

A Supply Chain Paradox

Anson Li

The University of Auckland
Department of ISOM, Level 4, OGGB,
12, Grafton Rd, Auckland, New Zealand
Telephone: +649 3737599 ext. 83730

Fax: +649 3737430

Email: akt.li@auckland.ac.nz

Kambiz Maani

The University of Queensland, St Lucia Campus

Level 5 Hartley Teakle building

St Lucia, QLD 4067 Australia

Telephone: +61 7 3365 4815

Fax: +61 7 5460 1324

Email: k.maani@uq.edu.au

Abstract

Supply Chain Management is a critical paradigm for success in today's capitalistic business environment. Among the numerous supply chain theories, however, a major theme of 'collaboration' emerges. Should individual businesses in supply chains operate in a 'winner-takes-all' mode of capitalistic local optimisation, or should they collaborate, cooperate, and co-exist as a communal and symbiotic organisation where individual partners are willing to compromise and even sacrifice in order to globally optimise for the whole supply chain? Is there some kind of stance between such extremes that makes better sense?

This study explores the relationships among supply chain partners through multiple perspectives, including systems theory, systems analogies, and mini case studies. Models and frameworks developed in this paper propose a new research interest area in the dynamics of supply chain collaboration.

Keywords: Supply chain management, collaboration, operations management, systems archetypes, business cases.

Introduction

Supply chain management (SCM) and collaboration is a critical success factor in today's business environment. Managers are well aware that, in order to deliver better customer value, the whole supply chain incorporating the extraction of raw material to the sales to end users must be well coordinated through successful collaboration. This popular idea, however, is not exactly in-line with most capitalistic business philosophies. While supply chain collaboration promotes coordinated operations where its partners focus on optimisation at the global level for the whole supply chain, the individual partners are essentially independent business entities which inherently strive to maximise its own performance. This goes against general systems theory, which stipulates that global optimisation at the systems level may not be achieved when the individual parts are locally optimised with their own individual objectives.

This paper explores such paradoxical phenomenon in supply chain collaboration using systems theory, analogies, and case examples. Dynamics of collaboration are portrayed using system dynamics models. The outcomes of this paper sheds light upon systemic collaboration issues at multiple levels of supply chain management.

The Contemporary Perception on Supply Chains and Supply Chain Management

Supply chain management is a popular management concept. Supply chains consist of groups of business entities that process, produce, and deliver particular products from its original materials through to the point where the final product reaches the customer. Due to the nature of supply chains, where a multitude of individually owned and operated companies are involved, their management and coordination is critical.

Supply chain management (SCM) is generally defined as the “management of activities that procure materials and services, transforming them into intermediate goods and final products, and delivering the products through a distribution system.” (Heizer et al. 2004). This illustrates the basic purpose and nature of supply chains. Definitions by other authors, including Schroeder (2004), Raturi (2005), Gardiner (2006), Russell et al. (2006), Krajewski et al. (2007) promoted also the significance of information in supply chain management, that while physical goods and services move downstream along supply chains, a reliable flow of information regarding inventory, process capabilities and product specifications must also be facilitated upstream in order to coordinate the supply chain. A typical description of a supply chain in action is shown in Figure 1 (Gardiner, 2006).

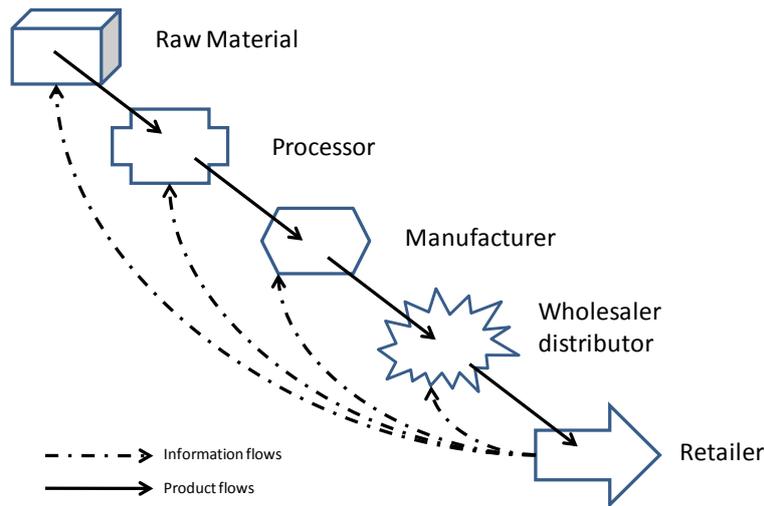


Figure 1 Product and Information Flows in Supply Chains

The general concept of supply chains and their management are well complemented by other critical ‘ingredients’. These include ideas such as “coordinating activities across the supply chain” (Stevenson, 2005), “integrated approach for global supply chain and sourcing” (Gardiner, 2006), “linking the company with the operations of its suppliers, distributors, and customers” (Bozarth et al. 2006), “interconnection of organizations” and “holistic approaches” (Slack et al. 2007). These theories highlight the fact that even though the businesses along the supply chain are independent entities, they should operate as ‘partners’ who work in a coordinated manner in order to achieve a “greater common good” for the supply chain as a whole.

A Paradox

The notion of supply chains and supply chain management poses a paradoxical condition. A supply chain excels and optimises when all its partners are well coordinated to work towards the common goal of delivering the final product to the customers, in the most efficient manner. This is the key objective of a supply chain.

At the individual company level, all partners are, on their own, independent businesses. The usual key objective of businesses in capitalistic environments is to maximise their gains (profits, sales, market share).

According to systems theory (Ackoff 1993), however, optimisation of any system as a whole is never achievable when all parts are locally optimised. In the supply chain context, therefore, optimisation of the chain as a whole is not feasible if the individual businesses are busy maximising their own profits, sales, and market share, while working in isolation from the other partners.

Supply chain studies and anecdotal evidence suggest that effective supply chain coordination involves ‘sacrifices’ and ‘compromises’ from its partners (especially the smaller-sized businesses) which divert their effort from their inherent objective to optimise their own performance. These include product design/specifications imposed by buyers, and updating information systems to accommodate compatibility with other

partners. While businesses are well aware of the potential benefits, most managers are reluctant to implement such initiatives due to the investments involved and issues of sensitive trade information being exposed. Thus, a paradox emerges. To collaborate, or not to collaborate? That is the question.

An extreme analogy of such paradoxes is a people's commune in a communist state, where all inhabitants work (eg. in fields and factories) towards the goal of maximising outputs of the commune as a whole. All of the inhabitants are educated about how their contribution to the greater common good is critical, and that everyone gets an equal share of the rewards at the end. However, as human beings, all individual members of the commune have an intrinsic nature of local optimisation, where they perceive that it is only fair to get more rewards for harder work, and thus, will tend to refuse contributing actively without extra direct rewards and incentives.

However, one should not rule out the possibility of individual entities working towards a greater common good, even when it involves sacrifices and compromises. This is shown by the analogy of charity. At the individual level, most people believe in getting a fair reward for their work, and that they should maximise such rewards. However, charity is a common phenomenon in the modern world where people give up a portion of their hard earned money to support people in their community. While this seems contradictory to individual goals in monetary terms, most people would happily participate in charity. (Perhaps the participation and knowing that they have made a difference is in itself a 'reward' to the individual).

This paper aims to study the phenomenon of supply chain management through the lens of such paradox. What are the common views of collaboration in supply chains, and how do the different views impact the outcomes? What are the long-term implications of different collaboration approaches? These questions are explored using systems theory and are further discussed in this paper.

Supply Chains as Systems

Among the literature surveyed in this study, the definition of SCM by Chase et al. (1998) shows a very comprehensive description of the supply chains' collaborative nature – “The idea [of SCM] is to apply a total systems approach to managing the entire flow of information, materials, and services from raw-materials suppliers through factories and warehouses to the end customer.” A “system” is defined by Maani et al. (2007) as

“a collection of parts that interact with one another to function as a whole. However, a system is not the sum of its parts – it is the product of their interactions (Ackoff, 1993). This means that when a system is taken apart it loses its essential properties and so do the parts. When an engine is separated from a car it loses its function and so does the car (ie. Motion). A system subsumes its parts and can itself be part of a larger system.”

Putting this definition into the supply chain context, the supply chain as a system consists of a number of business entities (partners), which take the role of the “parts”

that interact with one another so that the “system” of supply chain functions as a “whole”. Moreover, the supply chain is not just the sum of all its partners. Instead, the proper functioning of a supply chain depends on its partners’ interactions. Once the supply chain is taken apart, it loses its properties, and so do the individual partners. Therefore, it is reasonable to conclude that supply chains, as systems, should be managed properly with a “total systems approach” (Chase et al. 1998).

A total systems approach may support management issues from the individual company level up to the interactions among multiple supply chains (individual companies are systems in themselves, and supply chains can in turn be parts of bigger systems). In the general SCM context, the basis of an appropriate systems approach may be discussed using the analogies of the perfect automobile and teenage superheroes.

i. The Perfect Automobile

Most operations management and SCM textbooks and teachings suggest that one of the key success factors is to source from quality and reliable suppliers, rather than to base supplier selection entirely on costs. In a systems perspective, however, the effective operation of the system is not only about how good the individual parts are. The interactions among the parts are more important. Consider the following example of a “perfect automobile” project (Ackoff, 1993), where a car manufacturer wants to build the best car ever, based on reverse engineering. The company acquired every single model of cars that has ever been manufactured, and have all of these cars thoroughly tested by engineers. At the end of the testing, the engineers reported that Model X of Brand A has the best engine, Model Y of Brand B has the best suspension system, Model Z of Brand C has the best transmission system, and so on. Based on these results, the design of the perfect automobile is finalised as a combination of all these best parts from different models of different brands. It is a brilliant idea to put together all the best parts, but this project will inevitably fail due to the fact that all these individual parts cannot be put together because they were not designed to work together. The moral of this analogy in a SCM context is therefore, it is not good enough to just bring the best suppliers on board. It must be ensured that the partners along the supply chain can interact in an effective manner in order to prosper. Thus, the ever so popular idea of collaboration along supply chains.

ii. Teenage Superheroes (Power Rangers, Voltron, and others...)

Systems theory, as discussed above, suggests that the system as a whole may not be optimised when its individual parts are independently optimised (the perfect automobile analogy). That means, in order to optimise the system, some of its parts may have to compromise by performing sub-optimally to facilitate better interactions with other parts. This counter-intuitive concept is illustrated by the following analogy.

Consider children’s television shows such as the Power Rangers and Voltron (Figure 2).

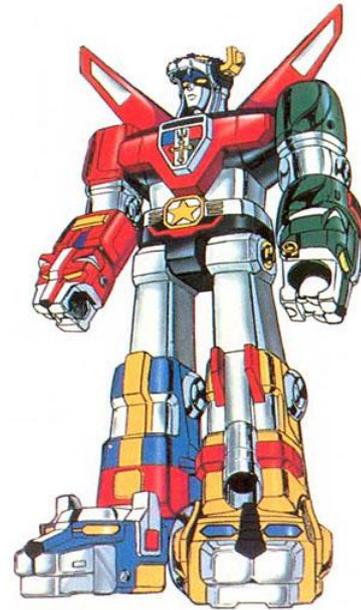


Figure 2 Teenage Superheroes - Power Rangers and Voltron¹

These teenage superhero shows usually feature a team of five teenagers, fighting against alien evils to protect the planet Earth from harm. While fighting with alien monsters, it is typical for the team to summon their individual vehicles to their aid. These individual vehicles will eventually combine to form a robot (such as the one depicted in Figure 2) which wins the fight at the end. The robot, as a system, consists of five main parts. The head and torso, the two arms, and the two legs. It is through the effective interactions among these parts that the robot wins the fight. Notice that the parts play different roles. The two legs are responsible for movement, and they bear most of the weight of the robot. The arms are responsible for attacks and defence. They do most of the hard work, and they sustain most damage while blocking blows to the head and torso, which houses the central control of the robot.

The moral of this analogy is that, for the system to optimise as a whole, some of the parts may have to work at sub-optimal conditions, or to even sacrifice their benefits as a compromise for other parts. This has also been discussed earlier in the example of charity. In the supply chain context, one can apply similar assumptions, that even though the individual business entities along a supply chain are individual operations, usually with objectives to optimise their performance in terms of profits, sales, and market share; there may come times when it is inevitable to compromise their performance for the optimality of the supply chain. An example of this is seen in a study by Croson et al. (2005), where a series of computer simulation experiments showed that inventory information sharing is effective in reducing the magnitude of bullwhip effect. Such benefits are only realised when information is shared up-stream. That is,

¹ <http://www.coloringdrawings.com/coloringpictures/coloringpowerrangers/wallpaper-powers-rangers/wallpapers-powers-rangers5.jpg>
<http://www.oafe.net/yo/art/voltron13.jpg>

when the top of the supply chain has access to inventory information of every down-stream operations. Under such arrangement, general bullwhip effect from these experiments is significantly dampened across the supply chain (Manufacturer and Wholesaler), with the most benefits going towards the top end of the supply chain. This is apparently a good initiative for the supply chain as a whole. However, while the down-stream operations have to give up their information without getting anything in return from up-stream, they do not enjoy much of the overall benefits as well. It is the upstream operations that gained most information (without having to give out much), and reaped most of the benefit through their dampened bullwhip effect. The down-stream operations have become the arms and legs of the Voltron robot, where they had to compromise and contribute for the greater common good of the supply chain, without getting much in return at the individual level. This gave rise to the idea of equity in supply chain operations, and initiatives such as profit sharing among supply chain partners.

Collaboration and Optimisation

Collaboration is a central theme to effective supply chain management, as discussed in previous sections with reference to supply chains' systemic nature and the systems approach. In order to facilitate effective collaboration, supply chain partners must understand their role as parts in the system. They must be ready to interact with the other partners in a systemic manner, and they may have to compromise by performing sub-optimally at times to facilitate global optimisation at the supply chain level.

A survey of supply chain literature (textbooks, in particular) in the past decade does show an emerging theme of collaboration in SCM. Partnerships among supply chain partners are being encouraged, with common tactics including information sharing, long-term relationships, joint decision-making, planning, and design. Such tactics should be based upon trust and the sharing of risks and rewards (Schroeder 2004, Raturi et al. 2005, Krajewski et al. 2007, Bozarth et al. 2008, Heizer et al. 2008, Russell et al. 2009, Slack et al. 2009).

These tactics and ideas, however, are often portrayed in linear contexts. For example, most theories and studies suggest that long-term buyer-supplier relationships lead to higher reliability, quality, and flexibility. While these are credible claims, they lack in details, including how such tactics may be implemented to achieve the benefits, and the underlying dynamics of such implementations, especially in the long run. A literature example that address such shortcomings in theories is Krajewski et al.'s discussion on supplier relations (2007), in which the various supply chain collaboration tactics were discussed with respect to two extreme modes of buyer-supplier relationships. A "competitive" and a "cooperative" orientation.

The competitive orientation views negotiations between buyer and supplier as a "zero-sum game". That is, "whatever one side loses, the other side gains". In such a mode of collaboration, the buyer and the supplier work closely under such arrangements. The buyer may force the supplier's prices down in return for business opportunities, while the supplier may press for higher prices for better levels of quality and flexibility. The authors suggest that purchasing power "determines the clout that a firm has" to bargain

a better deal. In short, buyers and suppliers in such relationships work closely in an adversarial stance. The ultimate objective for the company with the upper-hand is its optimisation at the local level.

In contrast, the cooperative orientation features buyers and suppliers working closely as “partners”. Krajewski et al. (2005) highlighted the fact that partners in such relationships are “helping the other as much as possible” with “long-term commitments, joint work on quality, and support by the buyer of the supplier’s managerial, technological, and capacity development”. Under such arrangements, the number of suppliers are often limited, which then give rise to increases in order volumes, which allows the suppliers to “gain repeatability”, and thus moving towards high-volume operations at low costs. A cooperative orientation also means that the buyer shares more information with the supplier on its future buying intentions, thus allowing suppliers to make better forecasts of future demands. Buyers may also suggest and assist in suppliers’ improvements, which may result in future reductions in inspection and quality problems for the buyer.

The relationship theory by Krajewski et al. shows a spectrum of different modes of supply chain collaboration, with the purposes to achieve local or global optimisation. As shown in the examples above, collaborative tactics may be implemented in very different manners, and thus resulting in very different outcomes. The up-coming sections of this paper aims to explore such implementation issues using two business cases, followed by a discussion on the dynamics of different implementation styles, and their archetypical implications in the long run.

The Exploitative and Cooperative Continuum

Based on systems theory and Krajewski et al.'s (2005) theory in buyer-supplier relationships, this study explores the supply chain paradox and the implementations of supply chain collaboration tactics using a continuum of approaches. The extremes of this continuum are defined as "Exploitative collaboration" and "Cooperative collaboration" (Figure 3).



Figure 3 The Collaboration Continuum.

- **Exploitative Collaboration**
The exploitative collaboration approach takes the perspective of one particular business entity in a supply chain, and contemplates from its point-of-view about how it should collaborate with its suppliers and customers. The primary objective for this extreme is to maximise customer value through local optimisation. Suppliers may compete for orders, usually with pricing incentives. Innovations of suppliers may also be exploited, with minimum loyalty (Slack et al. 2009). Furthermore, Russell et al. (2009) promoted the idea of "supplier teamwork", where the ability of suppliers to deliver "on-demand" is considered important in a supply chain relationship, with the objective to minimise inventory at the buyer's end. Suppliers are also expected to "help their customers lower product cost by lowering the price of its goods and services". Other responsibilities of suppliers include supplying information, contributing in design, fast response, meeting demands for quality, lowering inventory, and prompt delivery. In short, suppliers in the chain are responsible to support the end retailer to maximise customer value.
- **Cooperative Collaboration**
At the other end of the continuum, cooperative collaboration takes a more systemic perspective in managing the two-way relationships and interactions between supply chain partners. Heizer et al. (2006) in particular discussed in depth about managing supply chains with such an approach. Central to this idea is the fact that supply chain activities happen among "separate and often very independent organizations". As a result, "serious inefficiencies" may happen. Supply chain issues should be handled by managing two-way relationships between suppliers and customers. Any partner's actions should be mutually beneficial, and that assistance between each other, such as information exchange, must be reciprocal (Stevenson, 2005).

The primary objective of the cooperative collaboration approach is to facilitate an integrated supply chain. The issue of local optimisation and the members' inclination to focus on maximising local profit or minimising immediate cost

based on their limited knowledge (Heizer et al. 2006) should be minimised with a good systemic perspective on the supply chain as a whole.

Examples of tactics in these two approaches are discussed below, based on case studies on two companies. Toyota Motor Corporation, a Japanese car manufacturer, and Wal-Mart, an American retail chain.

Toyota and Wal-Mart's Supply Chain Collaboration Philosophies

Toyota and Wal-Mart, different in their backgrounds, product specialties, and operating philosophies, are both renowned as pioneers in supply chain management, in terms of their innovations, strategies, and practices (Ireland et al. 2005, Iyer et al. 2009). Both companies have a common objective to maximise customer value and satisfaction through effective and efficient supply chain management.

There are certain commonalities and differences between the two companies' SCM approaches. To start with, both companies aim to collaborate with its suppliers, and thus limits the number of suppliers they purchase from. Both companies aim to reduce costs along the supply chain in order to create better value for customers, and in order to support that, both companies promote efficient information sharing with its suppliers. Looking deeper into these common aspects, however, the approaches to achieve these goals are significantly different. The following section outlines examples of Toyota's and Wal-Mart's supply chain management approaches, based on case studies of these two companies.

Toyota Motor Corporation

The key to success in Toyota's Production System is the careful management of relationships along the supply chain. This is reflected in Iyer et al's (2009) description of Toyota's operating philosophy, where customer value and the stability of its supply chain go hand-in-hand. While Toyota aims to maintain stability in its supply chain through limiting the number of variants in its product range, a reasonable level of product value must be offered to customers in order to compensate for the lack of choice. Given the large role played by suppliers in Toyota's supply chain, such value creation must begin at the suppliers.

According to Teresko (2006), Toyota's supplier collaboration targets value in both vehicle pre-launch and post-launch situations. Prior to the launch of a particular model (about two or three years), supplier collaboration focuses on identifying and solving potential problems to the mutual benefit of both parties. Key issues at this stage are usually focused on product design. For example, the packaging of new parts. Even though a minor issue, getting the packaging design right in a collaborative manner saves a lot of future costs throughout the supply chain. Considerations in this aspect include how the packaging "interfaces with the supplier's process, product shipment and finally with how the part moves into production at a Toyota plant... the packaging of a purchased part can produce winning results in every venue – not only on Toyota's assembly lines." Such positive results encourage Toyota and its suppliers to further offer visibility about their operations (Iyer et al. 2009). With higher visibility and

clearer information such as Toyota's annual volume goals, both have a better idea about whether plans and targets are feasible, and adjustments can thus be made accordingly.

A whole different lot of issues in collaborative work surfaces once the product is launched (Teresko, 2006). The focus at this stage is on making it easier and less costly for the supplier to "maintain and even improve that low defect rate for delivered parts." Teresko stressed that "There's more value to be gained by collaborating with a supplier than by merely harassing them on cost."

Bearing such an important role in Toyota's operations, Toyota's suppliers are generally carefully chosen with a long-term perspective. Chosen suppliers are met with active support and other collaborative efforts from the car manufacturer. For instance, Toyota's objective in supplier management is to "minimize the number of suppliers and create long-term partnerships by nurturing existing suppliers to expand and grow with Toyota instead of growing the number of suppliers to induce competitive price bidding." (Iyer et al., 2009). Supplier evaluation criteria include assessment of management attitudes, production facilities, quality levels, and research and development capabilities. During the selection process, it is not uncommon for Toyota to visit the candidates' site, make observations, and comment on improvements. A supplier must meet extremely tough conditions to qualify. While some of the prospective suppliers are driven away by the stringent requirements imposed by Toyota's, others consider that requirement was to their advantage and held that the advice on improving quality and competitive factors provided by the technicians saved the cost of employing outside consultants. Iyer et al. illustrated this idea with an example of Toyota's prospective supplier that resulted in a win-win outcome:

"Toyota asked its potential suppliers to provide evidence that they could cut costs immediately with improved designs. One supplier came up with a design that was not only cheaper but simpler and better than that of Toyota's own Japanese supplier. The component was a simple gear stick knob costing pennies, but the British found a way of making it in two plastic parts instead of four, as in Japan."

Given the strict selection criteria and supportive advice from Toyota, the suppliers understand that they are entering into a long-term and loyal relationship with the car manufacturer once they are chosen. Suppliers are offered stable order commitments by Toyota, and in return the suppliers are expected "to use this opportunity to develop superior quality products and achieve productivity improvements." Such quality and cost improvements are then "reflected in improved customer value." (Iyer et al. 2009).

Toyota manage its suppliers and maintain their relationships with certain policies that provide support, while at the same time ensuring that the suppliers' performance are up to standard. A key strategy is to establish policies that "prevent unilateral actions to change volumes or commitments. The use of a consensus approach, fostered by visibility across the supply chain, minimizes actions that result in additional costs at different parts of the supply chain." (Iyer et al. 2009). In managing some of the more important suppliers, Toyota would absorb a part of the business risks or even invest in equity positions in them. An example of this is Denso, a key electronics supplier of Toyota (Teresko, 2006).

In return for Toyota's support, suppliers bear responsibilities other than the basic requirements in terms of costs and quality performance and customer value. These include recapitalising on order stability to maintain delivery performance and productivity improvements. All suppliers to Toyota are expected to share their innovations with other suppliers that supply similar products. (Thus, being a supplier brings along with it an opportunity to receive ideas generated across the supply network) (Iyer et al. 2009). Amongst the committed suppliers of Toyota, many of them carry specialties including wide ranges of patents for specific processes and the flexibility to adjust for demand changes in a timely and efficient manner. At the occasions of problem solving support, whether from Toyota or from the suppliers, personnel from both parties may dedicate substantial periods of time (up to months) working closely together. Such approaches tap into the knowledge base of the supplier network effectively.

In terms of contracts and price commitments, Toyota usually review prices with its suppliers every six months, "but the contract award is kept in place over the model life." (Iyer et al. 2009). While a long-term contract is offered, suppliers are kept under pressure to perform. Cost minimisation is a key objective. This is usually achieved by practising efficiency enhancing initiatives outlined by the Toyota Production System, including quality improvements, waste minimisation, and just-in-time delivery.

In the case of major problems in the supply chain, Toyota and its suppliers make short and long term measures in order to reduce immediate damages, and to maintain the sustainability of the solutions' impact. For example, with an immediate supplier problem such as a sharp drop in profits, experts from Toyota visits the supplier, observe, and suggest improvements. Such improvements get quick results but do not ensure that the supplier has imbibed the underlying principles. On the other hand, less urgent or long-term issues call for fundamental solutions. For example (Iyer et al. 2009),

"during the recession in Japan, only three of [Toyota's] main suppliers saw profit increases, while 57 saw profit and revenue decreases. Toyota responded by creating a kaizen promotion section within its purchasing department. The group worked with suppliers to decrease pay and cut investments and thus enable recovery of loss. In addition, suppliers were able to enhance their long-term capability. All of this works on an informal, personal level... the supplier is permitted to keep the gains from improvement due to Toyota's assistance."

On the whole, Toyota's supplier management approach shows key themes of mutual support, long-term perspectives, and the sustainability of results. Stability in the supply chain is critical, in order to promote the focus on creating customer value.

Wal-Mart

Another featured supply chain management pioneer is Wal-Mart, a major retail chain in the USA. Ehring (2006) pointed out that Wal-Mart became the "best supply chain operation of all time" by following two fundamental strategies:

1. It leverages its scale in multiple ways to create operational efficiencies that drive significant competitive advantage.

2. It uses its scale to create additional competitive advantage through best execution and supply chain investments.

Wal-Mart has always focused its operating philosophy on customer satisfaction (Ireland et al. 2005). The chain's executives understood, as early as in the mid 1980s, that effective supply chain management and collaboration would "enable the company to be more customer centric. Benefits for customers such as lower prices and reliable delivery can result from an effective supply chain. Further benefits for the business such as customer loyalty would thus be within reach. Wal-Mart understands that "if it does not take care of the consumer, then a competitor will".

Wal-Mart managed its operations as an "extended enterprise" (Ireland et al. 2005), an idea similar to supply chain management that was novel in the 1980s. One particular focus of Wal-Mart's collaboration approach is on information visibility. According to Ireland et al., Wal-Mart challenged the "prevailing mind-set" about the mistrust and the adversary relationship between retailers and their suppliers. The retail chain understood that if information such as point-of-sale consumption and future customer demand are shared with suppliers, both parties can effectively reduce inventory and other wasted activities, and thus costs could be minimised, and the savings can be passed along to the consumers.

Information sharing, of course, is not uncommon among trading partners in businesses in general. However, most retailers (such as Kmart), offered operational information for a price (Ireland et al. 2005). Such information is typically used by suppliers as market intelligence that "aided decisions about marketing programs and promotions." Wal-Mart, on the other hand, provides such information free of charge to its suppliers. For some major suppliers, such as Procter and Gamble, the extent of information sharing went as far as both parties' investment of proprietary knowledge and processes into each other to improve quality and drive costs out of the business (Ehring, 2006). As quoted by Fishman (2003), a Wal-Mart spokesperson claimed that "The fact is Wal-Mart, perhaps like no other retailer, seeks to establish collaborative and mutually beneficial relationships with our suppliers." Through its collaboration approach, Wal-Mart aims to improve its suppliers' performance. The chain makes its suppliers more efficient and focused, leaner and faster. Wal-Mart itself is known for continuous improvement in its ability to handle, move, and track merchandise. Less experienced suppliers are encouraged and urged to coordinate such improvements, with the help of a supplier development team, a free resource designed to enhance their capabilities to forge enduring relationships with Wal-Mart's managers and buyers. A recent example of Wal-Mart's collaborative initiative for coordination and efficiency is its announcement in 2003 that its top 100 suppliers must tag their product cases and pallets with RFID tags. It was envisioned that all of the mega-retailer's suppliers will fall under this directive by the end of 2006 (Boland, 2005).

Given the advancement and novelty in Wal-Mart's supply chain management philosophies, its approaches have met major criticisms, especially in terms of supplier relationship management.

For instance, Ehring (2006) pointed out that Wal-Mart is "notorious for leaning on its suppliers to drive down prices." Fishman (2003) also claimed that Wal-Mart has the "power to squeeze profit-killing concessions from vendors."

In order to achieve its objective to maximise customer satisfaction, Wal-Mart adhered to its promise to offer “everyday low prices”. As a result, especially on basic products, “the price Wal-Mart will pay, and will charge shoppers, must drop year after year.” (Fishman, 2003). Part of such reduction is of course achieved by the continuous improvement in its supply chain operations that drive down costs. However, the pressure from Wal-Mart towards its supplier to simply reduce prices plays an important part, and it is not uncommonly heard. Fishman (2003) in an investigative report, outlined some of the negotiation cases between Wal-Mart and its suppliers. Strategies such as “threats” to lower prices or to lose Wal-Mart’s business, and the strict 30 second delivery windows for suppliers, were discussed. It generally commented that Wal-Mart, in its collaboration with its suppliers, is legendary for quite straightforwardly telling them what Wal-Mart will pay for their goods. It is also typical for Wal-Mart to tell its suppliers to redesign everything from their packaging to their computer systems, in order to be compatible with Wal-Mart’s operations. When particular suppliers cannot perform to Wal-Mart’s requirements, the retail chain will source from some other companies, or they will produce the product themselves. Some suppliers are eventually forced to source off-shore where resources are cheaper, or simply forced into bankruptcy, which negatively impacts the US local jobs and economy. Mufson (2010) presented comments from China experts, that Wal-Mart’s guidelines to its Chinese suppliers could be more important than the orders from the Chinese Government.

Through such stringent collaboration approaches, Wal-Mart is successful in maintaining low prices while keeping close to suppliers who are up to the challenge. Fishman (2003) quoted one of the suppliers that “Wal-Mart does not cheat suppliers, it keeps its word, it pays its bills briskly... they are tough people but very honest; they treat you honestly.” And thus, in order to do business with Wal-Mart, vendors have to be “as relentless as and as microscopic as Wal-Mart is at managing their own costs. A particularly successful example of collaboration and the resulting improvements is Levi’s case, where according to Fishman (2003),

“Levi couldn’t have qualified to sell to Wal-Mart. Its computer systems were antiquated, and it was notorious for delivering clothes late to retailers. Levi admitted its on-time delivery rate was 65%... Getting ready for Wal-Mart has been like putting Levi on the Atkins diet. It has helped everything – customer focus, inventory management, speed to market. It has even helped other retailers that buy Levis, because Wal-Mart has forced the company to replenish stores within two days instead of Levi’s previous five-day cycle.”

The examples in these two pioneers, Toyota and Wal-Mart, illustrated a wide spectrum in approaches and tactics in effective supply chain collaborations, both within and across companies and industries.

Clear extremes of supply chain collaboration tactics were seen in the Toyota and Wal-Mart cases. According to Iyer et al. (2009), the “Japanese model” of supply chain collaboration encourages close relationships, competition over quality, delivery, engineering capability, high levels of information exchange, high levels of commitment, long-term relationships, and working with existing suppliers to resolve problems. The US model, in contrast, involves adversarial relationships, easy switching among suppliers, low commitment, price based competition for supplier selection, and a search

for new suppliers when problems arise. This is consistent with Teresko’s claim in 2006 that the Japanese model focuses on “building and maintaining collaborative supplier strategies”, while the US approach in general showed supplier relationships “hinging on cost-cutting demands”.

There are of course exceptions to such generalisations. As seen in the discussion above, Wal-Mart’s close collaboration with P&G shows dedication and commitment between the two companies, while Toyota admits that its relationships with some of the recent suppliers outside Japan are no longer as close as before due to the rapid expansion by the manufacturer (Anonymous, 2010). As suggested by Ehring (2006), “no company can invest in an unlimited set of relationships.”

All in all, both Toyota and Wal-Mart’s approaches and tactics towards supply chain collaboration falls along the collaboration continuum as follows, while Toyota leans more towards the “cooperative” end, Wal-Mart’s position is closer to the “exploitative” side (Figure 4). Both companies have achieved phenomenal success in supply chain management in their own ways.

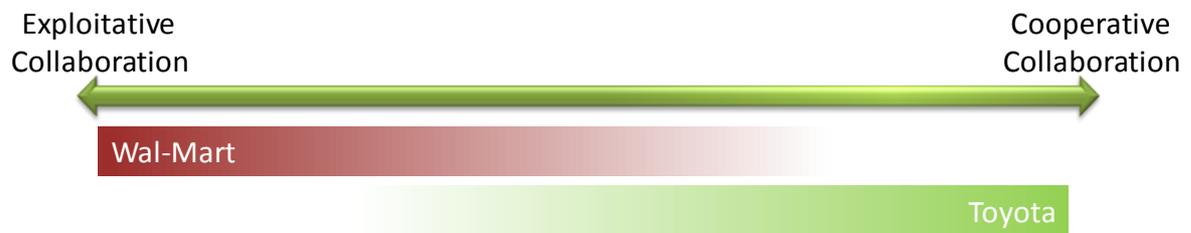


Figure 4 Toyota and Wal-Mart Along the Collaboration Continuum

Dynamics of the Supply Chain Collaboration Strategies

The Underlying Philosophies

Both ‘schools’ of supply chain collaboration strategies have shown their outstanding performance in the cases of Toyota and Wal-Mart. According to Iyer et al. (2009), Toyota’s supplier performance is consistently superior compared to its counterparts², and Wal-Mart still reigns as the world’s largest retailer and employer (Forbes.com, 2011).

The basic dynamics of the exploitative and collaborative approaches are portrayed in the following causal loop models (Figure 5):

² This claim is based on a Working Relations Index which ranks businesses over 17 criteria, including supplier trust of the OEM, open and honest communication, timely information, degree of help to decrease costs, extent of late engineering changes, early involvement in the product development process, flexibility to recover from cancelled or delayed engineering programs. “In 2005, the working index value for Toyota, Honda, and Nissan was between 298 and 415. The index for Chrysler, Ford, and General Motors (GM) was between 114 and 196. Eighty-five percent of the suppliers to the Big 3 OEMs characterize their relationship as ‘poor,’ with around half the suppliers claiming they would prefer not to do business with the OEM.” (Iyer et al. 2009).

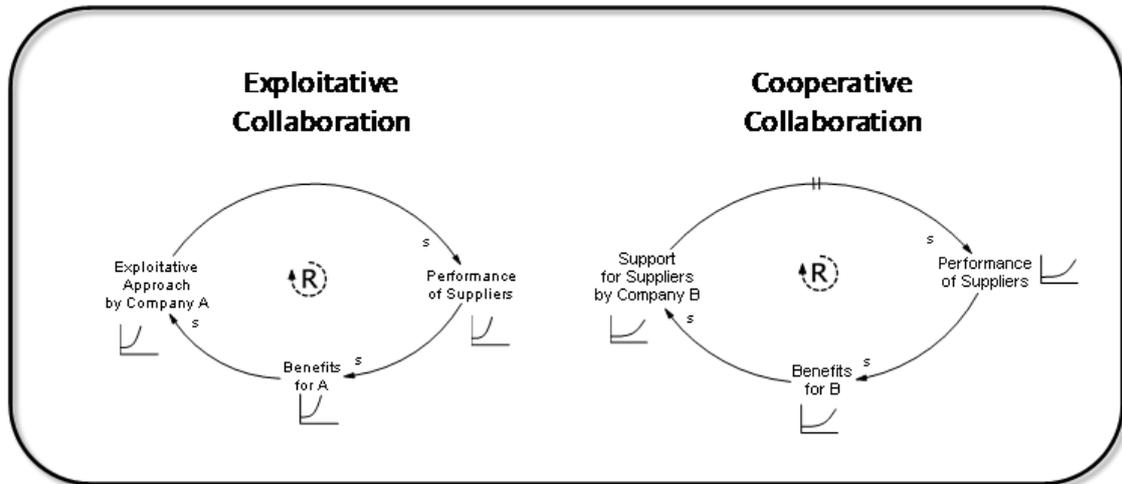


Figure 5 Basic Dynamics of the Extreme Approaches

With an exploitative collaboration approach, a business (Company A) tends to work closely with its suppliers with the main objective to improve customer value (for example, to drive down costs). This objective is achieved by imposing pressure on suppliers to cut costs, often through demands for improvements in efficiency, production cost cutting, and even out-sourcing. Company A may also require its suppliers to conform and align with company A's operations to further leverage efficiency. A key example of this is, Wal-Mart's 30-second delivery window for certain suppliers, and its design requirements for suppliers' packaging to conform with Wal-Mart's operations (Fishman, 2003).

The outcome of such approach (with stringent performance policies) is an increase in suppliers' performance. Suppliers endeavour to perform up to the required standards in order to continue supplying Company A. As a result of the cost-cutting and performance improvements from the suppliers, the benefits for company A increases, thus further encouraging the successful exploitative approach. This is seen in the more recent initiatives at Wal-Mart where suppliers are required to further conform to its policies in RFID implementations (Boland, 2005) and environmental/sustainability compliances (Turner 2010, Mufson 2010).

The cooperative collaboration approach shows a similar dynamic, with a slightly different pattern of outcome. Company B believes in cooperative collaboration with its suppliers. The suppliers are carefully selected based on their potential for criteria such as quality, delivery, and continuous improvement. Once the suppliers are chosen, Company B commits funds, investments, time, and effort into these suppliers, by the means of collaborative design, assistance in problem solving, and investments for improvements, with the vision of product and process quality improvement, cost reduction through coordination and elimination of wastes, and customer value enhancement. Such effort results in improvements in the suppliers' performance after a delay (time taken for nurturing the suppliers). Such improvements provide benefits for Company B, which may reinforce further practice of similar approaches towards supplier collaboration.

The reinforcing dynamics shown in the casual loop models are the basis of both the exploitative and the cooperative approaches of collaboration, towards the objective of more efficient supply chain management and better customer value.

Dynamics Over Time

Looking at the supply chain environment of Wal-Mart, it is apparent that the retail chain is following its collaboration philosophy all along, with reinforced actions such as continued focus on price reductions from suppliers, imposing new and more stringent policies on suppliers in terms of packaging, stock keeping (use of RFID tags), and environmental/sustainability initiatives. While such improvement initiatives are, according to Fishman (2003), effective encouragements for some suppliers to continuously improve (cases such as Procter & Gamble and Levi's), for the smaller suppliers, the on-going demand from Wal-Mart to cut costs and improve has proved to be a burden. For example, with Wal-Mart's new directive towards environmental concerns, suppliers were forced to "get serious" about pollution. "Wal-Mart says if you're over the compliance level, you're out of business." (Mufson, 2010). In terms of forced cost cutting, some smaller suppliers had to "lay off employees and close US plants in favour of outsourcing products from overseas." (Fishman, 2003). There are claims that many American jobs were lost, due to this effect, to low-wage countries such as China. Wal-Mart has doubled its imports from China between 1998 and 2003. All in all, as summarised by Fishman (2003), "doing business with Wal-Mart can give a supplier a fast, heady jolt of sales and market share. But that fix can come with long-term consequences for the health of a brand and a business [and the local economy]".

The phenomenon discussed above shows a significant 'side-effect' of the exploitative collaboration approach. The exploitative model is extended accordingly (Figure 6).

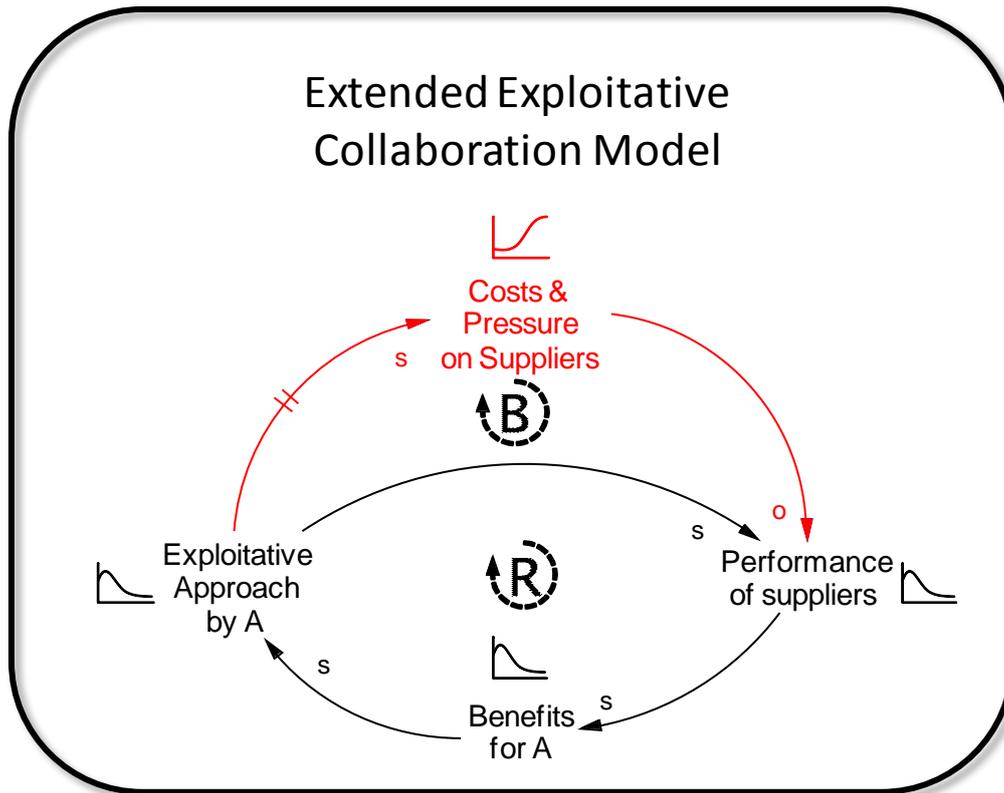


Figure 6 Extended Exploitative Collaboration Model

The extended model above is based on the basic exploitative collaboration model. The basic model showed all three variables (Exploitative Approach by A, Performance of suppliers, and Benefits for A) with exponential increase patterns over time.

In this extended model, however, a new variable with two links are introduced. Exploitative approach by Company A has a side effect of imposing costs and pressure on suppliers. This effect becomes significant after a delay. With the increased costs and pressure on suppliers, their performance in terms of quality and even the capability to supply will be reduced. Company A may opt to switch suppliers, but the capabilities of new suppliers are also questionable, since they would not have been Company A's first choice in the earlier selection process. With the deterioration of the suppliers' performance, the benefits for Company A is jeopardised, and hopefully this negative impact will result in less exploitative collaboration approaches by Company A. Notice that the additional Balancing dynamic has changed the original behaviour over time. The benefits for Company A are no longer reinforced, and thus, the incentive for further exploitative tactics is discouraged. The costs and pressure on suppliers will eventually reach a plateau (when the exploitative actions are reduced), and it may eventually tail off.

In the cooperative collaborations case, the basic model shows a reinforcing long-term supportive relationships, with objectives similar to the exploitative mode (continuously improving efficiency and minimising costs, improving customer value). Even though the basic dynamics shows also reinforcing benefits for the company and the suppliers, a main disadvantage of such an approach is the delay in reaping such benefits. While

Company B in the model invest and assist in improving its suppliers, the improvements on the suppliers' end may not be realised until after a significant period of time. Iyer et al. (2009) pointed out that a typical improvement project for Toyota and its supplier can take at least one and a half years. In one particular case, Toyota committed two to four consulting personnel to the supplier after the improvement project on a regular basis for the next five years. Therefore, a side effect of the cooperative collaboration approach is the initial investment into new relationships, and the potential hindrance in the company's own performance before improvements are seen at the suppliers. An example of this is the recent chain of product failure and resulting recalls in Toyota automobiles. Anonymous (2010) quoted the chairman of Toyota Motor Corp., Akio Toyoda, that "in its pursuit of growth [Toyota] stretched its lean philosophy close to breaking point." As a result, Toyota became "increasingly dependent on suppliers outside Japan with whom it did not have decades of working experience." Initial "grooming" of suppliers in committed relationships requires commitment of resources, which may be diverted from normal operations. This is a major risk for this approach, especially in times of rapid growth.

In light of such phenomenon, the basic model is extended to incorporate the other impacts from a cooperative collaboration approach (Figure 7):

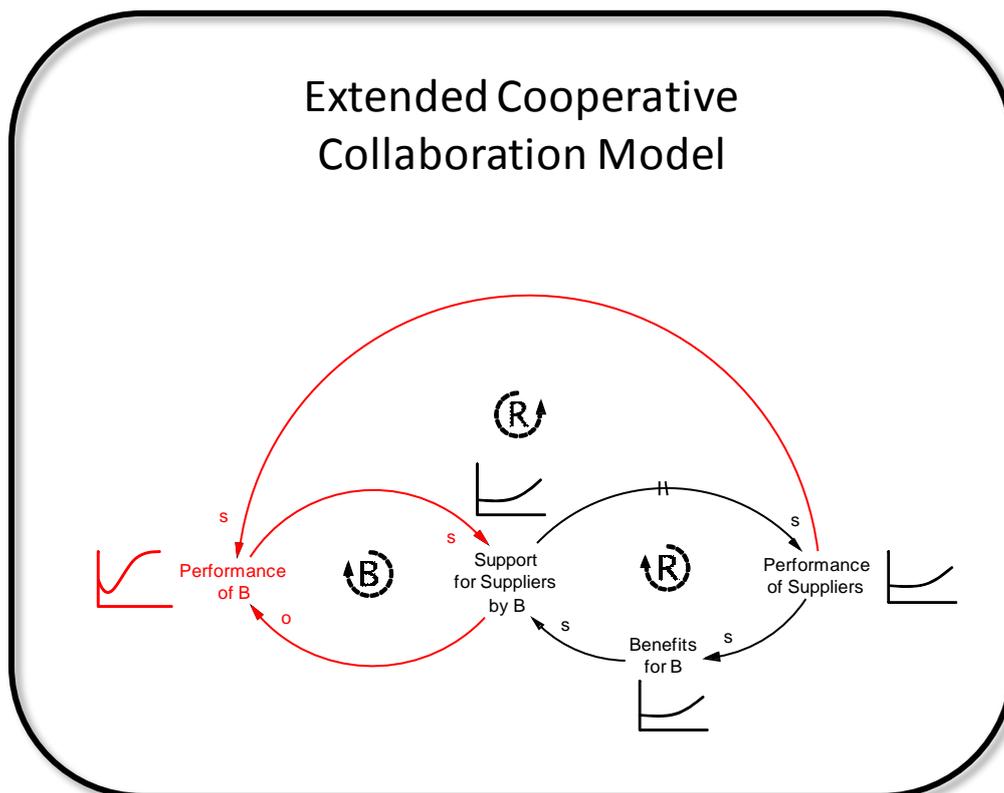


Figure 7 Extended Cooperative Collaboration Model

The cooperative support for suppliers by Company B has a direct negative impact on its own performance, due to the time, money, and effort invested in its suppliers (as discussed in Toyota's case above). Such impact may in turn discourage further support for suppliers. However, the cooperative collaboration approach assumes that the supply

chain partners are willing to compromise or to even sacrifice its own optimality to pursue optimisation across the supply chain, such discouragement can be considered as minimal.

Eventually, the suppliers' performance starts to increase (after the delay). Once this has become apparent, the resulting increase in Company B's performance can further reinforce the cooperative support towards Company B's suppliers, and thus promotes sustainable improvements. Notice that two loops have been introduced in this extended model. The behaviour over time dynamics remain unchanged from the basic model, and the Performance of B (new variable) shows a "worse-before-better" behaviour over time.

Key Dynamics In These Approaches

The dynamics discussed above imply that the two approaches in collaboration result in distinctive behaviour over time in terms of the companies' performance. For company A, its exploitative approach results in a "better-before-worse" dynamic, while for company B, its cooperative approach results in a "worse-before-better" behaviour. The dynamics of both approaches showed their benefits and disadvantages. Based on these ideas, a general portrayal of the dilemma between exploitative and cooperative collaborations can be described using a model based on the systems archetype of "Shifting the Burden" (Maani et al. 2007) (Figure 8).

The basic model outlining the dynamics of both extreme approaches in the context of a single company is presented in Figure 9:

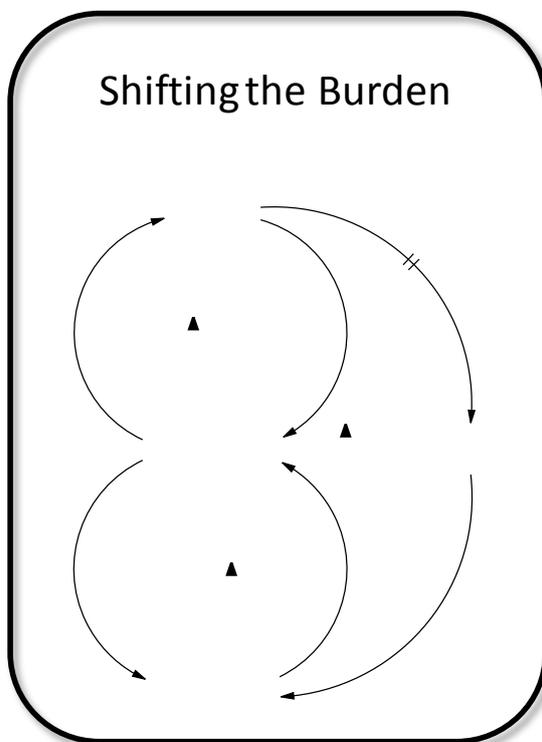


Figure 8 Shifting the Burden

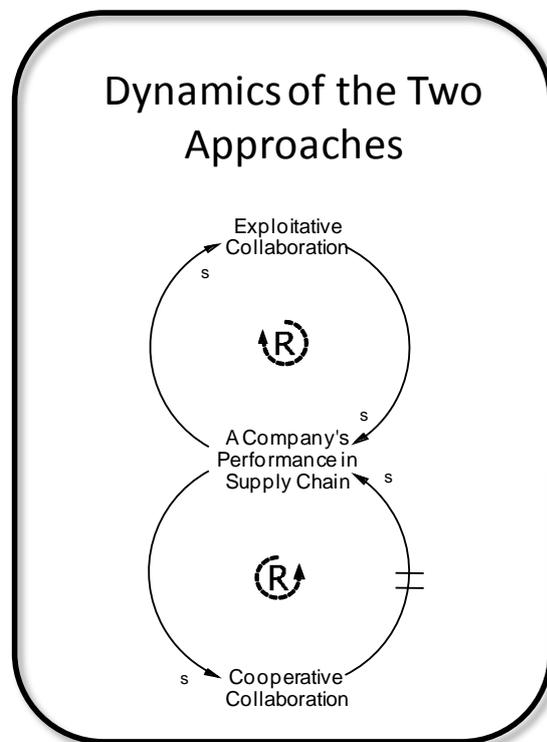


Figure 9 Combined Dynamics of the Two Approaches

In general, both collaboration approaches share the same objective, to maximise customer value through better supply chain management. Both approaches are effective in enhancing the company's performance. With an exploitative approach (the top loop), the company can quickly and effectively reduce costs and impose other requirements on its suppliers to work for its own needs. This results in immediate benefits, which results in a reinforcing dynamic for the company to further pursue benefits with this approach (for example, after pricing policies, the company may impose other policies on packaging, environmental issues, and others). This is of course based on the assumption that the company has significant influence over its suppliers, such as its size, market, and brand image.

The main disadvantage of this approach, as discussed above, is that the benefits are not sustainable.

On the other hand, the company can also take a cooperative approach, where improvements in performance are achieved through long-term, dedicated, and supportive relationships with its suppliers. The customer value is eventually increased through the betterment of all operations along the supply chain.

The main disadvantage of this approach, as discussed above, is that the benefits takes a long time to realise (there is a delay in the bottom loop's dynamics). That is, it does not provide a quick solution, and it usually involves significant initial investments.

The two extreme approaches, "exploitative" and "cooperative" collaboration, correspond to the "quick fix" and "fundamental solution" of the "shifting the burden" archetype. Thus, according to systems theory, there is a tendency for the company to rely on the quick fix (that is, the exploitative approach) for quick solutions. This is consistent to the theme of modern capitalistic business model, which is to locally optimise operations to ensure that the company's benefits are maximised. In Wal-Mart's case, they can continually enforce their stringent policies upon their suppliers to work in Wal-Mart's best interest. For Toyota, in the process of achieving rapid expansion, they have teamed up with unfamiliar suppliers which resulted in initial quick benefits. Eventually, a dependency is formed for the company to utilise the exploitative approach, instead of the other option. This is portrayed in the model in Figure 10.

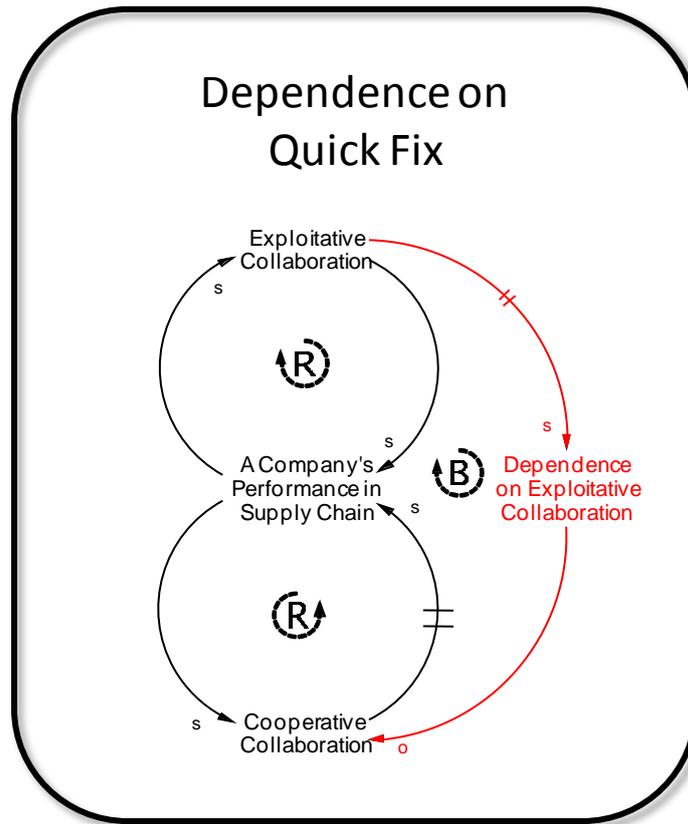


Figure 10 Dependence on Quick Fix

With a higher dependence on the quick fix option, the fundamental solution becomes even less appealing.

According to the case studies of Toyota and Wal-Mart, however, the above model does not seem to capture all of the major dynamics. As seen in the case where Toyota regrets the quick fix approaches, and how Wal-Mart starts to develop closer relationships with major suppliers such as Procter & Gamble (refer to earlier section on the case studies), some of the negative impacts of the exploitative approach seems to have an impact in promoting the fundamental solution, which is cooperative collaboration. In order to reflect this, the paradox model is further extended by another loop that outlines the eventual tendency towards collaborative collaboration in Figure 11.

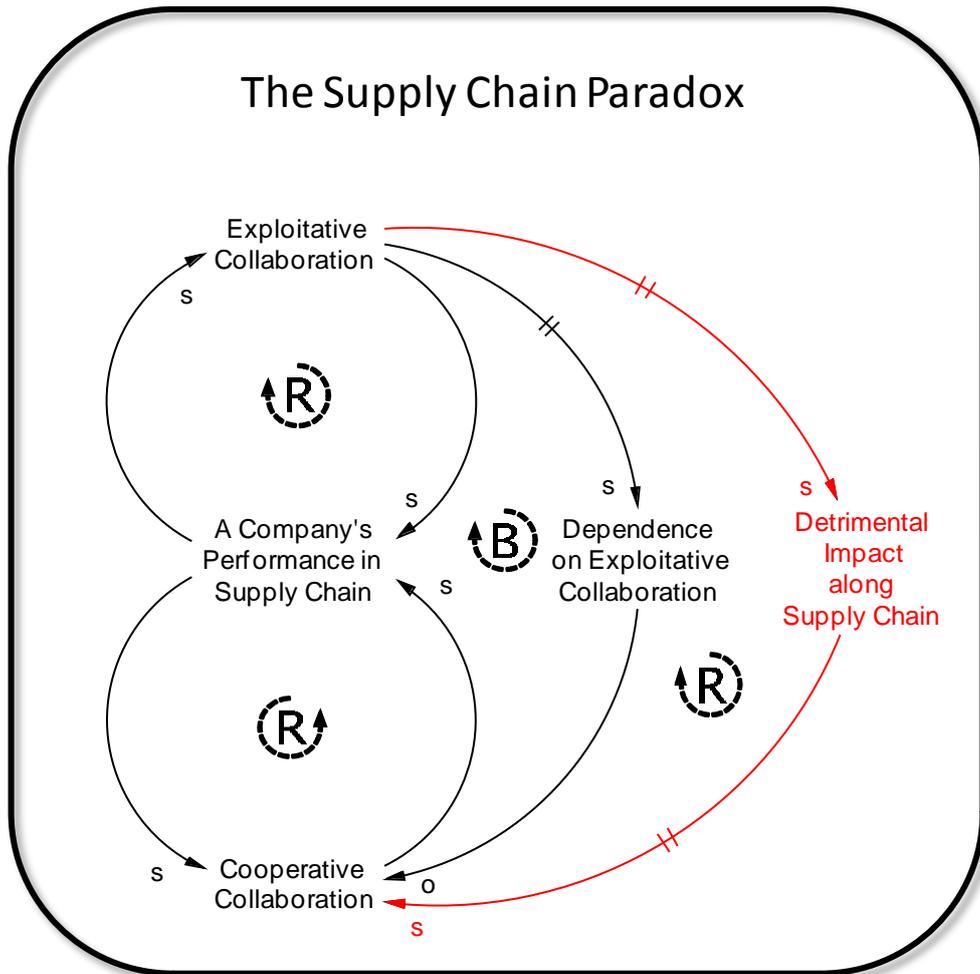


Figure 11 The Supply Chain Paradox

The extended loop in the model in Figure 11 suggests that the detrimental impact resulted by exploitative collaborations can eventually have an encouraging effect on the pursuance of the “fundamental solution” of cooperative collaboration.

Evidence in this extension of the model, however, is not commonly seen in existing research. The supply chain dynamic model discussed in this paper proposes a new research interest area in supply chain collaboration strategies and tactics.

Conclusion

Supply chain management is a paradoxical philosophy. On one hand, supply chains are made up of capitalistic business entities, whose main objective is to optimise its performance, including sales, profits, and market share. On the other hand, the success of a supply chain relies on effective collaboration across all businesses along the chain, where every partner is responsible for supporting each other for optimisation of the supply chain as a whole.

Case studies of two major pioneers of supply chain management (Toyota and Wal-Mart) are observed in this paper. While both have achieved outstanding results as individual companies through supply chain collaboration, their collaboration tactics and strategies differ significantly, and so do the conditions of their supply chain partners.

The paper proposed models of supply chain collaboration at multiple levels, based on case studies of these supply chains. From these models, the dynamics of the different collaboration approaches are projected. The findings of this study aims to form a basis for further research in the dynamics of supply chain collaboration, as the cornerstone of effective supply chain management. Further critical research to support such ideas include validation of models proposed in this paper, through observations and interviews with practitioners, comprehensive studies on businesses' perceptions and preferences in supply chain collaboration, collaboration dynamics of other current businesses, and longitudinal studies of major supply chains (including Toyota and Wal-Mart, the supply chains featured in this paper). These proposed studies should provide further insight in supply chain collaboration dynamics through time.

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