1 Introduction

1.1 Why Supply Chain Management

A supply chain is basically a group of independent organisations connected together through the products and services that they separately and/or jointly add value on in order to deliver them to the end consumer. It is very much an extended concept of an organisation which adds value to its products or services and delivers them to its customers. But what is the benefit of understanding the value adding from the supply chain perspective? Why managing supply chain is becoming necessary and important to today's business success? These are some of the fundamental questions that must be first addressed before discussing the "how to" questions.

Over the last three decades, the concept and theory of business management have undergone profound changes and development. Many old ways of doing business have been challenged and many new ideas and approaches have been created, among them are business process re-engineering, strategic management, lean thinking, agile manufacturing, balanced scorecard, blue ocean strategy, … just to name a few. Supply chain management is undoubtedly one of those new and well grown management approaches emerged and rapidly developed across all industries around the world.

The earliest appearance of the term '*supply chain management*' as we know it today published in recognisable media and literatures can be traced back to the early 1980s. More precisely, it first appeared in a *Financial Times* article written by Oliver and Webber in 1982 describing the range of activities performed by the organization in procuring and managing supplies. However the early publications of supply chain management in the 1980s were mainly focused on purchasing activities and cost reduction related activities. The major development and the significant increases of publications in the areas of supply chain integration and supplier-buyer relationship came in 1990s when the concept as we know it today was gradually established.

It is therefore clear that supply chain management is not one of the legacy academic subjects existed for hundreds or thousands of years, but rather a young and even nascent subject. It is only recently that business world started making use of this concept. So, the question is "Why now?" A convincing answer to this question is that our business environment has changed, which includes globalisation, more severe competition, heightened customer expectation, technological impact and geopolitical factors and so on. Under such a renewed business environment, an organisation focused management approach is no longer adequate to deliver the required competitiveness. Managers must therefore understand that their businesses are only part of the supply chains that they participated and it is the supply chain that wins or loses the competition.

Thus, the arena of competition is moving from 'organisation against organisation' to 'supply chain against supply chain'. The survival of any business today is no longer solely dependent on its own ability to compete but rather on the ability to cooperate within the supply chain. The seemingly independent relation between the organisations within the supply chain becomes ever more interdependent. You "sink or swim with the supply chain." It is for this reason that gives rise to the need for supply chain management.

Consequently, aspiring to become an excellent business simply through an entirely inward looking management approach can be very illusive. What's more practical and indeed more assured way of better managing a business is to managing it along with the supply chain through appropriate strategic positioning, adequate structural configuration, collaboration, integration and leadership. The paramount importance of doing so does not derive from the theories or reasoning, rather it is withstood by the business performance improvement and market measured customer results. It is the tangible benefits and success that it delivers makes the subject important.

Supply chain management is also pervasive and ubiquitous. One can hardly find any aspect of business that has nothing to do with supply chain management. Take an example of quality management – a very important part of today's business management, and ask yourself a question: can you manage and improve the quality standard of your product or service measured by the end-consumer without managing the suppliers and buyers in the supply chain at all? Of course not. Business value creation is always a collective contribution from the whole involved supply chain.

1.2 Defining supply chains

Ploughing through the plethora of literatures, one will come to realise that there are as many different definitions as many of those who cared to write about it. However, a broad conceptual consensus on the notion of Supply Chain (SC) and Supply Chain Management (SCM) is beyond anybody's reasonable doubt. Based on that, the author would like to offer his definition of SC here and SCM in the next section.

Supply chain is defined as a group of inter-connected participating companies that add value to a stream of transformed inputs from their source of origin to the end products or services that are demanded by the designated end-consumers.

In this definition, there are a number of key characteristics that have been used to portrait a supply chain. First, a supply chain is formed and can only be formed if there are more than one participating companies. Second, the participating companies within a supply chain normally do not belong to the same business ownership, and hence there is a legal independence in between. Third, those companies are inter-connected on the common commitment to add value to the steam of material flow that run through the supply chain. This material flow, to each company, comes in as the transformed inputs and goes out as the value added outputs.

Intuitively, one can imagine a supply chain as something resembles a "chain", in which the "links" are the participating companies that are inter-connected in the value adding process (see figure 1). The link on the upstream side of the material flow is the supplier's supplier; and on the downstream side of the material flow is the customer. There is usually an OEM – **Original** Equipment Manufacturer in between. The OBM sometimes is represented by OBM – Original Brand Manufacturer, or sometimes simply the "focal company."

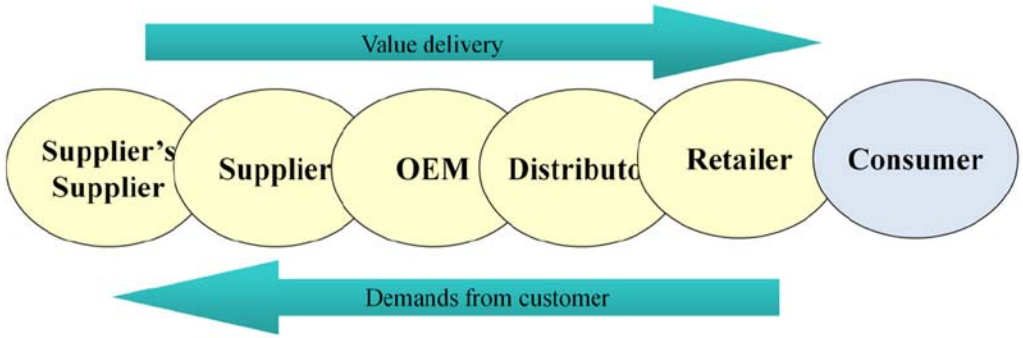

Figure 1. The basic Supply Chain model

At the end of a supply chain is the product and/or service that are created by the supply chain for the end consumer. Thus, the fundamental reason of a supply chain's existence is hinged on to serving the end-consumer in the market place. The degree of how well a supply chain can serve their consumer ultimately defines its competitive edge in the market place.

It is understandable that in real-world a supply chain is much more complex than the one depicted in Figure1. It is not really a "chain", rather it is more like a "network", when you consider that there are usually multiple suppliers and multiple customers for each participating companies in the chain. There are also possible nested chains within the chains. For example an engine manufacturing supply chain is a nested supply chain within the connected automobile supply chain.

Depend on how would like to see the supply chain, there are similar but different names you may like to call the supply chain. If you view a supply chain as basically a chain of value adding activities, you may like to call it "Value Chain"; if you perceive a supply chain as continuous demands originated from the consumer and stretched to upstream suppliers, you may like to call the supply chain the "Demand Chain".

Since the business connections between organisations are pervasive, how could one draw a boundary of a supply chain? In order to answer this question, one needs to understand the four intrinsic flows of a supply chain.

Material Flow: All manufacturing supply chains have material flows from the raw materials at the beginning of the supply chain to the finished products at the end of the supply chain. A furniture-making supply chain will have the wood cut down from forest at the beginning of its supply chain and home furniture at the end of supply chain. The continuous flow of wood been transformed through the chain and end up to furniture ties the whole supply chain together and defines its clear boundary. A furniture supply chain can never be confused with a chocolate manufacturing supply chain because the material flows in between are clearly different and never will they cross with each other.

Information Flow: All supply chain s have and make use of information flows. Throughout a supply chain there are multitude of information flows such as demand information flow, forecasting information flow, production and scheduling information flows, and design and NPI information flows. Unlike the material flow the information can run both directions, towards upstream and downstream alike. Interestingly most of them are unique to the specific supply chain. The information of woman's fashion clothing has no value to a motorbike supply chain. Any supply chain will have its own set of information flows that are vital to its existence which are often jealously protected against those of other supply chains.

Finance Flow: All supply chain have finance flow. It is basically the money flow or the blood stream of a supply chain. Without it, a supply chain will surely demise. However, for any supply chain, there is only one single source of such finance flow – the en-consumer. This understanding of single source of finance has led to a concept of "single entity" perspective of a supply chain, which is a very useful foundation for supply chain integration and collaboration. The distribution and sharing of this single financial resource fairly across a supply chain will allow for the better alignment between the contribution and reward for the participating companies.

Commercial flow: All supply chain represents a transactional commercial flow. This means that the material flow that run through the supply chain changes its ownership from one company to another, from supplier to buyer. The transactional process of buying and selling shifts the material flow's ownership from the supplier to the buyer repeatedly until the end of the supply chain – the end-consumer. This transactional commercial flow will only take place in a supply chain where there are more than one companies. On the other hand, if it is with an organisation there will be material flow, but no ownership change, and hence no commercial flow.

The four flows described above not only better explain the function of the supply chain, but also define it more rigorously. They represent four major areas of concerns and research activities in the supply chain management, which covers most of the known issues in the published literatures.

1.2 Customer Orientation

Having understood the supply chain model, one may ask "Is the end-consumer a part of the supply chain?" Most people will say "Yes", because consumer give the demand information; consumer provide the financial reward and so on. But the author will argue that strictly speaking the end-consumer is NOT part of the supply chain; the supply chain only extend from the very raw material suppliers to the retailer (if that's the last link in the supply chain before the end-consumer). There are number of fundamental reasons to support this argument.

1) First, all supply chain supplies, and every member of the supply chain supplies; but the consumer DON'T, it demands instead of supply. The fundamental function of a supply chain is to supply; and the consumer is the recipient of the supply, but not a part of the supply. Supply chain's existence is based on the existence of the demand from the consumer. Supply chain treats consumer as the object which it serves. If a supply chain contains the consumer within itself, then it will have no object to serve and no recipient to take the supply; and it will lose its purpose of existence.

2) Second, a supply chain adds value to the product (or transformed inputs), but the consumer DON'T. Consumer *consumes* the product and depletes its market value. Used goods are always cheaper than the new ones. A supply chain and every member in it have the irrefutable duty to add values to the material flow, and they must learn how to improve the business and its management; but consumers will never need to do that. Their job is to use the money to vote which supply chain best satisfy their demand.
3) Third, a supply chain is always specialised and a consumer is always general. A computer manufacturing supply chain only produces computers, whilst a consumer will have to buy food, clothing, and automobile as well as computers. Due to the extremely divers nature of consumer's purchasing, to put the consumer as part of a supply chain will not be helpful in understanding the nature of a supply chain and may cause considerable confusion theoretically and logically.

Based on these three fundamental differences between the nature of supply chain and that of the consumer, it is more appropriate and less confusion if we separate the consumer away from the concept of the supply chain. This definition of supply chain without consumer will not deprive the immense benefits that consumer may contribute to the supply chain. How the end-consumer plays this pivotal role in the existence and the management of supply chain is the core notion of *supply chain management*.

The end-consumer to a supply chain is perhaps the most important factor of all as far as its management is concerned. Everything a supply chain does is driven by the needs and wants of the end-consumer. The contents of SCM are populated with the approaches, activities as well as the strategies that are aiming at delivering the products and services to satisfy the end-consumer. Therefore, it is safe to say that the SCM should be and has always been a customer centred management. This reflects the typical characteristic of supply chain's customer orientation.

Not only the end-consumer serves as the ultimate objective, it also provides vital information and practical assistance to the decision making in the process of supply chain management. The end-consumers needs and wants, where they are, how many they are and how much they can afford and etc. give the supply chain manager some very precise guidance as how to achieve market responsiveness.

It is therefore beyond the shadow of doubt that supply chain and its management have always been, still are, and will certainly continue to be customer oriented. This customer orientation gives the fundamental reason and purpose of its existence. It also ensures that supply chain management has to be a system perspective based management approach that engages every participating member of the supply chain to align to the customer orientation.

1.3 Defining Supply Chain Management

Defining the supply chain management can be both dead easy and extremely difficult. It is dead easy because it is so widely known and widely practiced in almost all businesses. There is hardly a need to teach the "A, B, C" again. It is also extremely difficult because the definition must capture all what supply chain management in practice has reached far and wide. As an attempt, the author proffers the following definition:

> Supply chain management is simply and ultimately the business management, whatever it may be in its specific context, which is perceived and enacted from the relevant supply chain perspective.

This definition squared out the nagging confusion between organisational business management and supply chain management. Rarely any aspect of organisational business management is not related to or influenced by the external firms in the supply chain. Thus the best way to manage the business is to take into consideration and engage with the external organisations in the decision making in order to achieve the ultimate business objectives – that means supply chain management.

In other words, trying to identify a set of supply chain management activities that is not or nothing to do with any known business management activities would futile. The inception of the supply chain management concept did not create a new set of functional activities that has never been carried out before. What it created is a new way of understanding on how the business activities might be better carried out.

The supply chain management defined as such has already elevated the modern business management concept from the organisational focused domain to the supply chain focused system giving rise to more effectiveness in achieving the strategic objectives. Today's competition is no longer seen as the company against the company but the supply chain against the supply chain. Supply chain management is therefore a new perspective towards the old activities.

This definition effectively explains why supply chain management can be done in such vastly diverse ways; why apparently completely different management activities can often be called supply chain management; why the same traditional management function is now been entitled as supply chain management; and so on. The answer is simply that because we start view the management issues and taking actions from the supply chain perspective.

This definition certainly gives the supply chain management concept a ubiquitous and pervasive nature. But, that does not mean that there is nothing uniquely identifiable on its own. One can still identify some practically very useful conceptual components of the supply chain management. Any supply chain management practice and activities is captured by the three conceptual components: Supply Chain Configuration; Supply Chain Relationship; and Supply Chain Coordination.

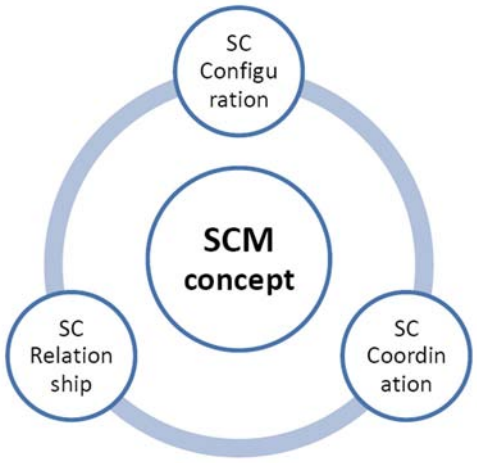

Figure 2. Supply Chain Management conceptual model

- **Supply Chain Configuration** is about how a supply chain is constructed from all its participating firms. This includes how big is the supply base for OEM (original equipment manufacturer); how wide or narrow is the extent of vertical integration (which is the single ownership of consecutive activities along the supply chain); how much of the OEM's operations are outsourced; how the downstream distribution channel is designed; and so on. It is also known as supply chain architecture. The decision on supply chain configuration is strategic and at a higher level.
- **Supply Chain Relationship** is about inter-firm relationships across the supply chain albeit the key focus of relationship is often around the OEM and its first tier suppliers and first tier customers and the relationship in between. The type and level of the relationship is determined by the contents of inter-organisational exchanges. The relationship is likely to be "arm's length" if they only exchanged the volume and price of the transaction; on the other hand, the relationship would be regarded as close partnership if the parties exchanged their vision, investment planning, NPI process and detailed financial information. The decision on supply chain relationship is both strategic and operational.

- **Supply Chain Coordination** refers mainly to the inter-firm operational coordination within a supply chain. It involves the coordination of continuous material flows from the suppliers to the buyers and through to the end-consumer in a preferably JIM manner. Inventory management throughout the supply chain could be a key focal point for the coordination. Production capacity, forecasting, manufacturing scheduling, even customer services will all constitute the main contents of the coordination activities in the supply chain. The decision on the supply chain coordination tends to be operational.

There is, however, one thing in common amongst the three key supply chain management focuses. That is they all deal with the external organisation in the same supply chain, which makes the concept more supply chain rather than organisationally internal. These concepts also tell us that supply chain management involves managerial decision making across strategic, tactic and operational levels – the pervasiveness. One may notice that all the major *Operations Management* text books will include a chapter or two on supply chain management, but that does not necessarily make the subject purely operational.

1.3 Development Trends

Another difficulty in understanding and defining supply chain and supply chain management is that it is never stand still and the subject has been continuously evolving since its inception in the early 1980s. The continuous development is partly propelled by the changes of overall business environment and heightened competitions in the global market place. But partly it is influenced by the new understanding of the supply chain that they participate. There are number of early development trends that can be observed evidently.

1) **From functional to process perspective**. Business management used to see and take action on the functional silos in the business. It was understandable that naturally the function is what seen to be the delivery part of the business. But, today with supply chain management concept managers can see their problems more from the process perspective, understanding that functions can only make sense if it is perceived from a supply chain process perspective.
2) **From operational to strategic viewpoint**. At early years of applying supply chain management concept, managers tends to see it as another operational tactics that will help to reduce operational cost, such as purchasing function improvement and optimising the logistics operations. But, gradually more and more managers realised that the effective changes can only be achieved if the operational issues are addressed from the supply chain wide strategic viewpoint. Operational excellence can only be manifested through its *strategic fit*.
3) **From single enterprise to extended enterprise**. Enterprise management is now arguably displaced by the supply chain management, where the supply chain is by definition the extended enterprise. The long established enterprise centred management thinking was based on that the competition was raged between the organisations, thus it becomes obsolete as the competitions are now predominantly between the supply chains. Management thinking over the extended enterprise produces a great deal ideas that single enterprise alone cannot.
4) **From transactional to relationship based engagement**. Business engagement between firms in the past was predominantly transaction based and cost driven. The merit of any purchasing and procurement of externally sourced materials and services was judged by the transactional measures such as price, volume and delivery terms. But what's now more of the practices in working with external organisations within the supply chain is so called relationship based engagement. This relationship approach does not abandon the transactional activities but put its decision baking on much wider consideration of knowledge exchange, long-term commitment, incentives and reward.
5) **From local to regional, and from regional to global**. Connections of supply network have over the last two decades grown from local to regional and to global. Hardly any major enterprise and supply chains is not connected to some part of the world. You need to get out before you can get up. This trend is spurred by the lower cost of labour and materials in many parts of the world, as well as first mover advantages in setting up global market presence.

The trends of supply chain development are not always positive and encouraging. There is now enough evidence to support that supply chain risks are now continuously growing to the level that is higher than ever before; and supply chain integration still remains as the major management shortfall across all industrial sectors (PRTM Global supply chain trends report 2010-12). The task of managing and improving supply chain performances across all industrial sectors is only becoming tougher, not easier. This calls for deeper and more thorough understanding of the challenges supply chains are facing.

2 Global Supply Chain Operations

2.1 Global Business Environment

To date, our world market is dominated mostly by many well established global brands. Over the last three decades, there have been a steady trend of global *market convergence – the tendency that indigenous markets start converge on a set of similar products or services across the world.* The end-result of the global market convergence is that companies have succeeded on their products or services now have the whole wide world to embrace for their marketing as well as sourcing.

The rationale of global market convergence lies partially in the irreversible growth of global mass media including Internet, TVs, radios, news papers and movies, through which our planet has become truly a small global village. Everybody knows what everybody else is doing, and everyone wants the same thing if it is perceived any good. It also lies in the rise of emerging economic powers led by BRICs (Brazil, Russia, India and China), which has significantly improved the living standard and the affordability of millions if not billions of people.

For organizations and their supply chains, the logic of going global is also clearly recognizable from economic perspective. They are merely seeking growth opportunities by expanding their markets to wherever there are more potentials for profit-making; and to wherever resources are cheaper in order to reduce the overall supply chain costs. Inter-organizational collaborations in technological frontier and market presences in the predominantly non-homogeneous markets can also be the strong drivers behind the scene.

One can also observe from a more theoretical perspective that the trends of globalization from Adam Smith's law of "division of labour". A global supply chain is destined to be stronger than a local supply chain because it takes the advantage of the *International Division of Labour*. Surely, the specialization and cooperation in the global scenario yields higher level of *economy* than that of any local supply chains. Thus the growth of global supply chain tends to give rise to the need for more coordination between the specialized activities along the supply chain in the global scale.

As the newly appointed Harvard Business School dean professor Nitin Nohria said "If the 20th century is American's century, then the 21st century is definitely going to be the global century." The shift of economic and political powers around world is all too visible and has become much more dynamic and complex. But, one thing is certain that there will be significantly and increasingly more participation of diverse industries from all around the world into the global supply chain network; hence bringing in the influences from many emerging economies around the world. Their roles in the globally stretched network of multinational supply chains are going to be pivotal and will lead towards a profoundly changed competitive landscape.

In such a global stage there are a number of key characteristics that global supply chains must recognize before they can steer through:

- **Borderless**: National borders are no longer the limits for supply chain development in terms of sourcing, marketing, manufacturing and delivering. This borderless phenomenon is much beyond the visible material flows of the globalised supply chain. It is equally strongly manifested in terms of invisible dimensions of global development such as brands, services, technological collaboration and financing. Evidently, the national borders are far less constrictive than they used to be. Arguable this is perhaps the result of technology development, regional and bilateral trade agreements, and the facilitation or world organizations such as WTO, WB, GATT, OECD, OPEC and so on.
- **Cyber-connected**: The global business environment is no longer a cluster of many indigenous independent local markets, but rather it emerged as an inter-connected single market through predominantly and growingly important cyber connections. For this reason, the inter-connection of our global business environment is almost "invisible", spontaneous and less controllable and surely irreversible. Globally stretched multinational supply chains would not be possible or even comprehensible without cyber-technology allowing large amounts of data to be transferred incredibly quickly and reliably.
- **Deregulated**: Trade barriers around the world has been demolished or at least significantly lowered. Economic and free-trade zones around the world have promoted open and fair competition and created, albeit never perfect, a level playing field on the global stage. Deregulation simplifies and removes the rules and regulations that constrain the operation of market forces. It has targeted more at the international trading and aiming for stimulating global economic growth. The typical deregulated regions are European Union, North America Free Trade Agreement zone; Associations of Southeast Asian Nations group and so on. Deregulation reduces government control over how business is done thus moving towards laissez-fair and free market system.
- **Environmental Consciousness**: Last decade has witnessed the growing concerns on the negative impact of business and economic development on the natural environment. The global movement towards green and more eco sustainable business strategies plays an important role in today's global supply chain development. This is also driven by the actions of lawmakers and regulatory agencies, such as the Environmental Protection Agency (EPA). Governments of leading economies are increasingly involved in promoting greening activities in business, and formalize more legislation and regulation to place upon firms in the future. Carbon footprint is now a key performance measure of the sustainability for many global supply chains.
- **Social Responsibility**: Along with that is a wider socio-economic impact. Fair trade and business ethics become increasingly the key measures on business's social responsibility, and the key factors for business decision making. Social pressure strikes at the heart of a company's brand in the mind of the consumer. A significant group of consumers have begun making their purchasing decisions based on the supply chain's ethical standard and social responsibility. Global corporate citizenship and social responsibility forms yet another important business environmental factor that can make or break a business.

2.2 Strategic Challenges

Under such a changing global business environment, what are the new strategic and operational challenges? At a macro level, there are at least five key strategic challenges that will have the long term and overall impact on the architecture as well the management process of the global supply chains. Those strategic challenges tend to be interrelated intricately and dynamically with one another. The magnitude of those challenges varies from industry to industry; and from time to time.

Market dimension

Continuing demand volatility across the world market has hampered many supply chains' ability to manage the responsiveness effectively. Demand fluctuation at the consumer market level poses a serious challenge to the assets configuration of supply chain, capacity synchronisation, and lead-time management. More often than not it triggers the 'bullwhip effect' throughout the supply chain resulting in higher operating cost and unsatisfactory delivery of products and services.

The root causes of the demand volatility in the global market are usually unpredictable and even less controllable. Economic climate plays a key role in overall consumer demand. The recent worldwide economic downturn has made many global supply chains over-capacitated, at least for a considerable period of time. Geo-political instability around the world has also contributed to the market volatility to certain industries. Technology development and product innovation constantly creates as well as destroys the markets often in a speed much faster than the supply chain can possibly adapt. Emerging economies around the world are aggressively churning out products and services that rival the incumbent supply chains in terms of quality and price, which lead to huge swings of market sentiment.

Recent research shows that customer loyalty has significantly decreased over the last decade, adding to the concerns of market volatility. The development of internet based distribution channels and other mobile marketing medias has made it incredibly easier for consumers to switch their usual brands. Many products are becoming more and more commoditized, with multiple competitors offering very similar features. With increased market transparency, many B2B and end customers simply shop for the lowest price, overlooking their loyalty to particular suppliers or products. A lack of robust forecasting and planning tools may have contributed to the problem, as companies and their suppliers frequently find themselves scrambling to meet unexpected changes in demand.

Technology dimension

Technology and the level of the sophistication in applying the technology for competitive advantages have long been recognised as the key strategic challenges in supply chain management. This is even more so, when we are now talking about the supply chain development in a global stage. The key strategic challenges in the technological dimension are threefold.

The first is the development lead-time challenge. The lead-time from innovative ideas to testing, prototyping, manufacturing, and marketing has been significantly shortened. This is partially due to the much widened global collaboration on technological development and subsequent commercialisation and dissemination. The globally evolved technology development systems have created a new breed of elite group as the world technology leaders across different industries. They capture the first mover advantages and made the entry barriers for new comers almost impossible to overtake. No doubt, there is a strategic challenge that global supply chain must create an ever ready architecture that can quickly embrace the new ideas and capitalise it in the market place.

The second challenge comes from its disruptive power. Harvard Business School professor Clayton Christensen published his book *The Innovator's Dilemma* in May 1997, in which he expounded on what he defined as the *disruptive technology*. The basic message he tried to put across was that when new technologies causes great firms to fail, managers face the dilemma. Evidently, not all new technologies are sustaining to business, often they are competency-destroying. The product or service developed through applying new innovative technologies may not be so much appreciated by the consumers. Consumers often are often not so eager to buy the ideas. They may not be so convinced that the value the technology created or the costs it added in. If you wait for other companies to test the market first, then you run a high risk of losing the first mover advantage and losing the market leadership. That's the dilemma and that's the challenge.

The third challenge lies in the supply chain network. The innovative ideas and new technologies usually emerge from a supplier or a contractor in the supply chain network. To convince the whole supply chain of the value adding or cost reduction is not guaranteed. Each supplier and contractor will have its own value stream and will make technology adoption decisions based on the needs of its own customers. Innovative ideas that come up from subcontractors may be stifled due to the supply chain's inability to coordinate value contribution between individual members and the whole supply chain. The cost and profit structures in the value network can also limit the attractiveness of an innovation. If profit margins are low, the emphasis will be on cost cutting across proven technologies, rather than taking the risk of the new technologies.

Finally from the technology evolution perspective, technology destroys as readily as it creates. The development of digital photography has literally destroyed the photo film manufacturing industries including many well known brands; LCD and Plasma technology also smashed the TV Tube (traditional screen component) manufacturing industry overnight. This increased risk of technology disruption at the industrial scale is lot more formidable than the innovative dilemma Prof Christenson was talking about in his book. Nevertheless, there are some helpful supply chain strategies that can better prepare them for the eventuality.

Resource dimension

From resource based perspective, global supply chain development is both motivated by dinging new resources around world and by make better use of its own already acquired resources to yield economic outputs. It comes as no surprises that one of the key strategic challenges in global supply chain development is about resource deployment. The term resource in this context means any strategically important resources, including financial resource, workforce resource, intellectual resource, natural material resources, infrastructure and asset related resources, and so forth.

Stretching supply chains' downstream tentacles around the world opens the door for making good (more efficient) use of internal resources, i.e. the same level of resources can now be used to satisfy much wider and bigger market in terms of volume, variety, quality and functions. However the internal resource or competence based strategy will also face more severe challenges on the global stage than in its own local or regional market. The challenges are not necessarily just from the indigenous market, but more likely they come from equally competitive incumbent multinationals and possible emerging ones alike. Also more menacingly the internal based advantages can evaporate anytime when global business environment subjects fundamental changes.

Stretching the sourcing-end (supply side) of supply chain to the global market is a great strategy to acquire scarce resources, or any resources at a much lowered cost. The productivity and operational efficiency oriented strategy is often no match to the procurement focused strategy in measures of reducing the total supply chain cost. No wonder many multinationals are actively debating on sourcing their workforce, materials and energy from overseas locations in order to significantly reduce the operation cost, which will then lead to more competitive market offerings. This resource sourcing strategy has been the prime drive for the surge of off-shoring and outsourcing activities all over the world. However many long-term and short-term impacts of outsourcing and off-shoring are difficult to be fully understood from the outset, if at all possible. Thus it forms a key strategic challenge in global supply chain development.

Time dimension

Most of the key global supply chain challenges are time related, and it appears to be that they are becoming even more time related than ever before. Given that everything else is equal; the differences on time could make or break a supply chain. When the new market opportunity emerges it is usually the one who gets into the market first reaps the biggest advantages. Competitions on many new electronic consumer products is largely about who developed it first and become the industry leader. From the internal supply chain perspective, the cost and core competences are all largely measured against time. Inventory cost increase, if the materials do not move on quick enough; supply chain responsiveness is can be significantly influenced by the lead-time and throughput time.

Indeed, one of the key supply chain management subject areas is about agility and responsiveness. That is basically defined as how fast the supply chain can respond to the unexpected and often quite sudden changes in market demand. Understandably, in the increasingly fast moving global market place, developing and implementing an agile supply chain strategy makes sense. However, the tough challenges are usually not on making the decisions as to whether should the supply chain be agile or not. They are more on balancing the 'cost to serve'. In order to maintain a nimble footed business model, the supply chain may have to upgrade its facilities with investment, having higher than usual production and service capacities, or having high level of inventories. Then the question is would the resultant agility pay for the heightened supply chain costs. There is no fixed answer to this question, and it remains as a key challenge to supply chain managers.

The time measures on many operational issues have also been the major challenges for supply chain managers. Customer lead-time, i.e. from customer order to product delivery, is one of those challenges. Toyota claims that they can produce a customer specified vehicle with a fortnight – the shortest lead-time in the auto industry. This adds huge value to the supply chain in terms of customer satisfaction, cost reduction, efficiency and productivity. But it could be a huge challenge, when the customers are all over the world and the productions sites and distribution logistics facilities are not well established.

All the challenges in the three dimensions are, of course, interrelated and even interdependent with each other. A supply chain strategist must have a sound system view to understand the intricate relations of all factors in the whole supply chain and over the projection of long-term. Those strategic challenges have undoubtedly given rise to the risk level of global supply chain development. It came as little surprise that the supply chain risk management, which will be discussed later in this book, is now one of the hot topics discussed in the academia and business circle alike.

2.3 How Global Supply Chains Responded

Knowing the challenges is one thing perhaps to begin with, but learning about how to face up to the challenges is quite another. Despite the plethora of literatures on supply chain management, there are still no universally agreed "one size fit all" recipes for managers to prescribe in order to survive the challenges. Academic and empirical studies show there are at least five common approaches that supply chains have survived the global challenges.

Collaboration

"If you cannot beat them, you better join them." A great deal of global supply chain management activities are not necessarily about competing against one another, rather it is more about collaboration and partnering. Inter-firm collaboration in supply chain management context is simply defined as working together to achieve a common goal. The content of collaboration varies from project to project and from business to business. It may be a research and development collaboration which is aiming perhaps for a technological advancement or a new product design; or it could be a logistics operational collaboration where the aim is to reduce logistics lead-time and cost; it could also be marketing collaboration where the aim is to penetrate the market and increase sales. So, the collaboration is usually mentioned when there is an area or a project the activities of the collaboration can be associated with. The parties that involved in the collaboration are often referred to as the *partners* or *collaborative partners*. There are a number of obvious reasons why collaboration is one of the most favourite supply chain management approaches.

- **Sharing resources**: collaboration between two firms helps to share the complementary resources between them, thus avoiding unnecessary duplication of the costly resources such as capital-intensive equipment, service and maintenance facilities, and distribution networks and so on. Information, knowledge and intellectual resources are also very common resources that are shared during the collaboration.
- **Achieve synergy**: collaboration of the two partnering firms will usually result in what is called 'synergy.' Synergy, in general, may be defined as two or more things functioning together to produce a result not independently obtainable. That is, if elements A and B are combined, the result is greater than the expected arithmetic sum A+B. In the context business collaboration or partnering, synergy is about creating additional business value that neither can achieve individually.
- **Risk sharing**: a properly constructed collaboration can help to mitigate the company's market and supply risk significantly for both parties. Risk is the negative but uncertain impact on business, which is normally beyond control. By collaborating on investment and marketing, the negative impact of the supply chain risks can be borne by both parties and thus shared and halved.
- **Innovation**: collaboration in technology development and R&D partnering is particularly effective way to advance their competitive advantages through innovation in the technological frontier. The logic behind is perhaps that when people from different business working to gather, they start blend their knowhow and experience together, sparkling new innovative ideas. In most of innovation training programmes one can always recognise one of steps of generating innovative ideas is to have brain storming across a multi-functional team.

Supply chain integration

The nature of a supply chain is that it is usually a network which consists of a number of participating firms as its member. For a global supply chain the network stretches many parts of the world, and the participating member firms of the network can be an independent company in any country around the world. Supply chains are therefore voluntarily formed 'organisations' with fickle loyalties and often antagonistic relations in between the member firms. Communication and visibility along the supply chain are usually poor. In other words, supply chains are not born integrated.

Supply chain integration therefore can be defined as the close internal and external coordination across the supply chain operations and processes under the shared vision and value amongst the participating members. Usually, a well integrated supply chain will exhibit high visibility, lower inventory, high capacity utilisation, short lead-time, and high product quality (low defect rate). Therefore, managing supply chain integration has become one of the most common supply chain management approaches that can stand up to the global challenges.

However, there is no supply chain that is strictly 100% integrated, nor any one that is strictly 0% integrated. It is about how much the supply chain is integrated from a focal company's point of view. To illustrate this degree of difference in supply chain integration, Frohlich and Westbrook (2001) suggested a concept of 'Arc of Integration' (Figure 3). A wider arc represents a higher degree of integration which covers larger extent of the supply chain, and a narrow one for a smaller extent. The issue about supply integration is particularly important when the supply chain is formed by the members around the globe.

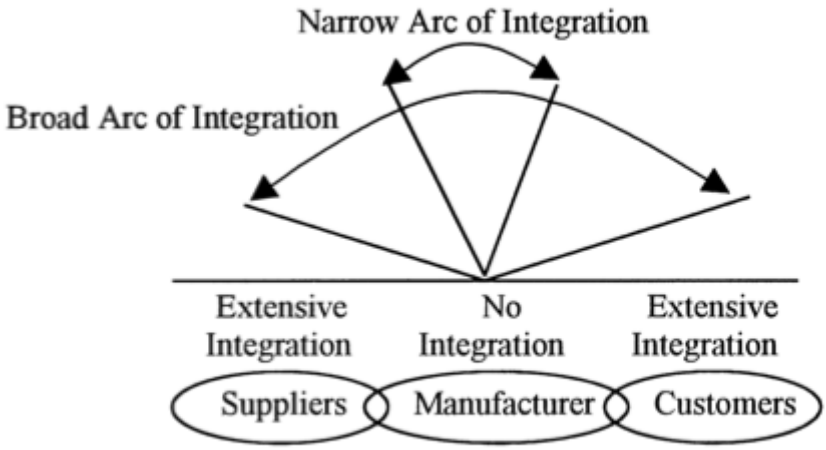

Fig. 2. Arcs of integration.

Figure 3. Arc of integration (Source: Frohlich and Westbrook, 2001)

Divergent product portfolio

A conventional wisdom says that 'don't put all your eggs in one basket.' It also makes sense in formulating a global supply chain development strategy. Translated into business management terminology, the wisdom is very similar to the 'divergent product portfolio' strategy. Then it may make even more sense when the global market becomes the stage for the supply chain. Two key characteristics of global market are volatility and diversity.

Develop divergent product portfolio will make the supply chain more capable of satisfying the divergent demand of the world market. Many leading multinational organisations have already been the firm believer of this strategy. They have developed a wide range of product or even business sector portfolio to cater for the market needs. Virgin Group, General Electric, British Aerospace are just some well know examples.

The divergent product portfolio strategy can also significantly mitigate the market risks that brought forth by the nature of global market volatility. If one product is not doing well, the supply chain can still be stabilised by others that do well. The shock of one single market at a particular time will not derail the overall business. In a long run, occasional market instabilities will ease off with each other. So, the divergent portfolio works like a shock absorber and risk mitigating tool.

Develop the "blue ocean strategy"

Instead of going for the 'head-on' competition in the already contested 'red sea' a much more effective approach is to create a new market place in the 'blue ocean', which makes the competition irrelevant. This is an innovative strategic approach developed by Prof. Cham Kim and Renee Mauborgne in 2005, and published in their joint authored book "Blue Ocean Strategy". In the book, the authors contend that while most companies compete within such red oceans, this strategy is increasingly unlikely to create profitable growth in the future.

Based on a study of 150 strategic moves in many globally active supply chains over the last thirty years, Kim and Mauborgne argue that developing the 'blue ocean strategy' (as they coined it) has already been proven an effective response to the global challenges for many supply chains. Tomorrow's leading supply chains will succeed not by battling competitors, but by creating 'blue ocean' of uncontested market space that is ripe for growth. They have proved that one can face up to the challenges most effectively without actually doing so. Creating new market space is actually a lot easier than you think if you know how.

Pursuing world class excellence:

To weather the global challenges and to achieve long lasting business success often calls for one fundamental feat and that feat is world class excellence. Almost all known world leading supply chains in all industrial sectors have somehow demonstrated that they have just been *excellent* in a multitude of performance measures. The *world class excellence* defines the highest business performance at a global level that stand the test of time. Only the very few leading edge organisations around the world truly deserve this title. But the title is not just a title. It is the fitness status that ultimately separates the business winners from losers.

To become a world class supply chain one need to excel in four dimensions. The first dimension is the operational excellence. All world class supply chain must have optimised operations measured in productivity, efficiency, cost effectiveness, quality, high standard of customer service and customer satisfaction. The second dimension is the strategic fit. All world class supply chains must also ensure that excellent operations fit to the supply chain's strategic objective and stakeholder's interests; and the internal resources fit to the external market needs. The third dimension is the capability to adapt. Would class supply chains must be dynamic and able to adapt into to new business environment in order to sustain the success. The fourth dimension is the unique voice. All world class supply chains needs to develop its own unique signature practices that render positive market results. Such internally unique practice coupled with positive market result is called unique voice. This dimension goes beyond benchmarking on best-practices; it creates best-practices (Lu 2011).

> In other words, what you can excel you can prevail, and the secret of success is doing the common things uncommonly well! That's the excellence.

2.4 Current Trends in Global SCM

Many reliable management researches and surveys conducted in recent years have come to a broad consensus that some significant development trends are shaping and moving today's global supply chains. The following trends are mainly based on and adapted from the PRTM 2010 Survey results with the author's own interpretation and analysis to facilitate student learning.

Trend 1: Supply chain volatility and market uncertainty is on the rise.

Research survey shows that continued demand volatility in most of global markets is a major concern to the executives of supply chains. Significantly more than any other challenges to supply chain flexibility, more than 74% of the surveyed respondents ticked the demand volatility and poor forecasting accuracy as the increasing major challenges to supply chain flexibility. Apparently, few companies have strategies in place for managing volatility in the years ahead let along implementing it. The lack of flexibility to cope with the demand change is increasingly a management shortfall. In the path of economic recovery, this shortfall could well be the trigger for bullwhip effect.

The fast development of cyber market and mobile media has given rise to the market visibility leading to high level of market transparency. B2B customers and consumers have found it a lot easier to shop for alternative lower price or better value. The switching cost is evaporated rapidly, and so is the customer loyalty, which adds salt to the injury. The only known approaches to deal with the trend of increased volatility are improving forecasting accuracy and planning for flexible capacity throughout the supply chain. Best performing companies tends to improve supply chain responsiveness through improving visibilities across all supply chain partners. On the downstream side, companies are now focusing more on deepening collaboration with key customers to reduce unanticipated changes.

Trend 2: Market growth depends increasingly on global customers and supplier networks

The research survey has shown a positive growing trend in international customers and international suppliers in more international locations. As a result, more than 85% of companies expect the complexity of their supply chains to grow significantly at least for the coming year. The immediate implication of this trend is that the supply chain will have to produce higher number of products or variants to fulfil the customer expectations, albeit this may vary slightly for different geographical regions. In the main, the pattern of global supply chain is going to be more complex in terms of new customer locations, market diversity, product variants, and demand volatility.

On the supply side, the trends indicated that a more dynamic supply networks stretching far and wide globally. Managing those suppliers, developing them and integrating them become more a critical challenge than ever before. Nearly 30% of respondents expect the in-house manufacturing facilities will decline and to be replaced by outsourced and off-shored international contractors. Similarly nearly 30% of respondents expected a decline in the number of strategic suppliers to the OEM (original equipment manufacturer) in order to achieve more closely integrate the supply chain for higher collaborated value adding. This will result in more consolidated supply base. This is more evident in North America and Europe, but significantly less so in Asia where expansion of supply network is more of the case.

Trend 3: Towards more cost-optimised supply chain configurations

Survey respondents seemed confident that they will be able to deliver substantial gross margin improvements over the next couple of years. However the gains will not come from price increases, but from reductions of end-to-end supply chain costs. Globalising supply chain operations and outsourcing specific functions are viewed as critical for controlling costs. It came as no surprise that outsourcing is on the rise across many industrial sectors around the world. Companies are taking advantages of lower costs in emerging markets and increasing their flexibility of their own supply chain. The functions that will see the greatest increase in outsourcing are product development, supply chain planning and shared services.

However, globalisation does not seem to have reduced process and management costs. In fact those hidden costs could be on the rise when supply chain becomes more global if not careful. Leading companies understand the impact of those hidden costs and are taking aggressive steps to identify and manage them. Many are embracing new concepts like Total Supply Chain Cost Engineering, an integral approach to calculating and managing total cost across all supply chain functions and interfaces. Rigorous cost optimisation across the end-to-end supply chain – from order management, sourcing, and manufacturing to logistics and transportation – are critical for success.

Trend 4: Risk management involves end-to-end supply chain

To date, risk has become an increasingly critical management challenge across the global supply chains. According to the research survey participants, new demands from their customers have played a key role in this development. Dealing with cost pressures of their own, many customers have increased their efforts in asset management and have started shifting supply chain risks, such as inventory holding risks, upstream to their suppliers. This approach, however, merely shifts risks from one part of the supply chain to another but not reduces it for the whole supply chain. In fact, between 65% and 75% respondents believe that supply chain risks can only be most effectively mitigated by the end-to-end supply chain approaches. These end-to-end supply chain practices include advanced inventory management, joint production and material resource planning, improved delivery to customers and so forth.

Leading companies are taking an end-to-end approach in managing risk at each node of the supply chain. To keep the supply chain as lean as possible, they are taking a more active role in demand planning, which ensures they order only the amount of material needed to fill firm orders. Firms are also limiting the complexity of products that receive late-stage customisation. Leading companies mitigate inventory-related risks by shifting the responsibility for holding inventory to their suppliers and, furthermore, by making sure finished product is shipped immediately to customers after production.

Trend 5: More emphasis on supply chain integration and empowerment

Little can be achieved without appropriate management approaches that truly integrated across all functions throughout the supply chain and empowered them to take bold action. However, approximately 30% mention the lack of integration between supply chain functions like product development and manufacturing. Integrated supply chain management across all key functions still seen to be a myth, with many procurement and manufacturing executives making silo optimisation decisions. Nearly one-fourth of survey respondents point to their organisations' inability to make concerted actions and coordinated planning to respond to the external challenges. This could be a surprise to many that would believe after so much has been talked by so many for so long on the supply chain integration, little has been achieved in practice.

Whilst almost all the survey participating companies have supply chain department, many of them failed to empower their supply chain managers to take leading roles in business transformation. Leading companies understand that breakthrough improvements are not possible unless the decisions made are optimal for all supply chain functions. For this reason, they have already taken steps to integrate and empower their supply chain as a single resource under one joint responsibility. These firms are making sure the organisation has a strong end-to-end optimization, and are integrating supply chain partners up and downstream.