

# Supply Chain Resilience and Sustainability

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*'The only stable thing is that everything changes' (Heraclitus, Ancient Greek Philosopher)*

## Abstract

**Scope:** Re-approaching the contemporary issue of a holistic re-engineering strategy in relation with the resilience in the value supply chain circuit. Increase in collective capabilities to overcome risks of increasing vulnerabilities and to improve business and economic sustainability.

**Research Methodology:** Building-up an integrated methodology framework of mixed participatory interactive action. Systemic and process value chain analysis, collective use modern knowledge management combining multicriteria with proactive value creation process for sustainable competitiveness with the 'power structure' and 'institutional flexibility' to encompass physical and social technology infrastructure with modern cybernetics governance.

**Anticipated Results:** Improve understanding and use of an operational R&D framework for enhancing collaboration, strengthening collective capacities and performing holistic re-engineering strategy in support of resilience and sustainable competitive advantage. Critical role of the institutional efficiency to combat power concentration and leverage the interfirm and interdisciplinary Supply Chain Re-engineering (SCR) to ensure resilience and sustainability.

**Originality/contribution:** Contribution to better understanding the resilience to face the increasing trend of vulnerability and mitigate risks from globalization of markets, as cornerstone to company sustainability. Relation to the problem of world poverty, environment protection and development by collective intercompany and interdisciplinary value chain networks. Knowledge management by re-engineering and building-up an interactive methodology framework of broader relevance, to fulfil the multicriteria of stability and sustainability (Sustainable Supply Chain Management, SSCM). Role of new collective culture and vision to align governance with human face and solidarity for maximization of collective capabilities and integration synergies. Rethinking of the roots of increasing of increasing vulnerability and crises, for resilience to ensure sustainability, development, progress in peace and saving the collective human civilization.

**Keywords:** SCM, Supply Chain Management. SCR, Supply Chain Re-engineering. HSCS, Holistic Supply Chain Strategy. SSCM, Sustainable Supply Chain Management. SMS, Sustainable Management Systems. RSC, Resilience of Supply Chain. SCR, Supply Chain Risk Management. CPAM, Constructive Participatory Action Methodology.

## 1. Introduction

This paper focuses on the development of a managerial agenda for the identification and management of supply chain risk and formulates certain recommendations to improve the resilience of supply chains. The conceptual issue of the value chain resilience enhances the supply chain management (SCM), as further advance to supply chain re-engineering (SCR) and to sustainable supply chain management (SSCM) to become mainstream in recent years. The conceptual engagement is part of the literature review that followed the surge of interest concerning the value chain resilience in the last decade. It seems enough for practitioners to sketch out the literature review, to avoid repetitions and focus in filling gaps to strength the resilience concept for performing implementation.

The literature review is followed by special concern to the methodology issue for the purpose of formulating a workable integrated R&D framework, to support decision making at case level. More specifically, attention is attributed on bridging the gaps for improving performance of re-engineering strategy at intercompany value chain level. The zero start or restart approach of critique, analysis and synthesis aims at better understanding of the complex SSCM, selection and mobilization of all partners by concerted participatory action R&D methodology.

The next section concentrates on the realization of the critical requirement of interactive, multidisciplinary and interfirm collaboration due to the complexity of the value network chain process. The attention then turns to the question of looking for most appropriate ways ('how') towards increasing collective capabilities to ensure resilience by two essential 'marriages': 'colpetition' (derived from collaboration and competition) and 'syntegration' (derived from synergy based on integration), as cornerstones to build-up a re-engineering plan, in view of the increasing risks of vulnerability in transactions environment.

The issue of new strategic thinking towards proactive strategies follows to cope with the changing environment of increasing risk and vulnerability, in view of the fact that the dominating tools and practices have ex-post reactive character following predetermined situations rather than proactive intervention to achieve long-term competitive advantage (e.g. 'standardization', benchmarking', etc.). It calls therefore for participatory new innovative ideas of collective management to meet the challenge of increasing vulnerability and to mitigate risks, without impairing the sustainability goal.

The study goes on the question how to strengthen collaboration for increasing collective interactive capabilities, based on a designed process of advanced planning and co-ordination at timely oriented strategic, tactical and operational level. For this purpose the attention turns to the issue of agility into the supply chain processes, as a further advance of the lean manufacturing and prior inventories management techniques.

It proceeds with generalizing SCR to ensure resilience at value chain level, which emerged eight years ago, originated largely from the Canfield University, School of Management (2002, 2003). The task is to sufficiently understand the essence, the constraints and how to overcome them as the only way to face anymore the challenge of survival and sustainability.

The study is extended to further penetration into the roots, causes and processes of value creation. Main issues in the integrated approach are the institutional flexibility and changing 'power structure'. Thus, it epitomizes the system dynamic analysis with reference to the debate the power structure concentration and the integration at value chain level - the so-called 'new institutionalism' - and the possibilities of SCM extension to public administration, organizations and enterprises.

The paper ends with a number of conclusions based on the criterion of contribution in improving the process of increasing the collective capabilities to strengthen resilience for

containing vulnerability and ensuring sustainability along with quality of life and social cohesion.

## **2. Literature review**

There has been increasing concern of research and operations management during the last decade to cope with increasing vulnerability and risks of business disruptions. The initial study on supply chain resilience, conducted in the Canfield University School of Management (2002, 2003), came out in brief with the following: (1) supply chain vulnerability is an important business issue; (2) little research existed into supply chain vulnerability; (3) awareness of the subject was poor; and (4) a suitable methodology is required for managing supply chain vulnerability. In parallel, researchers especially at the Massachusetts Institute of Technology (MIT) analyzed many case studies of exterior supply chain disruptions useful for identifying vulnerability characteristics and management responses such as flexibility, redundancy, security, and collaboration (Chopra and Sodhi, 2004; Sheffi, 2005).

Apparently, the increasing research attention to vulnerability and supply chain resilience is critical for SSCM that has increased momentum in recent years (WBCSD, 2002; Sharma and Henriques 2005; Global Reporting Initiative, 2006; Scherrer et al., 2007; Seuring et al., 2008; Searcy, 2009; Borison and Hamm, 2010).

As effective SCM contributes significantly in improving performance and attaining sustainable competitive advantage, risk and uncertainty has always been an important issue in SCM and has become a need for companies nowadays (see Aven, 2002; Tang, 2006; Vanary and Zailani, 2009; Borison and Hamm, 2010). Earlier research considered risks in relation to supply lead time reliability, price uncertainty and demand volatility which substantiated the need for safety stock, inventory pooling strategy, order split to suppliers, and various contract and hedging strategies (Chen and Paulraj, 2004; Gaiardelli et al., 2007; Barber, 2008). The notion of effective supply chain risk management (SCRM) has gained increasing momentum in more recent years due to increasing supply chains complexity and vulnerability, including the use of global contract manufacturers and suppliers. The topic of resilience in the supply chain literature has become more recognized and widespread, although SCRM is still in the infancy stage (Bakshi and Kleindorfer, 2009; Ponomarov et al., 2009; Vanary et al., 2009; Pettit et al., 2010).

The research of RSC is engaged with the phenomenon of increasing vulnerability and the techniques used to anticipate, mitigate and overcome disruptions (Bakshi and Kleindorfer, 2009; Pettit et al., 2010). Supply chains as complex networks of enterprises experience increasing turbulence and unpredictable disruptions. In effect, executives identify supply chain risks as the highest threat to their firms. Studies have found that, although effectively managing such operational risks directly affects financial performance, a majority of corporate board members are under-informed about those risks (Council on Competitiveness, 2007). Becoming aware of these gaps, an increasing number of researchers are realizing the significant role of the resilience concurrently at value chain level (Feller et al., 2006). The past uses of the concept of resilience in engineering, ecological sciences, and organizational research, facilitate creating a conceptual framework for supply chain resilience (figure 1).

Source	Definition	Field of study
Merriam-Webster (2007)	Capability of a body to <i>recover its size and shape</i> after deformation	Engineering
Folke et al. (2004)	<i>Ability to rebound</i> from a disturbance while maintaining diversity, integrity and ecological processes	Ecology
Gorman et al. (2005)	<i>Ability to bounce back</i> from adversity	Psychology
Stoltz (2004)	<i>Ability to bounce back</i> from adversity and <i>move forward</i> stronger than ever	Leadership
Rice and Caniato (2003)	<i>Ability to react</i> to an unexpected disruption and <i>restore normal operations</i>	Supply chain
Sheffi (2005)	<i>Containment of disruption</i> and <i>recovery</i> from it	Supply chain
Christopher and Peck (2004a)	Ability of a system to <i>return to its original state</i> or <i>move to a new, more desirable state</i> after being disturbed	Supply chain
Fiksel (2006)	Capacity for complex industrial systems to <i>survive, adapt and grow</i> in the face of turbulent change	Supply chain

**Figure 1:** Different Definitions of Resilience

The concept of RSC combines these previous tenets with studies of supply chain vulnerability, defined by Svensson (2002) as ‘unexpected deviations from the norm and their negative consequences.’ RSC has been defined as ‘the capacity for an enterprise to survive, adapt, and grow in the face of turbulent change’ (Fiksel, 2006).

Mathematically, vulnerability can be measured in terms of ‘risk’, a combination of the likelihood of an event and its potential severity (Sheffi, 2005; Craighead et al., 2007). It has foundations in traditional risk management techniques and is expanded by other authors (Chapman et al., 2002, 2004; Peck, 2005; Svensson, 2000, 2002, 2004; Zsidisin, 2003).

SCR, require closer collaborations with partners across the supply chains as well as with governments, in order to make supply chains robust and resilient. The short-term costs of such security measures can be overbalanced by the long-term gains from improved supply chain performance and improved customer relations (Sarathy, 2006). Moreover, globalization involving increasing amounts of overseas components sourcing, overseas production, global factory networks and lengthy geographically dispersed supply chains servicing international markets across the world. It is noticeable that overseas shipping now accounts for over 90 percent of worldwide trade, however, the physical infrastructure underpinning globalization has been considered to be under threat (National Defence University, 2002).

The concept of adaptability is crucial to ‘living systems’ and supply chains may be seen as a network of ‘living’ systems. Based on this systems concept, Fiksel (2003) proposed four major characteristics of resilient systems: diversity, efficiency, adaptability, and cohesion. Peck (2005) has proposed multi-level supply chain framework identified on four key principles: (1) resilience can be built into a system in advance of a disruption (i.e., re-engineering); (2) a high level of collaboration is required to identify and manage risks; (3) agility is essential to react quickly to unforeseen events; and (4) the culture of risk management is a necessity (Cranfield University, 2002, 2003; Christopher and Peck, 2004b; Peck, 2005). Other researchers have later on advocated the use of simulation-based studies to help quantify the relationship between supply chain disruptions and relevant design characteristics at a strategic level (Kleindorfer and Saad, 2005; van der Zee and van der Vorst, 2005; Tierney and Bruneau, 2007; Craighead et al., 2007; Falasca et al., 2008; Vanary

and Zailani, 2009). Supply chains are becoming more complex and more vulnerable, thus contributing to potential supply chain disruptions (Figure 2).

- ✧ Globalization of supply chains
- ✧ Specialized factories
- ✧ Centralized distribution
- ✧ Increased outsourcing
- ✧ Reduced supplier base
- ✧ Increased volatility of demand
- ✧ Technological innovations

Adapted from: *Supply Chain Vulnerability: Executive Report*,  
School of Management, Canfield University, 2002 \

**Figure 2:** Factors of supply chain resilience

It has been maintained that prevention or resilience as the ability to maintain positive adjustment under challenging conditions is supported by grounded like theory (Blatt et al., 2006). Because. It allows participants to identify what they see as a problem in line with a methodology that is intellectually stimulating and supports simultaneous inductive-deductive thinking (Glaser and Holton, 2004).

An eco-efficiency approach pertained that strategy rarely results to optimization, as it may be eroding the resilience of production systems (Korhonen and Seag, 2008). A literature review of the SCRM for the period 2000-2007 classified studies into five categories (conceptual, descriptive, empirical, exploratory cross-sectional and exploratory longitudinal) and types of risks, unit of analysis, the industry sectors, and the management process or strategies addressed (Vanary et al., 2009). Resilience is still evaluated, however, as a relatively undefined concept in the emerging discipline of SCRM (Pomonarov and Holcomb, 2009).

Other studies focused on that disruptions can also bring opportunities for success, by ‘impress customers and win their loyalty’ (Knemeyer et al., 2003), with actual examples (Sheffi, 2005), or ‘can offer an opportunity’, and ‘successful recovery and adaptation to new market forces can lead to competitive advantage’ (Rice and Caniato, 2003).

The concept of resilience is encompassing, among others, the organizational leadership, pointing out that it is ‘more than education, more than experience, more than training, the level of resilience will determine who succeeds and who fails’ (Coutu, 2002). Therefore, creating resilient leaders ‘is the best way to ensure that an organization will prosper in a very chaotic and uncertain future,’ and resilient organizations consistently outlast their less resilient competitors (Stoltz, 2004). Organizations must learn to improve anticipating, absorb, and overcome disruptions (Pickett, 2006). Disruptions have adverse effects in both revenues and costs, though there is still a number of theoretical and methodologies gaps for managing integration perspective and a unified theory of resilience is still underdeveloped and waits for interdisciplinary approaching (Ponomarov et al., 2009).

Other studies pertained to a number of factors e.g. the best contingency and mitigation strategies for a firm with a single product and two alternative suppliers (Tomlin, 2006); an insurance risk management framework (Lodree Jr, and Taskin, 2007); developing a dynamic system model for supply chains (Huang et al., 2007); an agent-based framework for studying multi-product, multi-country supply chains subject to demand variability, production, and distribution capacity constraints (Datta et al., 2007); insurance and re-insurance (Doherty et al., 2008); joint venture (Darrough and Stoughton, 1989; Bakshi and Kleindorfer, 2009); applications of the Nash bargaining solution (e.g., Plambeck and Taylor, 2005); incentive to hide vulnerability to disruptions from global supply chain partners (with not efficient markets, ‘asymmetric information’ and subsequent ‘adverse selection’ and ‘moral hazard’);

the principal-agent literature (Laffont and Martimort, 2001); a framework to solve the bargaining problem with incomplete information and the ‘revelation principle’ (Harsanyi and Selten, 1972; Myerson, 1979); recent debate on the axiomatic approach to bargaining vis-a-vis the strategic approach (sometimes also referred to as the non-cooperative approach to bargaining), by use this as the starting point a two-player model (Bakshi and Kleindorfer, 2009). The interdependent nature of risk in supply chains pertains to Total Quality Management (TQM) and new product introduction (NPI), although the differentiating feature of catastrophic disruptions is that, unlike in quality management, it does not make sense for the players to design contingent contracts that use occurrence of failures as a gauge for performance. Melnyk et al. (2010) maintain that the supply chains of tomorrow must be properly designed to deliver varying degrees of six outcomes – the traditional cost-related benefits, plus responsiveness, security, sustainability, resilience and innovation – depending on key customer needs. It is increasingly recognized the need for meeting the requirements of ‘reduced cost-fast delivery-improved quality’, so that a more sophisticated supply chain is emerging, that also will serve as a vehicle for developing and sustaining competitive advantage under a variety of performance objectives. While the old supply chain was strategically decoupled and price driven, the new supply chain must be strategically coupled and value driven. Therefore, it should be designed and managed to deliver specific multiple outcomes.

### **3. Revisiting the Methodology Issue**

The attention to the research methodology issue aims at supporting decision making through overcoming pervasive long past methods and practices, including the associated misconceptions, misunderstandings, contradictions, paradoxes, attitudes, culture, philosophy, asymmetric information, inertia and inaction to change. The real problem is how to amalgamate knowledge and multidisciplinary R&D attributes to serve the critical role of the methodology issue, as ‘there are hardly any publications on methodological questions in the field’ (Kotzab et.al, 2005). However, it has been pointed out that ‘few companies take the right approach’ when it comes to improving their supply chains (Lee, 2004).

Special attention is going to be attributed on how strategic thinking and knowledge management can be used to build-up proactive holistic re-engineering strengthen collective capabilities for achieving resilience, mitigating risks from increasing vulnerability to ensure sustainability of progress and quality of life. The task to motivate all available resources requires a new vision and a new state-of-the-art, taking into account the ‘institutional efficiency’ and ‘power structure’ for improving integration and supporting the application of SCR. Moreover, it will be studied whether the rootstalk of SCM can contribute in an alternative strategy, to overcome the constrain of debt, compared with the austerity stabilization program established in the end of the Second World War.

A converging remark from the literature review is the usefulness of conceptual research framework by modeling it and taking varying degrees of provision for quantification and measurement and control of the results. However, research concerning the supply chain resilience does not always relate sufficiently to the causes of vulnerability, as a way of avoiding the risks of trapping into misuse of concepts and long dominating conventional methodologies, theoretical preoccupations, philosophy, culture, techniques and practices (deduction, positivistic, partial character, etc.). The hasty move to new concepts, like value supply chain, holistic re-engineering and sustainability, can exert adverse effects on the long-term sustainability objective without sufficient provision on the methodology background. This can lead to possibly adverse effects by misuse of both logistics and of sustainable issue,

namely the ‘fatal sins of outsourcing’ and the myths associated with the issue of the sustainability (Seuring et al., 2008; Pagell and Zhaohui, 2009).

More particularly, such a fragmentation is associated with neglecting the role of the institutional framework, flexibility and change in the power structure. In so far as there is a trend of power concentration and institutional glitch, these can act as vulnerability generators and at the same time as breaks to the SCR, namely they can have double adverse effects on sustainability. Therefore, to strengthen the integrated network character of the SCM and its advance to SCR, the research has to be driven directed towards two directions: firstly, to formulate a R&D framework to support decision making at case level; secondly to penetrate into the interrelationships of the power structure and the institutional flexibility and their effects on vulnerability, introduction of SCR and collective capabilities.

This double purpose prerequisite a formation of a workable R&D framework and step inside to the issue of dynamic interrelationships between power structure and the institutional flexibility which incubates the collaboration forces and strengthen resilience and sustainability. More specifically, the concept of the network of value supply chain is based on collaboration attitude and practices which presupposes discipline to the socioeconomic axiom of active participation, conceived as a new social agreement of collaborative action. This prerequisite is often neglected in the number of frameworks and models seen in the literature review. It obviously suggests modern strategic thinking for genuine holistic redesigning from zero start to end, namely partnership in sacrifice as well as in the expected ‘syntegrating effects’ (from synergy and integration). It is a complex unique project, not easily rationalized, formalized and generalized.

Realism seems to suggest a ‘wisdom and phantacy mix’, with the need of collaboration to make compatible humanism with efficiency anymore, operating in today ‘chaos-tolerant supply chain in a world of increasing uncertainty’, namely relaxing the ambitions of generalizations and the risks of idealizing in office work away from the real world. Objectively, it is a complex interdisciplinary and interfirm task that has not prior paradigm to follow. This is feasible through change in attitudes and practice with social spirit and responsibility, on historical necessity for avoiding sinking altogether. For instance, nobody alone can say in advance, whether a firm or an institution in operation has to demolish in scrap and rebuilt or to go on restructuring for collective confrontation with others.

The actual challenge and opportunities of tomorrow call for a united front of start / end character for value creation to users. Thus, the resilience literature converges to the necessity of increasing collective capabilities, throughout re-engineering at value supply chain level, leaving aside differentiations in details. What each will be called to do in the new conglomeration will conform to the criteria of relative efficiency, talent, experience, etc.

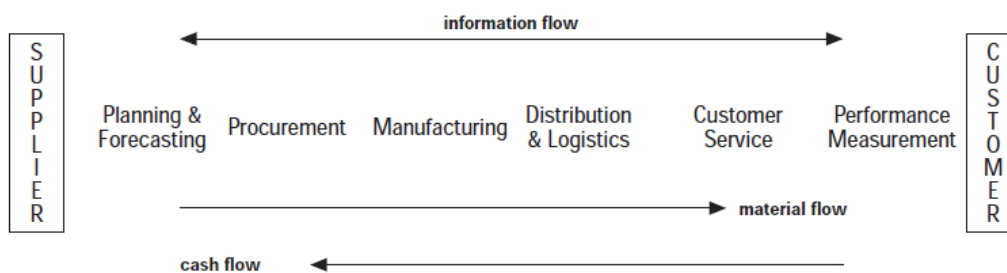
Therefore, overcoming conventional practices and use of genuine holistic strategy requires social responsibility, extended to institutional level, including academians and modern means of mass information. The R&D challenge of maximizing collective capabilities, by awareness and mobilization of all available resources, is not just a matter of formal organization, with possible harming innovation promotion and effective participation in the value creation process. A sufficient R&D methodology seems to be found in a constructive participating action framework (CPAF), as partnership in the ‘extended company’ to ensure flexibility to changing circumstances and become a ‘learning hyper-organization. Such thinking leaves room for specific infrastructure requirements and inter-organizational layers, as well as for ‘local’ behavior of sub-networks (Peck, 2005). It seems further to help the determination of an ‘optimal’ strategy under different conditions, through an approach such as multicriteria simulation-optimization and a context of providing computer-aided decision support (see more, Joines et al., 2002; Falasca et al., 2008).

## 4. Complexity and Collaboration in the Value Creation Process

### 4.1 Increasing Complexity

The resilience for capturing the dynamics of turbulence and vulnerability into the concept of a 'supply chain,' adds to its complexity. Better understanding of the concept of a supply chain is critical for the network of companies involved in the upstream and downstream flows of products, services, finances, and information from the initial supplier to the ultimate customer (Christopher, 1992; Lambert et al., 2005; Mentzer et al. 2001). Therefore, to deal from the beginning with the vast degree of turbulence and complexity in supply chains requires an enterprise view with collaboration among all business functions within the firm (Ahlquist et al., 2003), as well as inter-organizational alignment among supply chain members (Lambert, 2006; Slone, Mentzer and Dittman, 2007), otherwise inbound and outbound logistics. Because, changes, in the turbulent corporate environment, result in increasing complexity and vulnerability.

Supply chain incorporates three main flows: material, information and cash flow (Figure 3). Material flow activities aim at delivering to the final customer, via procurement of raw materials, manufacturing, distribution and customer service. These must be managed from upstream to downstream, based on the bidirectional flow of information and the movement of money from downstream to upstream.



Source : Spekman et al., 2004

Figure 3: Flows in the supply chain

Sufficient understanding of SCM is very useful, as well as of how it emerged and how it has been rapidly progressed to become mainstream at research and application level. Also, the implications of advance to SCR, acknowledged as a 'revolutionary change' must be realized, since it has been attributed as comparable to the scientific management and planning by Frederic Taylor and Henri Fayol that emerged just about one century ago (Boone and Bowen, 1987; Hammer and Champy, 1993; Knights and Willmott, 2000; Malindretos et al., 2002). Seeds of these changes go back to early after the 2<sup>nd</sup> world war (Drucker, 1954, 1988), by severe criticism of the functional firm structure and side effects of fragmentation of management, against coordination and effectiveness.

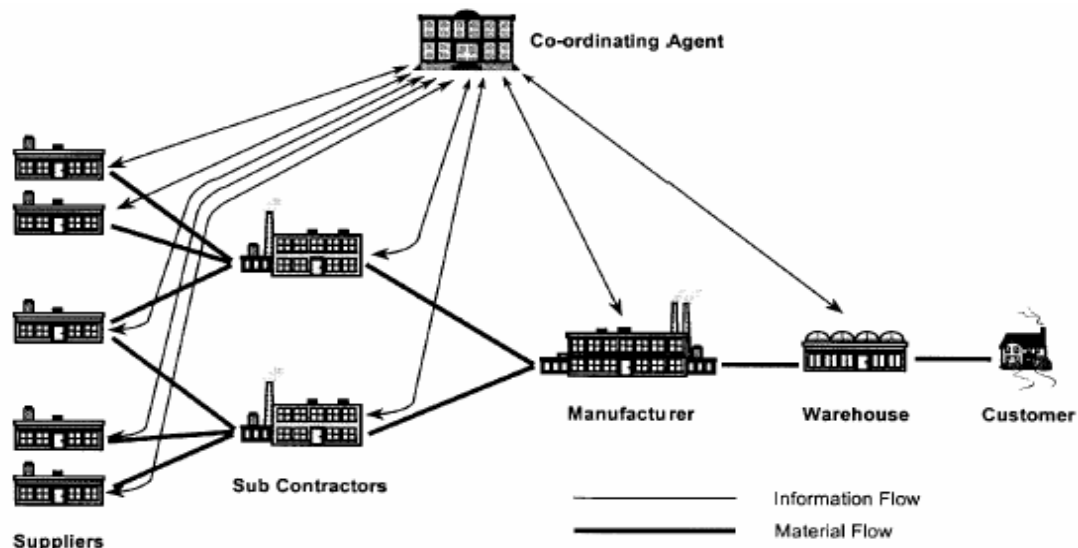
Especially, the distribution functions, such as procurement and replenishment, transport and warehousing, marketing and selling, were treated in the past as 'cost burden' and 'liability'. Therefore, the emergence of logistics as a scientific discipline deals with their inter-dependent management, taking into consideration the trade-offs and the potential positive effects in cost, quality, time, service and value creation to the final users. The use of such effects has been supported by assignment of 'non-core' functions to third parties (outsourcing: 3PL), upon the 'make-or-buy question' (Lambert and Stock, 1993; Rushton



and Oxley, 1989; Gattorna, 1990; Christopher, 1992; Ballow, 1992). Processes are specified and classified in two categories: core processes which express the main business goal and non-core ones, which are supplementary and can be assigned to outsourcing. The make-or-buy decisions have to be based on strategic integrated planning at supply chain level (Malindretos and Moschouris, 2008).

The next historical advance was the drive to further strengthening of the role of Logistics with entire move to interfirm supply chain level with stable interdisciplinary collaboration. SCM is an integrated concept throughout the supply chain as a source of value maximization and total cost minimization, based on interrelationships mix in a network sense. Such a conceptualization was first presented by Forrester (1961), however it was put in action later. Different experts have been discussing the usefulness of sustainable management systems (SMS) as holistic systems that might integrate environmental, social and economic elements (Esquer-Peralta et al., 2008). Focus has turn to value creation to the customers through higher service quality. This new change has helped in clearing up alternative distinctive firm strategies to ensure competitive advantage: ‘cost leadership’, ‘product differentiation’ and ‘combined focus’, with marked contribution of Porter (1980, 1985).

An arbitrary taxonomy in differentiated frameworks of the changes includes the following: the focus in ‘cost leadership’ strategies during the 1970’s was followed by ‘product differentiation’ during 1980’s. 1990’s has been earmarked by the so-called ‘globalization phenomenon’, after the unprecedented peaceful collapse of the central planning system in Europe by late 1980’s. To face the challenge of adjustment to the new ever changing transactions environment, there has been a further major change for first time in the economic history, characterized by the unification of firms at supply chain level, the so-called business process or supply chain re-engineering (SCR) (Hammer and Champy, 1993). Further attention during the first decade of the new millennium was given to the so-called sustainable supply chain management (SSCM) and to the issue of agility and later on to resilience, putting vulnerability and sustainability, in the mainstream of attention. The rebuilding of a supply chain into a SCM network has been subject to a very complicated exercise that requires long-run collaboration, holistic strategy, discipline, and control (figure 4).



Source: Jagdev and Browne, 1998

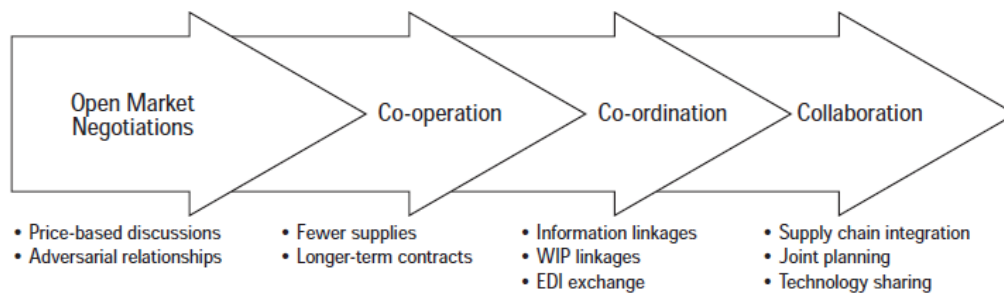
Figure 4: A typical extended enterprise

The literature focuses on conceptual and empirical aspects, not always in balance, often without adequate connection with the fundamentals of the SCM and SSCM. Clarification of many other relevant concepts is associated with the historical change, such as integration, holistic character, networks, value strategy, management systems (MS), power structure, institutional flexibility, etc. Such issues are increasingly studied without always sufficient specification, in a variety of fields, including cybernetics and governance, academy, politics, and non-governmental organizations, also being used by the general population.

#### **4.2. Critical Role of Designed Collaboration**

In meeting a challenging business environment, the emergence and rapid extension of SCM has not to be conceived as prescription, savior and a safety belt. True that no single firm can anymore ensure effective provision of product (or product/service bundle) since inefficiency, delays and other 'wastes' (i.e. non-value adding activities) can emerge anywhere in a disorganized supply chain. Contemporary effective integrated supply chain can create maximum end-user value, with agents working together as partners. The real challenge is how to marry collaboration with competition (col-petition), by designing and coordinating in order to create the desired value for the customer throughout the whole supply chain. Facing this new era of business practices, successful winners will be those that can collaborate and work together with all partners, in a supply chain committed to better, faster and closer relationships with the final users (Christopher, 1992). The modern electronic high technology can facilitate collaboration and information for sharing risks and costs, taking an equitable share in the outcomes to be created. The partners can be motivated to help each other, to improve collectively the operational efficiency towards eliminating waste, so that the whole chain will be optimized and integrated as a single system.

The sense of collaboration in the network supply chain level is to achieve high collective capabilities and performance, beyond temporary long-term cooperation. Collaboration goes side by side with co-ordination, involving a set of relations to develop seamlessly linked activities between and among trading partners, through JIT systems and other mechanisms. Thus, co-ordination is not sufficient for the overall SCM and therefore it calls for a new sense of collaboration. True collaboration partnerships are based on high levels of trust, commitment, consistency and information sharing among the partners (Spekman et al., 1998; Slack et al., 2004). Partners throughout the supply chain must be integrated in a user customership relation so that to attain maximum satisfaction for the final users. Thus, there can be significant impact on own performance as well as that on the whole supply chain. Close collaboration with partners, including manufactures, suppliers, distributors, transporters and end-customers are the key to success. A climate of closer collaboration among all partners creates common goals for the mutual benefit of each individual partner. Failing to collaborate would result in the distortion of information, which, in turn, can lead to inefficiencies, excess stock, slow response and lost profits (Lee et al, 1997). Collaboration enables partners to gain a joint understanding of future product demand and to implement realistic programmes for satisfying it and yielding major business benefits: increase in the market share, stock reductions, reduction in cost and lead-time, improved quality and shorter product development cycles (Corbett et al., 1999).



Source: Spekman et al., 1998

**Figure 5:** Key role of collaboration in the supply chain

The changing business environment has called for close collaboration in the form of ‘extended enterprise’, (Browne et al., 1995; Browne et al., 1996; Jagdev and Browne, 1998), ‘adaptive supply chain’ (SAP, 2002), and linking of firms into ‘learning organizations’, with knowledge to become ‘the currency of exchange’ (Spekman and Davis, 2004), through frequent exchange of status information (Jagdev and Thoben, 2001). All activities for movement of materials and information should be operated through collaboration with partners in a synchronized and coordinated way (Scholz, 1997).

## 5. Syntegration and Cybernetics

### 5.1 From Synergies to Syntegration

To overcome the main limitations, environmental management systems (EMS) have to explicitly address cultural and structural issues in a true holistic approach and to look for innovative insights into the combined use of complexity and cybernetics for understanding complex networks dynamics (Espinosa and Leonard, 2009).

The transition that the postmodern western societies from the industrial to the information age and knowledge management are experiencing is a major subject for companies, non-profit and public organizations alike (Hasler Roumois, 2007). The actual ‘synergy effects’ can be best achieved through building-up integrated supply chains, so that the concept of ‘syntegration’ and ‘syntegration method’ have been introduced. It works out in a ‘cybernetically sound’ method that has scientific background and structure to enable for practical experiences of governance useful to analyze the current global crisis (‘cybernetics of crisis’). Further clarification is helpful from avoiding irresponsible misuse of the synergy concept without substantiation of integration and holistic SCS. The ‘syntegration’ approach can be integrated in a modern systems theory and is, therefore, very suitable component of a ‘learning organization’ (Maturana and Varela, 1987; Leonard and Beer, 1994; McMullin, 2004). Syntegration, based on management-cybernetics, results in optimal integration that brings forth the maximum benefit of communication processes. Empirical findings and practical experience account for outstanding success of Syntegration (Diringer, 2010).

### 5.2. Proactive Supply Chain Strategy

The Porter's strategy options (1980) and the proposed five-forces model, actually underline different degrees of markets imperfections (competitive rivalry; barriers to entry; threat of substitutes; the power of buyers and the power of the suppliers) and the value creation process. It substantiated three ‘generic strategies’ (cost-leadership, differentiation and focus), in pursuing competitive advantage (Porter, 1985). The five forces analysis, is one part of the complete Porter strategic models, whereas the other are the value chain and the

generic strategies. It has been pointed out that the primary social mission of companies as institutions is to create value to the citizens and society at large. Main duty of the modern management and leadership has to revisit social mission and responsibility, in order to articulate a moral corporate philosophy, contrary to thinking about companies in very narrow terms and to weaken their ability to create value for the society (Ghoshal and Moran, 1999). On the other hand, strategic planning should not harm strategic thinking, as the most successful strategies are visions, not plans (Mintzberg, 1994).

Moreover, within increasing vulnerability in business environment, the management has to turn attention to forward and rethinking in terms of a proactive strategy at supply chain level (figure 6).

It deviates from the past evaluation of the tools and methods (e.g. ‘best practices’, standardization, benchmarking, etc.), without rejection of their usefulness. Because, they are based on an industry’s general idea of what it does today and not foreseeing future, missing, thus, innovation. In other words, they are not proactive, forward-looking exercise, but reactive. For instance, best practices already exist and therefore to create competitive advantage requires enhanced collective capabilities, beyond the ‘generally acceptable business capabilities’ within an industry (Vivek Sehgal, 2010). It involves a ‘configure-to-order’ model and a new paradigm of promoting innovative ideas for attaining mutual benefits for customers and partners involved in the value chain.

Business functions that grow organically, simply don’t deliver any competitive advantage. The underlying reasons are that evolutionary change of business processes is actually reactive and therefore, it is like building fire-fighting infrastructure when the house is already on fire. Management must be proactive in order to build-up competitive advantage and create capabilities that need to grow, instead of simply reacting to the business conditions.

Vulnerability Factor	Definition	Sub-Factors
Turbulence	Environment characterized by frequent changes in external factors beyond your control	Natural disasters, Geopolitical disruptions, Unpredictability of demand, Fluctuations in currencies and prices, Technology failures, Pandemic
Deliberate threats	Intentional attacks aimed at disrupting operations or causing human or financial harm	Theft, Terrorism/sabotage, Labor disputes, Espionage, Special interest groups, Product liability
External pressures	Influences, not specifically targeting the firm, that create business constraints or barriers	Competitive innovation, Social/Cultural change, Political/Regulatory change, Price pressures, Corporate responsibility, Environmental change
Resource limits	Constraints on output based on availability of the factors of production	Supplier, Production and Distribution capacity, Raw material and Utilities availability, Human resources
Sensitivity	Importance of carefully controlled conditions for product and process integrity	Complexity, Product purity, Restricted materials, Fragility, Reliability of equipment, Safety hazards, Visibility to stakeholders, Symbolic profile of brand, Concentration of capacity
Connectivity	Degree of interdependence and reliance on outside entities	Scale of network, Reliance upon information, Degree of outsourcing, Import and Export channels, Reliance upon specialty sources
Supplier/Customer disruptions	Susceptibility of suppliers and customers to external forces or disruptions	Supplier reliability, Customer disruptions

Source: Pettit, 2008

Figure 6: Vulnerability Factors

The clear conclusion is that supply chain strategies need to deliberate the design of the supply chain rather than pursuing concepts that are outrun and therefore irrelevant. It means that corporations must explicitly design supply chain processes directly towards the goals of business strategy. This applies whether minimizing cost is the strategic goal - when the management should be designing supply chain to squeeze cost out through reducing shipping expenses etc. initiatives - or increasing warehouse and transport efficiencies through better labor scheduling, wave planning, stocking efficiencies, etc. Alternatively, if the strategic goal is product differentiation, the attention should be centered on product design, mass-customization, product-quality and variety. Similarly, if the business strategy is based on customer-service, the supply chain must enable customer-centric capabilities, such as order fulfillment, tracking, visibility during manufacturing and transit, etc.

Actually, processes, in any case, involve complex issues derived from their interdependence, interfirm design, mathematical programming or some complex statistical modeling – anything that is hard to understand, like a ‘black-box’. Thus, it is critical to have the clearest views of their interrelations and ‘bottlenecks’ in order to interfere on time and effectively.

All in all, staying in conventional wisdom, hinders innovations and progress at application level. It is noticeable that before ‘six-sigma’ became a corporate diet and SPC (statistical process control) became a standard method for controlling quality, they were merely statistical tools; before linear programming became fashionable in solving supply chain problems - using the constraints of available material and resources - and time-series analysis became a standard in demand forecasting, they were just mathematical theories.

As the list of collective capabilities factors can go on, no management can wait for each of them to become history before assuming new business initiatives and the associated risks. It would lead to stagnant society, economy and civilization, if not still living in the trees!

As resilience is a key ingredient in logistics risk management, it is a ‘wicked problem’, since it is open-ended and almost impossible to solve by addressing some part of the perceived problem; this often creates adverse consequences in other areas. Building resilience in organizations calls for new ideas, merging and blending different approaches to craft a solution (Simpson, 2010). Resilience was seen as collective skill acting on three levels, individual, group and organizations level; organizational resilience is not the sum of group resilience and group resilience is not the sum of individual resilience. Many businesses are somehow nested in a stable environment, relying on today and are confounded when things suddenly change. A critical question that arises is ‘adapt or transform’, that is ‘adaptive fit’ versus ‘robust transformation’: though adaptation may work temporarily, transformation and building a resiliency capability is what works best in the long run, and presumes a triple of ‘agility, adaptability and alignment’ (Lee, 2004).

## **6. Re-engineering based Resilience**

### **6.1. Agility versus Leaning**

The changing role of the inventory has passed from the Economic Order Quantity (EOQ) model (Ford W. Harris, 1913), industrial revolution and inter-city transport of goods motivated the inventory as the primary means of decoupling production from demand and combating myriad of uncertainties throughout the system, later adapted to account for uncertainty in lead-time and demand (Whitin, 1954). Adding safety stock to cycle stock extended the use of inventory as primary buffer against uncertainty for decades.

The era of customer focus in the 1980's brought service to the forefront (Kent and Flint, 1997). To manage the interaction of supply and demand risks, some methods were developed for Quick Response, using policies such as Just-in-Time (JIT), Real Time, Vendor Managed

Inventory (VMI) and Continuous Replenishment (Herron, 1987; Schwarz and Weng, 2000; Waller et al., 1999; Zinn and Chames, 2005).

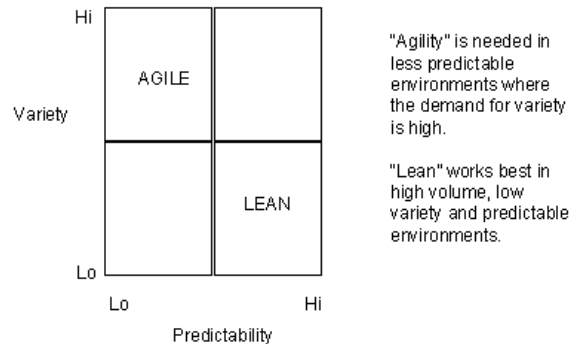
Among proposals of how to deal with an uncertain and unpredictable environment, the three notions of 'adaptive organization', 'flexible organization', and 'agile enterprise' are the most predominant and popular. There are many different approaches to define each of these terms and there is much confusion and ambiguity concerning definitions and components of each of these concepts (Sherehiy et al., 2007). Agility was defined as a rapid and proactive adaptation of enterprise elements to unexpected and unpredicted changes (Kidd, 1994). Other definitions of the 'agility' concept point out 'a manufacturing system with capabilities (hard and soft technologies, human resources, educated management, and information) to meet the rapidly changing needs of the marketplace (speed, flexibility, innovation, infrastructure, customers, competitors, suppliers, responsiveness) (Yusuf et al., 1999). Despite differences, all definitions of 'agility' emphasize the speed and flexibility or adaptability and flexibility as the primary attributes of an agile organization (Gunasekaran et al., 2001; Yusuf et al., 1999). Although, studies on agility utilize some ideas and practices related to the adaptive and flexible organization, many important developments on this topic from the organizational and management field were overlooked (Sherehiy et al., 2007). Still, there are a number of significant conceptual shortcomings concerning agile methods and the associated literature in its current state, including a lack of clarity, theoretical glue, parsimony, limited applicability and naivety regarding the evolution of the concept of agility in fields outside systems development (INFORMS: Institute for Operations Research and Management Sciences, 2010). Quick Response systems increase the brittleness of supply chains by imposing connectivity requirements and reducing inventory buffers (Monahan et al., 2003). This brittleness may be offset through increased responsiveness based on shorter lead-times; however, in such a highly-constrained system disruptions can be disastrous (McBeath, 2005).

Lean manufacturing - used in the 1990's with increasing globalization for continuing cost reductions - is defined as a 'systematic approach to identify and eliminate waste (non-value-adding activities) through continuous improvement by flowing the product at the pull of the customer in pursuit of perfection' (Optiprise, 2006). However, as these process improvements yielded mixed benefits, Christopher and Rutherford (2004) had recommended that one way to avoid 'leaning down too far' is to integrate the expected cost of recovery into the total cost equation so an optimum level of leanness can be identified. In today interesting times, powerful forces are re-shaping the global business scene: financial and economic upheaval in the Far East, Latin America and Russia, are creating a tidal-wave of change in the firms' environment. Organisations that once felt insulated from overseas low-priced competitors, now realize that they must constantly continue to create new value for their customers at a lower price. This challenge requires a radically different approach, with basic key to success the creation of an agile supply chain on a worldwide scale. Agility should not be confused with 'leanness'. Lean is about doing more with less and is often used in connection with lean manufacturing to imply a 'JIT' approach to the business. Many companies that have adopted lean manufacturing are anything but agile in their supply chain. From yesterday's world, characterised by mass production of standardised products, produced for generally predictable market demand, today's world is almost the opposite, since customers demand tailored solutions (high variety) in small quantities (low volume) with a high degree of uncertainty.

Figure 7 suggests that there will still be conditions where lean concepts are appropriate, in particular where the product is standard and volume demand is high and predictable. Such conditions however tend to become fewer, as global forces lead to higher levels of market volatility.

## Agle or lean?

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**Figure 7:** Agility versus Lean Production

## 6.2. Revival of Re-engineering

Supply chains are complex networks of enterprises that experience continual turbulence, creating a potential for unpredictable disruptions. In fact, executives identify supply chain risk as the highest threat to their firms (FM Global, 2007). Studies by the Council for Competitiveness found that, although effectively managing such operational risks directly affects financial performance, a majority of corporate board members were under-informed about those risks (Council on Competitiveness, 2007). Furthermore, traditional risk management techniques are lacking ability to assess the complexities of supply chains, evaluate the intricate interdependencies of threats and prepare an enterprise for the unknowns of the future (Hertz and Thomas, 1983; Starr et al., 2003; Vanany et al., 2009). Becoming aware of these gaps, many supply chain researchers are beginning to understand the value of the concept of resilience, defined as 'the capacity for an enterprise to survive, adapt, and grow in the face of turbulent change' (Fiksel, 2006).

The broad view of resilience in order to capture the dynamics of turbulence and complexity, responds to the supply chain definition as the network of companies involved in the upstream and downstream flows of products, services and information from the initial supplier to the ultimate customer (Christopher, 1992; Lambert et al., 2005; Mentzer et al., 2001). The vast degree of turbulence and complexity in supply chains requires an enterprise view with collaboration among all business functions within the firm (Ahlquist et al., 2003), as well as inter-organizational alignment among supply chain members (Lambert, 2006; Sloan, Mentzer, and Dittman, 2007). However, as a result of environmental changes, supply chains are becoming more complex and vulnerable.

Many tools and methods have been proposed to help business enterprises cope with continual change and survive in the long-term. In this section, we briefly review those methods, both old and new, that have contributed in dealing with supply chain disruptions, providing a foundation for the concept of supply chain resilience.

Considering the factors contributing to potential supply chain disruptions the following example demonstrates the importance of even small disruptions to the automotive manufacturing supply chain. Thus, a big earthquake in central Japan on July 16, 2007, damaged severely the facilities of Riken Corp., a supplier of automobile components including specialized piston rings. Riken had located all of its plants in a single area of Japan to increase efficiency, making the entire production capacity vulnerable to a catastrophic incident (Chozick, 2007). Earthquake damage to Riken facilities and its utilities completely

shut down production for one week, and required another week of repairs to return to full output. As a result of carrying limited inventories, Toyota, one of Riken's many customers, was highly vulnerable to production and transportation disruptions. Toyota's sourcing strategy emphasized close relationships with a limited number of suppliers, but in this case Toyota was forced to shut down all 12 of its domestic assembly plants, delaying production of approximately 55,000 vehicles.

Supply chain managers are becoming increasingly aware of these vulnerabilities. A study found that at the time a disruption is announced, the average shareholder return immediately dropped to 7.5 %. Four months after a disruption, the total loss grown to an average of 18.5 % (Singhal and Hendricks, 2002).

The study of re-engineering supply chains to improve resilience has a number of discernible general principles, which should be followed:

Firstly, resilience underpins the supply chain and largely the principles of SCM.

Secondly, resilience needs additional design. Integrated re-engineering of a supply chain, can improve its resilience.

Thirdly, as supply chains extend across different corporate entities there will need to be a high level of collaborative working if risk is to be identified and managed effectively.

Fourthly, resilience implies agility, namely being ready to react quickly to unpredictable events, that is clearly a distinct advantage in an uncertain environment.

Finally, resilience in the supply chain will be enhanced by creation of a risk management culture in the organization. The biggest risk to business continuity may derive from the wider supply chain rather than from within the business.

Understanding these key principles implies a number of particular issues for reconsideration. More specifically:

- Choice of supply chain strategies that keep several options open: this may not be the lowest cost course of action in the short term but may provide an opportunity to reduce the impact of a disruption if and when it occurs. There is an analogy here with 'Real Options Theory' in investment planning. Thus, a strategy that is based around centralization of distribution facilities may be the lowest cost option but it could also shut down other options and hence increase vulnerabilities.
- Re-examination of the 'efficiency vs. redundancy' trade-off: conventionally surplus capacity and inventory have been seen only as 'waste' and therefore undesirable. However, the strategic disposition of additional capacity and/or inventory at potential 'pinch points' can be extremely beneficial for resilience throughout the supply chain. The trade-offs inevitably involve the judgmental balancing of the cost handicap involved in maintaining slack 'just-in-case', against the probability and likely impact of a negative event. There is not a general message that corporate executives would be willing to hear. Nevertheless, if resilience is to be taken seriously, surplus capacity may well be the lesser evil than excess inventory withholding.
- Both capacity and inventory can provide 'slack' in a supply chain to enable restrain effects to be coped with. Inventory, carried in a generic or semi configured form, can enable the creation of a 'de-coupling point' which, together with additional capacity (e.g. production, transport, people), can enable demand uncertainty to be more effectively managed. This doesn't advocate a return to the days of buffering every stage in the supply chain with safety stock or excess capacity. It seems that the strategic and selective use of 'slack' may be fundamental to supply chain resilience.

## **7. Power Structure and Institutional Flexibility**



Multidisciplinary collaboration, the cornerstone of a value supply chain, reflects a network of interrelationships and suggests a system dynamics approach and advanced planning to be 'process-based' – rather than 'fixed-goal' – oriented (Scott, 2004; Bagheri and Hjorth, 2007). As it has been affirmed, 'sustainable development and sustainability are about collective values and related choices and are therefore a political issue' (Prugh, 2003). Thus, in an integrated framework, it is necessary to consider the principles and values and look for specific actions to solve real current problems (Frankel, 1998). However, it has been seen that the literature review has not shown enough attention in the roots of values and the institutions and how these are related with the phenomenon of increasing vulnerability and resilience of sustainability. To fill this gap, attention turned to the possible interactive role of institutional flexibility in relation to changes of the 'power structure' within the process of value creation. The main question is whether the neglect of these possible interrelationships can have adverse effects on the sustainability and how they may be overcome.

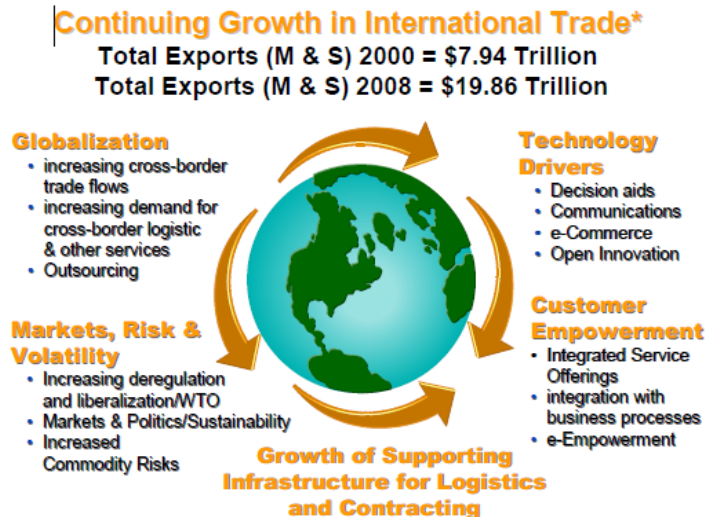
This research incorporates two main pillars: the institutional flexibility and the phenomenon of changes in the power structure. It therefore focuses on whether and how they accommodate with changing technological, economic and social environment. More specifically, the concept of the SSCM attributes critical role on interfirm and interdisciplinary collaboration to attain sustainable competitive advantage. The issue of institutional flexibility goes back to the roots and the fundamental sources of value creation. Economic theory of plural value creation (of utilitarian and marxist origins) is approached in combination with the Sociology that concerns the conglomeration of societies upon concrete value roots of common acceptability (Scott, 2004). The so-called 'new institutional school' accentuates the behavior-constraining aspect of institutions, as the 'rules of the game' (North, 1990), which reduce transaction costs and face problems of 'information asymmetry' (Williamson, 2000). It is beyond the conventional definition of institutions as 'durable systems of established and embedded social rules that structure social interaction' (Hodgson, 2003). In contrast to the conventional liberal view of institutional neutrality, it has been pointed out that the institutional flexibility plays critical role on the technological, economic and social progress (Kay et al., 2003). Moreover, the increasing social vulnerability and the need for resilience reflect the degree to which societies or socio-economic groups are affected by stresses and hazards, whether brought about by external forces or intrinsic factors – internal and external – that negatively impact the social cohesion in a country' (Witte & Reinicke, 2005; UNDP, 2007).

The institutional flexibility is related with the concept of power and 'power structure' and in multidisciplinary approach it received increasing interest especially after C. Wright Mills (*The Power Elite*, 1956) and Floyd Hunter (*Community Power Structure*, 1953). The more recent research turned to the diversion from the pluralism of fair competitive conditions and efficient markets (no discriminations, equal treatment, knowledge diffusion, symmetric information, etc.), through established cells of power concentration in minority interests (big corporations, lobbies, control of modern electronic information, 'virtual reality' cultivation, etc.) (Domhoff, 2005, 2007).

Moreover, resilience mirrors a new philosophy, civilization, culture and state-of-the-art, as the concepts of the SCM and SCR go back to the roots of the western capitalist system, founded on the protestant ethics and social values of extreme individualism and modernization. It turns to inherent instability and to 'creative catastrophe', in Schumpeterian sense. It is not in line with the collective and participatory basis of the SCM, as it has power foundation, so that a question arises whether it inclines to vulnerability and crises or whether they are system or civilization crises; in this case it calls for incorporation of other civilization elements or complete replacement (inclusive social responsibility, solidarity, mutual interests, collaborative spirit, solidarity, trust, etc.).

The global dimensions of the supply and value chain bring in historical perspective the trend of increasing turbulence and vulnerability. Rethinking on its roots goes back to the end of the World War II in 1944, in the establishment of the Bretton Woods agreement, the International Monetary Fund (IMF) and the rest international economic organizations. It is recognized that the technological change and later on the globalization phenomenon, have facilitated the production and marketing of a hugely increased variety of goods, but simultaneously pushed also certain industries to concentrate giving contrasting impressions of greater variety as the beginning of many complex socio-economic and cultural issues remaining to be resolved (Storper, 2001; Krasner, S. (2001). Also, there has been emergence, widening and deepening of 'consumerism', extended further down the social hierarchy, along with an increasing status hierarchy in consumption and fragmentation of the contemporary material and cultural life (Miller and Berger, 2001). Concerning more particularly the last twenty years the 'consumerism' has attributed to change in the society in terms of individual values, aspirations and consumer behavior patterns, related to underlying demographic, economic, technological and social trends. Thus, the 'consumer society' has been raised to reinforcing firms in industrial western countries to implement defensive technological changes (Howard and Mason, 2001). Further analysis shows that the consequent phenomenon of over debt and discounting future income by the 'consumer society' is rooted back to the foundation of the international monetary system (IMS) and a strategic choice concerning the world income distribution after the end of the World War II. It has formed on the World Power Structure (WPS) at that time, that is not irrelevant to the favorable power of the USA not participated totally in the war (Pit, 2010). Thus, there has been an exclusive pegging of the US\$ with the gold as 'reserve currency'. Thus, in brief, the over debt situation is 'the price' of the post growth of western countries, which is destabilizing itself. Moreover, the 'stabilization program' is actually destabilizing, as single sighted against deficit countries and is biased against investment and development, by austerity and deflation penalization to them. It is further on indicative of change in the 'time preference' in terms of favoring current over future consumption, so raising interest rates and withholding productive investments. Moreover, more recently, the European Monetary Union (EMU) has moved to the IMF stabilization mechanism, after failure of the 3/60% rule of current deficits/debt ratios to GDP, which however, has been the result lack of fiscal policy integration and of control mechanism.

It is therefore cleared up that the phenomenon of increasing vulnerability and the problem of resilience for ensuring sustainability is attributed to a mix of systeming and strategic and management reasons. The non industrialized countries have entered into trade liberalization environment without carrying out structural changes and consequent disproportional rise in government and external debt. However, the debt problem and the crises and vulnerability may also turn massively against the surplus/lender countries, in case of concerted bankruptcies and stop debt servicing by collective action of the debtor countries to increase their bargaining capabilities with lender countries. Moreover, it has not to be neglected the structural changes that have taken place during the second half of the 20<sup>th</sup> century, to mention here the collapse of the 'iron curtain' and the 'opposite fear' of the USSR by the end of the 1980s, the rise of the 'developing economies' more particularly China, India, Brazil, etc. Also, the control of the information mechanism along with 'asymmetric information' and intransparency that are distorting equal terms and competition chances and create moral hazard and corruption, that inhibit genuine globalization and global supply chains, along with global governance based on a single civilization attributes (figure 8).



\*Figures are in current \$'s. Source: WTO--<http://stat.wto.org/Home/WSDBHome.aspx>

Source: Kleindorfer, 2009

**Figure 8:** Smoothened global transactions circuit

The integrated re-engineering based resilience at value network level enables in particular proactive resolving critical local problems, although their emergence is uncertain. It calls for design of emergency planning by building-up a crisis model for earthquakes in sensitive countries, as it seems to have happened in Japan two years ago; a similar emergency plan for debt crisis is going to mitigate risks of deadlock in the IMF austerity program, insofar as it threatens to sovereign debt crisis and social cohesion, sometimes called Plan B, etc.

## 8. Main Conclusions

This study main goal was the provision of useful insights concerning the issue of resilience in relation to sustainability, as a means to hit the phenomenon of increasing vulnerability, along with the globalization phenomenon. The high relevance of the resilience issue rests in mitigating risks of unexpected events and ensures company sustainability in turbulent environmental conditions, due to economic, social, technological and physical climate changes. Therefore, the conclusions that are drawn have broader relevance for companies and any type of economic and social organization working out in an increasing risky world, as it is reflecting the need of an integrated R&D framework for designing a new holistic strategy of SSCM based on breakthrough re-engineering. More specifically, the conclusions drawn are epitomized as follows:

*Firstly*, the use of the resilience concept in relation to the broad challenge of sustainability represents a new way of risk management, with practical orientation.

*Secondly*, within the issue of integrated value chain analysis the objective of resilience is founded on close, dedicated connection with designed 'collective capabilities', for achieving sustainability within the new and ever changing economic, social and physical environment, of vulnerability, high complexity and interdependence.

*Thirdly*, the successful transformation of the historical challenge of sustainability to chances of reduction of disruptions depends critically on holistic re-engineering strategy, in a brainstorming process throughout the value supply chain, with new strategic priorities re-

ordering that exerts counterbalancing impact to the vulnerability with proactive 'crisis management' in the new turbulent and volatile global environment.

*Fourthly*, the success of resilience presupposes use of modern advance planning based on major move from past dominating research methods and practices that underlie extreme 'individualism' and 'statism', to a new vision, philosophy, culture, attitudes, awareness, common front, beliefs and interests, state-of-the-arts and day-to-day practices.

*Fifthly*, the feasibility study and the cost/benefit analysis for building up a resilience 'business plan' can be facilitated by a holistic R&D constructive participating action research framework (CPAF): from zero start and solid strategic partnerships, feed-back process, co-ordination and effective control system. It can be supported by multidisciplinary strategic thinking, for use of all available resources, knowledge and know-how in a learning organization (knowledge management), in alignment with critical role to the 'human capital' and proper combination with modern electronic information systems, towards producing multiple collective synergic benefits ('syntegration', from synergy and integration).

*Sixthly*, the holistic strategy based on the integrated management solution is in effect contrasted with the power concentration management model; as this model superimposed the policy option associated with the phenomenon of post-war consumerism and 'consumer society'; it has been based on 'asymmetric information' that undermines equal opportunities, conventional wisdom, foresight, human values, institutional malfunction, resources waste, moral hazard, corruption, mismanagement and massive future discounting by destabilizing debt accumulation.

*Seventhly*, the critical role of a new 'collaboration culture' contrasted to the 'stabilization program' of the IMF established in the end of the war (1944) on the basis of the then 'world power structure' and accepted severe criticism as it penalizes solely the debtors, disfavors direct investment and exports and is impediment to introducing SCM/SCR for resilience and sustainability.

*Eighthly*, further analysis of resilience relates the 'consumer society' with a likely deeper change in 'time preference' and consequent rise in interest rates against investment, development and debt reduction. Moreover, the social status aspect of the consumerism, undermines fair competition and efficient markets, driving more broadly to an opportunity of abandoning the reliance on others, in alignment with the revisionist views of UN (ECLA), of Prebish, Hirschman, etc, for a long north-south 'dialogue of deafs'. It also expresses creative convergence and filling the gaps of economic efficiency and ethics with collaboration based on human values, common beliefs, mutual interest, participation, trust and social responsibility.

*Ninthly*, the value chain analysis of resilience combined with re-engineering and strategic thinking can contribute significantly in overcoming the past dominance of the 'power structure' criterion, that affected negatively 'institutional efficiency', violated the principles of effective management (such as equal chances and treatment and reward/punishment, positive sum 'group game') and inhibited the roots of people's satisfaction and the necessary structural changes for achieving sustainable competitive advantage (giving sense to 'global value chain').

*Tenthly*, the emergence of financial crisis in 2008 in USA and its later passing over through compliance and hit disproportionately the EU area, beyond the common cause of long extensive use of artificial overexpansion in debts by 'derived financial products', hedge funds, etc. The consequent creation of over debt and of the so-called 'bubbles', e.g. in the real estate, in stock exchanges, in the banking sector has proceeded in threatening the 'sovereignty of states' and the international economic and social order, raising a 'genuine globalization' issue. Its persistence and duration reflects in addition the lack of federation in

EU and of common fiscal policy and discipline, partly for systeming reasons and for strategic defective European Monetary Union (EMU).

Altogether, this study has been engaged with the resilience based on holistic re-engineering strategy by multidimensional collaboration for SSCM at micro and macro-level, by restoring institutional flexibility, fair competition and equal terms between big-size multinationals and united value creation networks of the local SMEs and overcoming 'asymmetric information', adverse selection and moral hazard, etc. Such an overall designed collaboration of local resources (upgrading and localization problem) can increase policy performance for overcoming crises and achieving sustainable development, poverty, income redistribution, at local and global level, for social cohesion and lasting order of progress and peace for all.

A transparent fertilizing debate is proposed and further implementation research required at case study level.

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