its supply chain, as it depends on the speed of reaction when the customer activates the order, how smaller can be the ripening period and an adequate political cost, plus increase our profitability. The relationship with suppliers is important for both the competitive market, being competitive in costs, as the benefits of a close relationship to the design and brings innovative products to market. Supplier Relationship processes and customer relationship are the "joints" of the supply chain, both the one and the other are the beginning and the end of the supply chain, and the goal is to optimize product flow and information between them for improving their competitiveness, innovating together.

In the future, companies must ensure the sustainability of the companies who provide services or commodities and to take responsibility for end of product life cycle, which is essential for the design and implementation of partnerships and the integration of suppliers with their customers.

The customer relationship management optimization must be integrated by the purchasing needs adequate to manufacturing capabilities in particular, and the entire global supply chain, being the aim the total integration of the supplier in the organization management system, with full transparency in the planning and scheduling orders, and the manufacturing system, integrating the supply by the supplier to the same work place, and all this by working on improving for both parties, assimilating win-win culture.

9. The Reverse Logistic Management

The Reverse Logistics covers all the activities related to returns, end of the life cycle o products, filtered (controls set so that only items allowed to make the feedback loop) and minimization (reduction / elimination of returns when they are not desired), developed by the organization and that also affects members of your supply chain. The proper management of this

process not only leads to the efficient management of reverse flow, but also identifies opportunities to minimize unwanted returns and better control of assets reused (e.g. containers). Each type of return requires a different management, it can have different impacts, or may or not affect the end user, and require decisions in one or more members of the supply chain.

- Returns of customers: For changes required by customers or quality issues. They are the most important of the returns. Each organization can establish a more or less lenient with returns (if the customer does not have problems returning, continue to buy)
- Returns of marketing / sales material generally returned by the next member of the supply chain by: lower sales than expected, quality issues, renewal of inventory, the customer decides not to use that product in the future, seasonal products overproduction or excess shipments. Some of these returns are also due to management practices of the Direction. Overloading the end of the sales control channel to reach short-term financial results, can cause a high rate of returns. Inadequate incentive systems produce undesirable behaviours, dislocating the objectives of the organization with the outside sales (i.e. not associate bonus sales returns)
- Return on assets. Recapture and re-launch of assets. They are assets that management wants to see returned: containers, cages, ...
- Product recalls. Caused by quality issues and / or safety. Made voluntarily or forced by the Administration. In this case communication is key to effective planning and implementation of the withdrawal.
- Returns to environmental issues. For the implementation of environmental legislation. In a short term the governments will be more demanding environmental legislation, so the design of products should be developed along with the global supply chain, including reverse logistics at the end of its life cycle.

As we see the sum of knowledge necessary for the proper management of the process requires the participation of a multidisciplinary team in collaboration with internal customers and suppliers. Returns may represent 6% of revenues and logistics costs of these 4% of logistics costs of the company, so we must establish an efficiently reverse process for returns by Innovation, the Gatekeeping (filtering), reduced time to decision of destination (reuse or withdrawal), the use of computer Systems, centralization of back centres, zero defects, remanufacturing and reparation, asset recovery, negotiation, financial management of accounts, outsourcing, prevention,...

These are the key Business processes that we must link and integrate throughout the overall supply chain and in all the stakeholders, but we need to promote the innovative partnership models for integrating these actors and processes, based in the new trends for cooperating in a long term for the product and process innovation.

10. The Partnership Models in the future

The supply chain must share a common goal of development and subsequent production, sharing a business model that is the basis for modern consumer satisfaction, while preserving the environment and complying with the rules.

The alliances in the future must be a particularized relationship based on mutual trust, open mind, sharing risks and benefits, business results achieved higher results than the sum of both parts separately (without establishing alliance).

The relationship is detailed, and we must profit from this particularity, as we use the time and talent on both sides have to yield results researching, developing and innovating new products and processes. The alliance also supports the reduction of costs and repeated efforts. The Alliance of a supplier with an industry leader can give prestige and stability for the new and instable markets,

achieving developments and new products, otherwise never would be able to design and develop, being more competitiveness in the current markets.

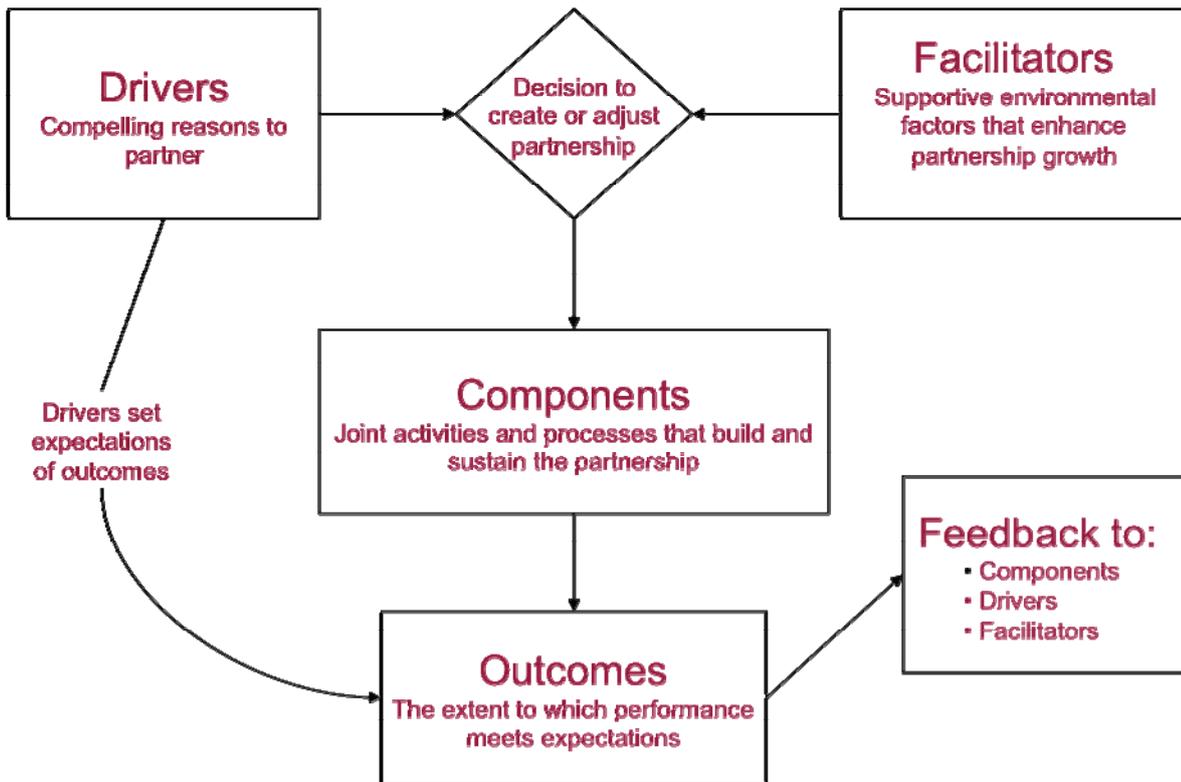


Fig. 2. The Partnership Model developed by Douglas M. Lambert

Source: Douglas M. Lambert, Editor, *Supply Chain Management: Processes, Partnerships, Performance*, Third Edition, Sarasota, FL: Supply Chain Management Institute, 2008, p. 261

As each partnership depends on: factors that motivate the operating environment, strength and closeness of contact and areas of the relationship, we can develop three general cases:

- Level I, committed to improvement. Both parties are recognized as partners in a limited way and coordinate activities and schedules. Normally, the alliance is focused on short-term and reaches a functional area / division of each organization. The highest percentage of alliances is of this type.
- Level II, operational alliance. Organizations are involved beyond the coordination of activities and schedules. Although not expected a relationship to "life" if it works long term. There are several functional areas / divisions of each organization work together.
- Level III, strategic alliance. Organizations to integrate their operations in a significant percentage. Each organization perceives the other as the "extension" of itself. Normally not end in the date of the alliance.

References

- [1] Lambert, Douglas M., *Supply Chain Management: Processes, Partnerships, Performance*, Third Edition, Sarasota, FL: Supply Chain Management Institute, 2008