

LEANNESS AND AGILITY AS MEANS FOR IMPROVING SUPPLY CHAINS. A CASE STUDY ON EGYPT

Nesrine El-Tawy, PhD Candidate in Operations Management, Brunel Business School, Brunel University, UK Nesrine.ElTawy@Brunel.ac.uk

David Gallear, Reader in Operations Management and Enterprise and Deputy Head of School (Teaching, Learning and Accreditation), Brunel Business School, Brunel University, UK
David.Gallear@Brunel.ac.uk

Abstract:

Supply chain management has received greater attention from the academics and the practitioners, however the literature review lacks a comprehensive view for supply chain management practices and how its members should act to contribute to its overall success (Li el at., 2005). In this era, where the business organisations are working in several challenging threats and opportunities, greater attention is given to supply chain management. Nowadays, companies are always searching for means to improve their supply chains. The main aim of this research is to show “how leanness and agility approaches can be used within the same enterprise as complementary means for improving its supply chain”. To achieve this research objective, the research has provided an assessment and summarised the literature on the supply chain management, lean thinking and agility thinking including their importance; their definitions; their practices and the relationship between lean and agility. The resulted proposed framework deduced from the literature has been applied in the Egyptian Manufacturing Business to show the relationship between the agility principles, lean principles, entity performance and the successful supply chain.

Key words: Leanness , agility, supply chain, competitive advantage.

1- INTRODUCTION AND BACKGROUND

Supply chain management has received greater attention from the academics and the practitioners, however the literature review lacks a comprehensive view for supply chain management practices and how its members should act to contribute to its overall success (Li el at., 2005). In this era, where the business organisations are working in several challenging threats and opportunities, greater attention is given to supply chain management. Nowadays, companies are always searching for means to improve their supply chains. A new business fact suggested by Christopher (1992) that the companies solely can't be able to compete or even survive inside this market place, however the means of competition are now placed on the companies' supply chains . “One of the significant paradigm shifts of modern businesses management is that individual business no longer compete as solely autonomous entities, but rather as supply chains (Lambert and cooper,2000, p.65, cited in Weber,2002, p.578).

Leanness as a concept has been firstly stated by John Krafcif as a term for the new production system applied by Toyota. Herron and Hicks (2007) argue that the reason behind Toyota implementation for such concept has been the fact that it couldn't afford the huge capital- based mass production systems applied by the US companies. As a result, it has searched for means to reduce waste in all its operational activities, and hence, 'Lean production' has been born. Lean approach has been widely known after the introduction of Womack et al. (1990) book. At the beginning this concept has been known as a production system to help in reducing waste in manufacturing function, however, it has become also known as a way of doing business for companies. Womack et al. (1994; cited in McIvor, 2001) have introduced the lean enterprise as a concept that extends itself beyond being simply a production system. Recently, it has also entered the supply chain field as a way for improving the supply chain performance.

As with the leanness approach, the agility has also been introduced firstly to be applied to the manufacturing function. The origin of the agile manufacturing has been firstly introduced by a set of researchers at Iacocca Institute, Lehigh University (cited in Yusuf et al., 1999). Agility can be considered simply as the ability to be flexible and fast as well as the capability of being able to change proficiency (Ramasesh et al., 2001). Several studies have focused on it as a way for improving the production systems inside organisations such as (Narasimhan et al., 2006; Yusuf et al., 1999). Then it has been applied to the whole organisation where several studies have focused on the concept as a way of doing business to improve the overall performance of the organisation and its ability to react to the market conditions such as Sherehy et al. (2007). Others have focused recently on the concept as being an umbrella combining all the business entities within the same supply chain, and encouraging them to work together to improve the performance of their supply chain collectively and interactively such as (Van Hoek et al., 2001).

Recently, there is a new term has been introduced which is 'Leagility'. A term describing the fact that leanness and agility philosophies can be applied complementary with each other within the same supply chain. However, the literature includes ambiguity about the form of the relationship that may exist between them and the way through which they can be applied within the same organisation as a means for improving its supply chain. Most of the literature focuses on the fact that not the companies are the source of competition; however it is their supply chains that are competing inside this market place. Therefore for a business entity to ensure competitiveness, it should improve its supply chain, but *HOW*. This research wishes to provide a solution for that problem. The main aim of this research is to show ***“how leanness and agility approaches can be used within the same enterprise as complementary means for improving its supply chain management within the Egyptian manufacturing sector”***

The structure of the paper reflects the inductive generated nature of the research methodology used. Followed the introductory section where the research problem emerges, section two reviews and synthesizes the relevant literature. The purpose of this section is to point to the weaknesses of the existing construction as regards leanness and agility as means for improving supply chain. Section three describes the research methodology adopted in this paper, which is a Case study. The purpose of this section is to inform the reader about the details of data collection, the techniques used during the research and the main constructs as directed by the case study to induce the final picture of the induced framework. The main empirical content of the research is then presented in section four, which commences with more detailed presentation of the case study. This is followed with a discussion of the proposed framework which has an impact on improving the entity's performance within the supply chain. Finally, the paper concludes with a discussion of the research's implications, contributions and limitations which serve as suggestions for future research.

2- LITERATURE REVIEW

The Literature review is considered to be a core element in any research. Merriam (1998, p.6) suggests that the literature review is "*an interpretation and Synthesis of published research*" (cited in Collis and Hussey, 2003, p. 109). This section provides further explanation and deep understanding for the main research constructs: Supply chain management, Lean thinking, Agility as a concept, and the similarities and differences between these two concepts. It also shows how these business concepts may be combined together to improve the entity's supply chain performance and the entity's welfare.

2.1 Supply chain management

Supply Chain Management has been defined by 'The Council Of Logistics Management' (2000) as "*the systematic, strategic coordination of the traditional business functions and tactics across these businesses' functions within a particular organisation and across businesses within the supply chain, for the purpose of improving the long term performance of the individual organisations and the supply chain as a whole*" (cited in Li et al., 2005, p.618). Supply chain can be considered as a set of activities that are used by any company to provide value to its customer either as a product, service, or both (Li and Shaw, 1998, cited in Samaranayake, 2005). Samaranayake (2005) has defined supply chain as a network of individual or partially linked business parties combined together upstream or downstream in cooperation to produce goods and /or services to their end users. Supply Chain Management is therefore, a process of integrating materials, flow of information between different parties as customers, manufacturers, and suppliers. supply chain management as a concept has

received great attention from both the academics as well as the practitioners and much empirical research has been published on the concept, (Li et al., 2005; Emberson, 2001). Several comprehensive reviews on the proposed framework for supply chain management analysis are characterised by ambiguity and unclear vision (Bechtel, 1997; Croom et al., 2000; Tan, 2001; cited in Emberson, 2001). Despite its size, the literature on supply chain management lacks a comprehensive view for supply chain management practices and how its members should act to contribute to its overall success (Li et al., 2005). New and Payne (1995, cited in Emberson, 2001) argue that supply chain as a concept can be characterised as a 'holistic process', and consequently so its management.

A study (1998) by Boddy et al. has showed that about more than half of their survey companies were not successfully in forming successful partnerships with members in their supply chains (cited in Li et al., 2005). Even in highly developed countries and regions such as US also the supply chain management is not well implemented. For example a survey conducted by Spekman et al., (1998, cited in Li et al., 2005), found that 60% of the supply chain alliances are not passing well. In another study by Deloitte consulting survey (cited in Li et al, 2005) has found that although 91% of the manufacturing companies undertaking the survey are determining the importance of their supply chains, 2% only are considering their supply chains as world class (Thomas, 1999, cited in Li et al., 2005). Li et al., (2005) have suggested that most of the failure related or associated with supply chain management is due to its complexity, and due to the lack in the research literature that help companies to guide and manage effectively and efficiently their supply chains. Thomas (1999) supports their argument by providing examples of some researchers focusing on certain issues only in the supply chain (cited in Li et al., 2005). For example, some researchers focus on the integrated inventory inside the company and within their supply chain members (Alvarado and Kotzab, 2001; Bechtel and Jayaram, 1997; Romano and Vinelli, 2001; Van Hoek, 1998). A second group of researchers considers supply chain management as a more advanced extension of the traditional purchasing and supplier management activities (Banfield, 1999; Lamming, 1996). A third group deals with supply chain management by focusing on the internal supply chain such as dealing with total quality management practices (Tan et al., 2002); internal integration (Pagell, 2004; Braganza, 2002); agile/lean manufacturing (Womack and Jones, 1996; Naylor et al., 1999; McIvor, 2001) and postponement (Beamon, 1998; Naylor et al., 1999; Van Hoek, 1998; Van Hoek et al., 1999) .

However there are some efforts for considering the concept of supply chain management as a whole from the supplier to the end customer. For example a study by Tan et al., (2002, cited in Li et al., 2005) have examined the evaluation of the supplier practices and its effect on supply chain management. Similarly, Tan et al. (1998) examine the relationships between the practices of the supplier management, the practices of customers relationships and the organisational performance and

therefore, taking into account the whole supply chain from both backward and forward views (upstream and downstream). The process of supply chain management includes several sub processes such as planning of sales and operations management demand; managing customer orders; planning, controlling and executing of production; quality of orders and inventory management; procurement; managing distribution; planning process; managing transportation and shipment; and integrated planning for supply and demand (Samaranayake,2005). Samaranayake (2005) argues that in analysing this process as a whole, it seems that it includes several components, suppliers, and customers. Therefore, integrating all these elements has become of great importance and a challenge for businesses today. He also suggests that in analysing this process, it can be shown that supply chain management can't simply be considered as an extension of logistics; rather it goes far beyond this limited function or activity.

Most of the literature on supply chain practices has focused on them from different point of views. However all are directed to achieve one common, agreed upon objective which is how to improve the company's performance (Li et al., 2005). Li et al., (2005) have defined the supply chain practices as the bundle of activities undertaken by the company to effectively manage its supply chain. They also argue that several researchers have provided frameworks for supply chain practices. For examples, Donlon, (1996) has discussed five practices for supply chain including: suppliers' partnership; outsourcing; cycle time compression; continuous process flow and sharing of information technology. While Tan et al., (2002) have identified six practices for supply chain management involving: supply chain integration; information sharing; determining supply chain characteristics; managing customer service; diverse location proximity and JIT. Min and Mentzer (2004) have discussed supply chain management as involving: common vision and goals; sharing information; sharing risk and return; cooperating together; high degree of integration; long- term relationship; and common supply chain leadership. Li et al., (2005) after analysing and explaining some previous frameworks of supply chain practices, have come up with their own framework showing the important common practices, from their point of view that can lead to improvement in managing a company's supply chain. They have identified six practices including: strategic supplier partnership; customer relationship; information sharing; information quality; internal lean practices; and postponements.

Despite all these efforts, there is still a gap in the literature of supply chain management concerning a truly unified conceptual framework showing how every company can manage its internal as well as external relationships for the sake of its overall supply chain performance and success.

2.2 Lean thinking

After the huge shift in 1980s in the business environment conditions, US and Europe factories have compared their implementation for the scientific management and mass production against the Japanese factories which have been very successful due to their implementation to Just-in-Time (Poppendieck, 2002). Moreover the important global challenges and high competition have led the US companies to seek to adopt new production techniques (Hall, 1987, Meredith and M .C. Tavish, 1992; cited in Shah and Ward, 2003). Among these is the 'Lean' System. Although lean manufacturing as a production system has received important attention by both the researchers as well as the practitioners; however there is a debate on its roots (Papadopoulou and Ozbayrak, 2005). No one can ignore the fact that the concept has been firstly termed by John Krafcif, who used it to describe the new manufacturing techniques produced by Toyota by Taiichi Ohno. John Krafcif was studying the automobile industry in a programme called 'International Motor Vehicle MIT' which has been led by Daniel Roos, James Womack, and Daniel Jones (cited in Papadoulou and Ozbayrak, 2005; Bendell, 2006). However some researchers such as Childerhouse et al.(2000, cited in Aitken et al,2002) argue that lean manufacturing systems have been originated inside UK in the Spitfire production in the Second World War and that even Keirutsu can be also originated to the US automobile industry in1915 (Drucker, 1995, cited in Aitken et al., 2002). Also even the JIT system has been implemented in London during the construction of the Crystal Palace (Wilkinson, 2000, cited in Aitken et al., 2002). Despite all this debate, the lean thinking has received great attention and has become well known after the publication of 'The Machine that Changed the World: The Story of Lean Production' (cited in Poppendieck, 2002; Bendell, 2006; McIvor, 2001). In his book, Womack et al. (1990, cited in McIvor, 2001) have found that Japanese automobile assembly's plants have productivity double that of the US assembly's plants. They suggest that this is due to the fact that the Japanese automobile companies were implementing 'Lean Production'. Their logic (cited in McIvor, 2001) has been that based on lean thinking, which includes: determining the value path of each product as a joint process between all the companies involved into its production and trying to optimise this good's value path, can lead to less resources consumption. They also argue that this can be performed through the development of teams organised jointly either inside that company or between the company and other partners using supported functional specialists (McIvor, 2005).

Leanness as a scientific system has been suggested to take the meaning of a system that aims to use less inputs to produce more outputs with a variety degree to meet customer needs, through a fundamental core objective which is the 'waste reduction' (Li et al, 2005). Lean production has been firstly defined in Womack et al (1990) book as an opposite production system for Mass Production. . They suggest that "Mass –producers set a limited goal for themselves-'good enough', which translates

into an acceptable number of defects, a maximum acceptable level of inventories, a narrow range of standardised products. To do better, they argue, would cost too much or exceed inherent human capabilities. Lean producers, on the other hand, set their sights explicitly on perfection: continually detecting costs ,zero defects, zero inventories, and product variety .Of course no lean producer has ever reached this promised land- and perhaps none ever will, but the endless quest for perfection continues to generate surprising twists” (Womack et al. 1990,p.13). They continue” Lean producer, by contrast, combines the advantages of craft and mass production, while avoiding the high cost of the former and the rigidity of the later.....Lean Production is ‘Lean’ because it uses less of every thing compared with mass production” .

An early definition for the term Lean is that provided by Krafcik in (1988) as a Production System where he argues that “it uses less of every thing, compared to mass production- half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also it requires keeping far less than half the inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products”(Womack et al ,1990).

Among the famous definitions given to lean production is that by Production System Design Laboratory of MIT (2000) as “is aimed at the elimination of waste in every area of production including customers’ relations, product design, suppliers’ networks and factory management. Its goal is to incorporate less human effort, less inventory, less time to develop products, and less space to become highly responsive to customer demand while producing top quality products in the most efficient and economic manner possible” (cited in Papadoulou and Ozbayrak, 2005, p. 789). Hopp and Spearman (2004, cited in Narasimhan et al., 2006) argue that leanness as a production system requires the least possible buffering expenses. De Traviile and Antonakis (2006,cited in Narasimhan et al.,2006) define it as an integrated system aims at the use of utilising capacity, minimising buffering costs as a result of decreasing variability through the system. Shah and Ward (2003) define it as the bundle of practices that collectively produce high quality, lightly stream products that meet the least possible or no waste. Papadoulou and Ozbayrak (2005) define lean manufacturing as a system directed to the waste reduction combined together with continuous improvement. Naylor et al. (1999, cited in Narasimhan et al., 2006) define it as a system which requires all forms of waste elimination, including time, and requires high degree of scheduling. Lean manufacturing is a set of practices of waste elimination including costs and time in a production system associated with set up times, few lot sizes, and pull-production strategy (Womack and Jones, 1996; McIvor, 2001; Taylor, 1999; cited in Li et al., 2005). Finally Narasimhan et al., (2006) define it as a production system aims at achieving

the least possible waste through the elimination of the unneeded operational processes, inefficient operational processes, or unneeded buffering costs.

MIT (2000) has gone beyond the boundaries of the concept as being only a production or a manufacturing system, as it defines Leanness as a business concept as a philosophy that not only includes the practices that take place inside that factory, but it is considered as a core change in the company's people way of thinking and so their way of behave (cited in Papadoulou and Ozbayrak, 2005). Similarly MIT (2000) argues the importance of implementing Leanness as away of doing business, and not only as a production system, when they argue "...while much had been documented about the implementation of specific lean practices, especially on the factory floor little had been developed regarding the greater issue of lean implementation as a holistic process-especially at the enterprise level" (cited in Papadopoulou and Ozbayrak, 2005, p.789).

Moreover, Lean thinking, as a business concept, has also been defined by Bendell (2006) as the systematic search for perfect value through reducing waste in all the company's business processes' aspects. He adds that it needs a deep emphasis on every element that adds value of all the company's products as well as a clear understanding for the business processes' operations that lead to the provision of the product or the service.

"Lean Enterprise" as a term has been firstly introduced by Womack et al.(1990) as a way to explain the fact that 'Leanness' as a concept can also be extended externally and not within the organisational factory boundaries only (Papadoulou and Ozbayrak,2005). The book by Womack et al. (1990) provides only slight introduction for the concept of Lean Enterprise and its characteristics, while their book in (1994) provides the details and more information of this concept, including five principles for a Lean Enterprise (Papadoulou and Ozbayrak,2005). Lean Enterprise has been defined by several researchers but that definition provided by Womack et al. (1994) is "...a group of individuals, functions, and legally separate but operationally synchronised companies. The group's mission is collectively to analyse and focus on a value stream so that it does everything involved in supplying a good or service in a way that provides maximum value to the customer"(cited in McIvor, 2001, p.228).Lean Enterprise is also defined by Helling (2001); Richards (1999) as a company that uses the minimum possible materials, human resources, capital, time ,physical resources, energy ,and information to provide value to all its stakeholders (cited in Papadoulou and Ozbayrak 2005).

Lean Thinking has been also extended to cover external relationships especially with suppliers and customers (Womack and Jones, 1996; Dimanescu et al., 1997; cited in McIvor, 2001) and therefore another term has been appeared related to Leanness which is 'Lean Supply'. Womack et al. (1990, p.138-168; cited in McIvor, 2001) have focused on the important role played by suppliers and

therefore focusing on importance of lean supply characteristics. Lamming (1996) has provided a lean supply characteristics model which represents the path for future progress (cited in McIvor, 2001). Lamming (1996) defines Lean Supply as “.....an arrangement (which) should provide a flow of goods, services and technology from supplier to customer (with associated flows of information and other communications in both directions) without waste”(cited in McCullen and Towill, 2001, p.531). In (1995) Lamming has provided a definition for Lean supply characteristics (cited in McIvor, 2001 p.228) as”.....the elimination of the duplication of effort and capability in the supply chain, combined with a philosophy of continuously increasing the expectations on performance and self-imposed pressure to excel. This is achieved by recognition of mutual dependence and common interest between customer and supplier-beyond the principle of operational collaboration (as characterised by supply partnerships): such strategies require the preconception of the business units”.

It is important here to mention that Jones et al. (1997) have introduced Lean Logistics originated from ‘Toyota Production System’, where it extends TPS across all its supply chain members from the extraction of raw materials passing across its supply chain until reaching its customer (cited in McCullen and Towill, 2001).

Some authors are using Just-In Time concept and Lean concept as two interchangeable terms (Heizer and Render, 2001; cited in Narasimhan, 2006). For example Gaither and Frazier, (2002; cited in Narasimhan, 2006) define Lean manufacturing as the process of applying the JIT practices. However, on another hand, a study comparing between both concepts and showing the relationship between them, conducted by Papadoulou and Ozbayrak, (2005) provides the definitions of both terms by a similar research institution to be able to compare between them. they state the definitions provided by the ‘American Production And Inventory Control Society’ (APICS) Dictionary by Cox and Blackstone, (1998). They define Lean production as “a philosophy of production that emphasis the minimisation of the amount of all the resources (including time) used in the various activities in the enterprise. It involves identifying and eliminating non-value adding activities in design, production, supply chain management, and dealing with the customers. Lean producers employ teams of multi-skilled workers at all levels of the organisation and use highly flexible, increasingly automated machines to produce volumes of products in potentially enormous variety”(p.788)

While they define JIT as “...a philosophy of manufacturing based on planning elimination of all waste and continuous improvement of productivity. It encompasses the successful execution of all manufacturing activities required to produce a final product from design engineering to delivery and including all stages of conversion from raw material onward. The primary elements of JIT is to have only the required inventory when needed; to improve quality to zero defects; to reduce lead times by reducing set-up times; queue lengths; and lot sizes; to incrementally revise the operations themselves

and to accomplish these things at minimum costs” (p.788). Therefore, Papadoulou and Ozbayrak (2005) argue from the above definitions, that the similarities between the two systems of production are exceeding the differences which points to the fact that lean manufacturing may be considered as ‘descendent’ of JIT concept.

2.3 Agility as a concept

The highly dynamic nature of business environment in today’s era which has been appeared as a result of the world’s new economic feature ‘Globalisation’, has led to the development of several business market uncertainties (Baramichari et al., 2007). Another feature of today’s business environment is also the ‘high competition’ which can be considered as a result of the several international trade agreements as well as due to the highly learnt, knowledgeable, and accessible customers (Li and O’Brien, 1999; cited in Swafford et al., 2006). It is argued that the solution to meet all these uncertainties is the proper method in managing them (Thompson, 1967; cited in Sharifi and Zhang, 1999). Speed, quality, flexibility, and responsiveness, the key elements of agility concept, are considered as the key solutions for dealing with such business market conditions (Baramichai et al., 2007; C-T et al., 2006). Yusuf et al. (1999) also argue that the solution for the company is to implement the agility principles as an important strategic component to enable it to respond to these business conditions. This idea has been supported by Van Hoek et al., (2001) where they argue that the agile organisational structure is the path for any organisation to be able to face these dynamic and complex business environmental conditions. Sherehiy et al., (2007) suggest that the organisations can face these business conditions through the use of several paradigms, such as ‘adaptive organisation’, ‘flexible organization’ and ‘agile enterprise’.

From then, agility as a philosophy has received great attention from both the academics as well the practitioners. Agility has been firstly introduced to be applied as a production manufacturing system and several studies have focused on it as a way for improving the production systems inside organisations such as (Narasimhan et al., 2006; Yusuf et al., 1999). It has been applied to the whole organisation also where several studies have focused on the concept as a way of doing business to improve the overall performance of the organisation and its ability to react to the market conditions such as Sherehy et al ., (2007). Others have focused recently on the concept as being an umbrella combining all the business entities within the same supply chain, and encouraging them to work together to improve the performance of their supply chain collectively and interactively such as Van Hoek et al., (2001). The agility as a term was firstly introduced in practice by some creators at the Iacocca Institute of Le high University USA (Sherehiy et al., 2007; Swafford et al., 2006; Yusuf et al., 1999). The term has been firstly mentioned in the literature, in the 21 century Manufacturing Enterprise Strategy Report 1991 (McCullen and Towill, 2001). The US government may be

considered as the main motive for the development of that concept. Where the department of the US Domestic Defence has determined that the defence manufacturing companies have begun to change into producing commercial products after the Cold War in 1989 (cited in McCullen and Towill, 2001). However they have targeted to ensure that at the same time, these domestic Defence companies have the ability to return to produce the defence products at any point of time (cited in McCullen and Towill, 2001). In addition, the commercial organisations have also begun to search for means for competition against the far eastern companies (cited in McCullen and Towill, 2001). Therefore the Iacocca Institute Report has provided them with 'Agility': a competitive weapon that can enable companies to respond quickly and effectively to any environmental change and at the same time, can meet the highly changeable demand of customers (McCullen and Towill, 2001). From another side, Christopher and Towill (2000) argue that 'agility' as a new business philosophy is originated as a developmental concept or as an extension for the flexibility manufacturing system which has been received attention and has extended into a greater concept called 'agility'.

As a result of its importance, 'agility' has been defined by several authors, researchers, as well as several institutions. 'Agility' has been defined by the Iacocca Institute of Lehigh University, USA as "a manufacturing system with capabilities (hard and soft techniques, human resources, educated management, information) to meet the rapidly changing needs of the market place (speed, flexibility, customers, competitors, suppliers, infrastructure, responsiveness)" (cited in Sherehiy et al. 2007, p.445-446; Yusuf et al., 1999, p.36). While in his book Kidd (1994, cited in Jackson and Johansson, 2003) define agility in production as "...agile manufacturing can be considered as the integration of organisation, highly skilled and knowledgeable people, and advanced technologies, to achieve co-operation and innovation in response to the need to supply our customers with quality customised products" (p.482-483). Brown and Besant (2003; cited in Narasimhan et al., 2006) define the agile manufacturing as the ability to deal with the changes in the business environment market quickly and effectively. Similarly, Prince and Kay (2003; cited in Narasimhan et al., 2006) define it as the ability to react to unexpected changes and deal with highly changeable customer demand concerning price, requirements, quality level, quantity and speed of delivery. Sharifi and Zhang (1999) argue that the agile manufacturing is the organisation that possesses a wide vision on the new competitive nature of business environment and which possesses a wide range of abilities to respond to any changes and to have the ability to gain from the business environment as much opportunities as it can. In support to the above researchers Sharifi and Zhang (2001; cited in Narasimhan et al., 2006) define the agile production as the ability to determine, react with, and deal with the expected and unexpected changes inside business market place.

As mentioned before agility as a concept doesn't limit itself as only a manufacturing system to improve the ability to respond quickly and efficiently to production changes. However as Jackson and Johansson (2003) argue that agility itself as a concept or a philosophy is an important weapon to keep the whole organisation live inside this dynamic, high competitive business environment. This idea is also supported by the work of Sherhiy et al. (2007) where they argue that it has been studied by several researchers that agility as a concept goes beyond the walls of the production department, and it should be seen as a philosophy for the overall organisational strategy. Organisational agility is defined by Sharifi and Zhang (1999) as the potential abilities of an organisation to deal and respond to the unplanned changes as well as the unexpected environmental threats and opportunities. While Goldman et al. (1994, cited in Swafford et al., 2006) defines the organisational agility as the organisation which has a dynamic nature and an ability to gain a competitive advantage through this dynamic nature which enables it to focus on developing knowledge and flexible processes to be able to react to the environmental market changing conditions. Agility is defined also by Christopher (2000) as the organisational ability to quickly respond and react with the demand changes. Kidd as defining the agile production system, he also defines the agile enterprise (2000) as "an agile enterprise is a fast moving, adaptable and robust business. It is capable of rapid adaptation in response to unexpected and unpredicted changes and events, market opportunities as customer requirements .Such a business is founded on processes and structures that facilitate speed, adaptation, and robustness and that deliver a coordinated enterprise that is capable of achieving competitive performance in a highly dynamic and unprofitable business environment that is unsuited to current enterprise practices" (cited in Swafford et al., 2006, p. 171). Naylor et al., (1999, cited in Christopher and Towill, 2000) define agility as a business concept, as the managing of the market knowledge and the use of virtual corporation in order to gain market opportunities inside changeable market conditions. While Christopher and Towill (2000) define agility philosophy as the ability to adopt the company's structural forms, information systems, logistical systems, and that flexibility is the most important element of agile organisation. Yusuf et al., (1999) come up with a comprehensive definition for agility after reviewing most of the literature during 1990s, where they define it as the successful induction of the competitive forms such as speed, flexibility, innovation, proactively, quality level, and profitability, and the effective use of resources, practices, and knowledge in order to provide products and services to meet customer needs in a changeable business environment. Before all the above, Dove (1996; cited in Baramichai, 2007) suggests that agility as a business concept is the ability of an organisation to live in a high dynamic changeable environment.

Applying agility into supply chains has been introduced recently. It can enable organizations within the same supply chain to gain the winning advantages of agility collectively (Harrison et al. 1999, cited in Sharifi et al., 2006). Lee and Lau (1999) and Christopher and Towill (2000) argue that

applying agility to supply chains is to emphasize the importance of 'responsiveness' (cited in Sharifi et al., 2006). Sharifi et al. (2006) argue that the drivers behind applying agility to supply chains are similar to those behind the implementation of agility concept principles to manufacturing function which are the change and uncertainties. This idea has been supported by Harrison (2000), where he argues that it is unlogic to limit the impact of the concept only inside the production department, and that this concept should be extended to the whole company's supply chain. Christopher (2000) and Van Hoek, (2001) have exceed that concept of agility to the organisation's processes and relationships with other members within the supply chains to be able to respond quickly and effectively to the unexpected business environmental conditions (cited in Baramichai et al., 2007). Baramichai et al. (2007) define supply chain agility as "an agile supply chain is an integration of business partners to enable new competencies in order to respond to rapidly changing, continually fragmenting markets. The key enablers of the agile supply chain are the dynamics of structures and relationship configuration, the end-to-end visibility of information, and the event-driven and event-based management...." (p.335)

In summary, the above literature review shows several research have been introduced to show the importance of supply chain and so its management. This has been given more attention due to the today's business environment which is characterised by high changeable and complex nature. The literature review shows also that leanness and agility as two business philosophies have been introduced firstly to be applied as production systems. However, they have gone beyond this limited functional area to be applied as a means for doing businesses and also have been applied for the whole company's supply chain. But how all these business concepts can be applied collectively to achieve the success for the whole supply chain partners, this is the main concern of this research.

2.4 Relationship between Leanness and Agility

There are some common features that may characterise both concepts: lean thinking and agility. But on the other hand, there are differences which distinguish them from each other. In this subsection the differences and the similarities will be discussed by combining both based on the previous researches. It is so important here to focus on the direction of the relationship between both concepts and whether these two paradigms appear to be usable together inside organisations or they are contradictory approaches that may not be able to be applied together.

The following table shows the similarities and differences between lean and agility thinking. Table 1:
differences between lean and agility thinking

Point of comparison	Lean Thinking	Agility Thinking
<u>(I)Attributes</u> 1- Primary goal 2- Linkages 3- Performance measures 4- Organising work 5- Planning and controlling work	Eliminate waste With long-term supply chain partnerships. Performance measures (eg, quality, productivity) Work standardisation, continuous improvement through disciplined environment Planning to protect operations through a fixed period in the planning cycle.	Meet customer demand With virtual supply chain Customer-facing matrices (eg., meeting orders on time in full) Self-management Planning for immediate interpretation of customer demand and quick response(Source: Harrison , 2000)
<u>(II) Principles</u>	1- Waste or moda elimination 2- Value stream identification 3- Process flow achievement 4- Pull or Kanban strategy implementation 5- Continuous perfection searching. (Womack and Jones, 1994 ; cited in Bendell,2006)	1- Customer enrichment 2- Enhancing competitiveness through cooperation. 3- Leveraging the skills of people and information. 4- Mastering change and uncertainty. (Nagel, 1993; cited in Rigby et.al, 2000); Goldman et.al, 1995 ; cited in Van Hoek, 2001)
<u>(III)Practices :</u> 1- Practices at the manufacturing level	* JIT * TQM * Human resources management (Shah and Ward, 2003) * Pull system * Waste elimination * Exchange of high buffering costs with low ones * Decreasing variability * Continuous searching for improvement (Hopp and Spearman, 2004 ; cited in Narasimhan et.al, 2006) * JIT * Managing quality * Involvement of employees (McLachlin, 1997 (cited	* JIT system; TQM; Relationships with customers; Partnerships with suppliers; sharing information; Variety skill training programmes; use of advanced technological systems. (Brown and Bessant, 2003 (cited in Narasimhan et.al, 2006) * Use of advanced technologies in information and communications systems; computer-based manufacturing; modular system. (Price and Key, 2003 ; cited in Narasimhan et.al, 2006) * Use of advanced technologies; internal networks; empowerment authority for workers; concurrent working teams. (Sharifi and Zhang, 2001 (cited in Narasimhan

	in Narasimhan et.al, 2006)).	et.al, 2006)).
2- Practices at the enterprise level	<p><u>Lean Enterprise</u></p> <ul style="list-style-type: none"> * High agility means. * High responsiveness * Reduce resource consumption (Papadopoulou and Ozbayrak, 2005) 	<p><u>Agile Enterprise</u></p> <ul style="list-style-type: none"> * Integrative framework and comprehensive set of standards; self-sufficient module systems; easily re-use of modules; easily plug-in compatibility; easily deferring of commitments; use of redundancy and diversity; interfaced peer-to-peer; control and information distribution; self-management; and easily scalability adjustment (adjusted from Dove, 1996 ; cited in Baramichai et.al, 2007)
3- Practices at the Supply Chain	<p><u>Lean Supply chain</u></p> <ul style="list-style-type: none"> * Global operations with local focus; * Alliances and collaboration. * Early supplier involvement * Cost/ value analysis jointly. * Transparency * Two way information exchange * Using of Kanban system * Flexibility in managing capacity * Synchronized managing of capacity * JIT * Price reductions from order onwards savings. * Quality mutual agreement * Very high pressure for both suppliers and customers. * Integration in research and design. (Adjusted from Lamming, 1993 ; cited in McIvor, 2001). 	<p><u>Agile Supply Chain</u></p> <p>It is achieved through three levels;</p> <ol style="list-style-type: none"> 1- Principles (use of rapid replenishment and postponed fulfillment). 2- Programmes (organizational and supply agility, driven of demand; quick and flexible response; lean manufacturing system). 3- Actions: using of continuous replenishment programmes; determining of real demand; use of cross-functional teams; managing process system; using of synchronized operations; vendor managing of inventory; reducing waste; standardisation or modularisation system; using economies of scale approach; reducing set up time; reducing pipeline time. (Christopher and Towill, 2001)

3- Practices at the Logistics	<u>Lean Logistics</u> <ul style="list-style-type: none"> * Level scheduling * Demand amplification reduction; * Focusing only on what is pulled from the customer. * Work synchronisation across the whole system * Planning for most cause reduction through logging irregularities. (Jones et.al, 1997 ; cited in McCullen and Towill, 2001) 	<u>Agile Logistics</u> The same practices which are done in level three in the supply chain. (Christopher and Towill, 2001)
<u>(IV) Strategic intent</u>	Waste elimination (McCullin and Towill, 2001)	Diversity of requirements through quick responds (McCullin and Towill, 2001).
<u>(V) Outcome</u>	Use of resources with high quality and in efficient manner (McCullin and Towill, 2001)	Quick response, achieving mass customisation and resource efficiency.
<u>(VI) Characteristics for supply chain</u>	<ul style="list-style-type: none"> * Commodity products * Predictable demand * Low product variety * Long product life cycle * Customer driver is cost * Low profit margin * Physical dominant costs * With purchasing to buy goods. * With long term contractual stock out penalties * Highly desirable information enrichment * With Algorithmic forecasting mechanism. (adjusted from Mason-Jones et.al, 2000 ; cited in McCullin and Towill, 2001) 	<ul style="list-style-type: none"> * Fashion products * Volatile demand * High product variety * Short product life cycle * Customer driver is availability * High profit margin * Market ability dominant costs * With purchasing policy is to assign capacity * With immediate and volatile stockout penalties * With obligatory information enrichment * Consultative mechanism for forecasting. (adjusted from Mason-Jones et.al, 2000 ; cited in McCullin and Towill, 2001)
<u>(VII)Market Winner</u>	With cost is the market winner (adjusted from Mason-Jones et.al, 2000 ; cited in McCullin and Towill, 2001)	Service level is the market winner (adjusted from Mason-Jones et.al, 2000 ; cited in McCullin and Towill, 2001)
<u>(VIII) Market qualifiers</u>	1- Quality 2- Lead time 3- Service level (adjusted from Mason-Jones et.al, 2000 ; cited in McCullin and Towill, 2001)	1- Quality 2- Cost 3- Lead time (adjusted from Mason-Jones et.al, 2000 ; cited in McCullin and Towill, 2001)

From the above table, it can be shown that the main differences between Leanness and Agility concepts can be summarised in the following points:

-leanness is mainly concerned with reducing waste while, agility is mainly concerned with customer responsiveness.

-leanness is enhancing information sharing while; agility is making information sharing obligatory.

-Leanness is encouraging standardisation of work and continuous improvement while agility is encouraging self- management.

There is a relationship between leanness and agility. However there is a debate in the literature on the direction of this relationship. On one side, McCullen and Towill (2001) study shows that agile production can be considered as a 'precursor' for the lean production. Also in the study of Shah and Ward (2003), where they have grouped all the appreciated practices for leanness into sets, have put the agile manufacturing methods as one component of their JIT set of leanness practices. Similarly, Papadopoulou and Ozbayrak (2005) argue that to achieve lean enterprise, it should first possess agility capabilities in order to be able to be lean. On the other side, there are several research studies supporting the opposite side of direction. For example, Harmozi (2001, cited in Narasihan et al. 2006) argue that for a company to consider itself possessing world class performance attributes, it should transfer from applying lean production into agile production. Van Hoek et al.(2001) also supports the same way of thinking where he suggests that the main focus of agility are customer responsive and managing the market changes and therefore, this requires special types of capabilities, among them ,if not, the most important one is 'Lean Thinking'. Also Kidd (1994, cited in McCullen and Towill, 2001) argues that agile production includes lean manufacturing techniques. Similarly, Harrison (2000) argues that agility is concerning with long term strategies , while leanness is more concerned with short term strategies, and thus for a supply chain to achieve its long term strategies of matching with the market changes, it should be able first to achieve its short term leanness strategies. Therefore, he argues that leanness can be considered as an 'enabler' for agility. Similarly, Robertson and Jones (1999, cited in McCullen and Towill, 2001) suggest that achieving agile manufacturing requires achieving lean manufacturing. Christopher and Towill (2000) argue that today's business market is putting great pressure on supply chains to transfer from lean, functional into agile , customized supply chains.

Similarly, the chronological evolution of manufacturing paradigms (cited in, Narasimhan et al., 2006, p.444) supporting the same direction and that leanness precedes agility, where it shows that manufacturing has begun as

Craft production ~~→~~ **mass production** ~~→~~ **lean/JIT production** ~~→~~ **agile production**

On the other hand, several studies agree on the fact that agile and lean are placed on a continuum scale, each on the extreme side from the other and that companies should place themselves in a place in-between both. However this doesn't mean that there is no link connecting both together or that they are contradictory to each other. For example, Naylor et al (1999), and Fisher (1997), where Fisher supply chain model suggests a link between efficient supply chains and the functional products, which Naylor et al. (1999) termed 'lean'. Fisher (1997) has also found a link between responsive supply chains and innovative products in which Naylor et al, (1999) called it agile (cited in Emberson, 2001). Several researchers discuss the link between leanness and agility and whether they can be used together or not. Most of the results show that both concepts can be used separately but within the same supply chain. From that idea, a new term combining both together was appeared which is known as 'leagility'. Naylor et al. suggest that both concepts can be used together within the same supply chain, where leanness should be applied before the decoupling point whereas agility should be applied after the decoupling point (cited in Narasimhan et al., 2006). This has been also supported by the work of Christopher and Towill (2001) where they discuss three hybrid strategies for using both concepts within a supply chain in a complement way .The first is the decoupling point, the second is the 'Pareto/80:20' where the lean system techniques should be applied with volume lines while the agility techniques should be applied with the slow movers. The third strategy is 'surge/base demand separation' where the lean principles should be applied for the demand elements which are characterised by being easily forecasted, while the agility principles should be applied for the elements that are characterised with being highly unexpected.

All the above literature shows the debate around the relationship between both concepts and the direction of that relationship. As per aim of the research, it is to provide a proposed conceptual framework as a basis for a solution for that debate and to show how lean thinking and agility thinking can be both collectively applied within the same organisation as ways to help the company in improving ,not only its performance, but also its supply chain performance.

3- RESEARCH METHODOLOGY

This paper follows the 'Phenomenological' paradigm. it has been defined by Bryman and Bell (2007) as "*an epistemological position that requires the social scientist to grasp the subjective meanings of social action*" (p.728). It has other terms including: 'Qualitative'; 'Subjective'; 'Humanistic '; 'Interpretivist' (Collis and Hussey,2000,P.47).Under this methodological approach, the focus is on the details of the phenomenon, and what behind that details to provide an explanation and more

understanding for reality (Saunders et al.,2000). The phenomenological paradigm has its own features ,such as: focusing on qualitative data; focusing on small samples; focusing on developing theories; using rich and subjective data; depends on natural location; characterised by high validity and low reliability; making generalisation for the results from one setting to another(Collis and Hussey,2003). This research is considered as using the ‘Phenomenological’ paradigm. It uses as a methodology: the ‘Case study’ approach. One that reflects the assumptions of the phenomenological paradigm for the following reasons: the data collected is mainly qualitative data through conducting the interview technique. The sample used is considered as a small sample (it is only one manufacturing company). The research provides a conceptual framework to show the relationship between leanness and agility as two means for improving the company’s supply chain. The data collected can be considered as rich data as the interviewees were left freely to discuss and explain what they perceive as important for them; the data is considered as subjective since every interviewee was explaining and discussing from his/ her point of view; the research uses a natural location, where the research was conducted in the manufacturing plant where the interviewees work; finally the research is not intended to benefit only one manufacturing company, however it can be applied to any manufacturing company intending to improve its supply chain performance. Therefore this research meets the criteria of phenomenological paradigm assumed by Collis and Hussey (2003).

A ‘Case Study’ approach includes gathering of data through several means such as interviews; observations; documentary analysis (Saunders et al, 2000) as well as the questionnaires (Collis and Hussey, 2003). There are sequential stages for conducting a case study approach including: selecting the case; preliminary investigations or drift; the data stage; the analysis; and the report stage (Collis and Hussey, 2003, p.69-70). Stake (1995; cited in Bryman and Bell, 2007) argues that the case study approach is related to examining the nature of the issues in a particular case in study. Bryman and Bell (2007) suggest that this type of research approach has been used by several famous and well-known studies in business and management studies field.

The ‘Case’ is defined as a unit of analysis in which the data obtained or the variables under study are examined and analysed (Collis and Hussey, 2003). A case may be a single enterprise; a single location; a person; or a single event (Bryman and Bell, 2007). Scapens (1990; cited in Collis and Hussey, 2003) differentiate between four types of case study approaches: experimental; illustrative; descriptive; and finally the explanatory case study which is to explain and provide greater information about the relationships between variables in actual settings.

The company selected for this research is a clothing manufacturing corporation in Egypt, Alexandria, Borg El Arab, (manufacturing bloc 2). It has two manufacturing plants. One is producing female

lingerie and night wear, and other is producing female casual wear collections. The company has been selected to meet the following criteria:

1-It has a moderate supply chain.

2 It operates within a changeable business environment.

3- It is operating in a manufacturing sector, where its production and working practices need to be lean

4-It is operating in a manufacturing sector, where its production and working practices need to be agile.

This research is qualitative research. The main concern is the qualitative interviews. Qualitative interviews are divided into One-to one interviews which can be also classified into Face- to face interviews and the telephone interviews. The second type of the qualitative interviews is the One- to-many which includes the focus group interviews (Saunders et al., 2000).

This research uses the semi-structured interviews since it is more relevant to be used with the qualitative research (Collis and Hussey, 2003; Saunders et al., 2000). According to Saunders et al. (2000) the semi-structured interviews can be best used to answer and provide the understanding to 'what' and 'how' questions. They also argue that it is the best for an explanatory research design which is being used by this research.

Based on these arguments the semi-structure interviews were used for the primary data collection. Also the research depends on 'One- to -One' type of interviews where three of the interviews have been conducted through 'Face-to-Face' interaction and the other two have been conducted using the telephone.

The interview protocol has been divided into four parts: the first is related to the supply chain concept and its management. It includes five questions related to the concept and aim to determine the opinions of the interviewees on its importance and the way through which it can be improved. The second part is related to the 'Leanness' as a way of doing business. It includes three questions related to the concept and aim to determine the interviewees' opinions about it and its role in improving the company's supply chain. The third part of the interview is related to the 'Agility' as a way of doing business. It includes three questions related to the concept and aim to determine the interviewees' opinions' on the concept and its role in improving the company's supply chain. Finally, the last

section includes two questions related to the relationship that may exist between leanness and agility and its direction, as well as the impact of integrating the two concepts together inside the company on its supply chain performance.

The interviewees have been selected to meet the following criteria:

- 1-They hold managerial positions, where they are their departments' managers.
- 2-They have good experience
- 3-They are from different functional areas
- 4- Their working is related directly with the company's supply chain.

In summary, the research is using the phenomenological paradigm as a research design. It uses the case study approach as the methodological means to show the relationship between leanness and agility. It can be also considered as an explanatory; basic; and qualitative research. It is considered as an explanatory research since it aims to explain a causal relationship between two business philosophies 'Leanness' and 'Agility' and their impact on the supply chain when applied within the same company. It is considered as a basic research since it aims to benefit all the manufacturing companies which are intending to improve their supply chains. It is considered as a qualitative research since it depends mainly on the qualitative data collected from conducting a number of interviews with the managers in the Case Study. The interview used is the semi-structured one since it is the most appreciate type of interview to be used with the explanatory research. It provides deep understanding and discussion for the interviewees' perceptions.

4- FINDINGS AND ANALYSIS

The primary data has been collected from two sets of interviews (during 2008). The first three interviews were face-to face interviews with the production manager, the marketing manager of the first manufacturing plant (A) and the CEO. The second two interviews were conducted with the production manger and the procurement manager through telephone interviews of the manufacturing plant (B). It is important to mention here that both plants are belonging to the same case study company.

In this dynamic and complex business environment, businesses within the same supply chain should work together to achieve success and especially when working in an industry like the clothing one.

This type of industry can be characterised by being fashionable and seasonable. the production manager in manufacturing plant (B) said “ *I do agree to certain extent, where there must be certain conditions, under which we can together compete and gain inside the market place, such as the existence of enough , well-managed quality controlling systems on both, not only on the raw materials, the supplies, and other components sent by the supplier but also on the quality of the finished goods produced by us and even until the product reaches the final customer, but if there is not enough such controlling quality systems, this statement will be so difficult to be applied especially here is Egypt*” .While, the CEO has completely supported the argument. Although she argued that it is not applying in Egypt, but she believes in it where she said” *I agree with the statement, in general, however this may not be the case here in Egypt, we are still a developing country ,our economy has been recently open for market competition , but in general I agree if all the members and me with them are working as one group , then if one fails to support the others, all the group members will fail ,I can say it is like a ship in the sea we have all to work together to reach the shore safely*”. This supports the idea suggested by Christopher (1992). He argues that companies are not competing with each other; however it is their supply chains. But this can't be easily applied now in Egypt except under specific economic, managerial, and market improvements. This may solve the problem that exists in the relationship between the companies and their suppliers, which is the lack of enough trust between them. This may be due to the lack of enough quality controlling systems, high maintenance costs, and inadequate use of high technology. As a result of this there are several problems affecting the relationships between the companies and their suppliers which in turn affect negatively their supply chain performance. The practices and policies implemented by the company to assist their suppliers show that they are aware of these problems and that they are trying to solve them collectively with their suppliers. the production manager of manufacturing plant (A) said “*...sometimes when the supplier sent the raw materials not with the enough quality level, we should spent a lot time in inspecting each unit, and this of course costs us a lot.*”. Another type of problem mentioned by the production manager of manufacturing plant (B), where she said “*.....as a result of not depending completely on the local suppliers, we have three suppliers, one of them is international supplier and the problem here in different, where we have good and historical relationship with him, but the problems here are the high transportation costs as well as the tariffs*”. Another different problem also mentioned by the procurement manager of manufacturing plant (B), where he said “*....I am the one who always carry all the load, when there was a problem one day in the manufacturing plant for about four days, the production line was not working due to low quality level of the raw materials sent by the supplier, I purchased another lot from another supplier with a high price, and even the plenty fees obtained from the first supplier didn't cover the increase in the prices paid for the second supplier*”. Also the marketing manager said “*....each low quality unit of production which*

may be as a result of either low quality level of raw materials or even a production defect, can affect my reputation and position in the market place, but the production defect may be controlled by the production people here in side our company but what about the low quality raw materials". The above quotations show that there are several problems exist which affect negatively the relationship between the company and its suppliers. All these problems can be summarised into one core reason that **there is no enough trust between the company and its local suppliers as a result of the lack of quality controlling systems which helps both the suppliers and the companies to ensure that the goods sent by its partners are possessing high quality level.** Therefore, determining the problems can be a starting stage for solving them, which may lead to improvement in their relationship. Consequently, this can lead to improvement in their supply chain. What can be also induced from the findings and the analysis is that lean thinking can lead to improvement in the enterprise's way of doing business, which in turn can lead to improvement in supply chain performance. were the CEO said "*.....as I said before, we are all in the same ship, we all either achieve success or fail together, if one only works for him/ her interests and sake , the whole ship will not reach its shore*". About the practices or the polices implemented by the company to improve its supply chain, the production manager in manufacturing (A) said "*we can't stop our relationship with any of our supplier even he sent us low level of raw materials .If he did this we return it to him and ask him to improve his performance based on the requirements sent to him by us. sometimes I can help him when I determine that this low quality level is not his own fault and that it is out of his own control, because sometimes this may be due to the lack of enough maintenance concern for the machines, in addition in such industry like his industry, the maintenance costs is so high and needs huge amount of money, sometimes it may be over the capacity of the supplier. So as a way of assisting him we develop our maintenance annual programmes collectively with our supplier as a means to share the cost with him and to improve together*". The other production manager said "*.... recently, we did a 'motivation policy' this year, where this policy was planned to improve our suppliers' performance. This motivation policy is to send at the beginning of the year to the three suppliers together to inform them that the supplier who will give us the highest quality with the lowest cost we are going to sign with him a contract to supply us with the whole quantity we need. This policy makes the three suppliers to do their best to give us the best offer. If this policy achieves success, we hope that we can have only one supplier upon with whom we can develop a long trustfulness relationship*".

The above words show that the company is determining the importance of its supply chain and also aware of the benefits that it may gain from having well- managed supply chain as well as to build a strong relationship with its suppliers. It can also be shown from the above words that the company is aware of the types of the problems they that face with the supplier in his industry and therefore this makes it more able to help him as much as it can. This can be considered as a starting point for

building a close strong relationship between them as both are facing the difficulties and collectively trying to solve and cope with them.

Although the case study is not considered as a lean enterprise, however it tends to approach this, since all the principles are applying there with some degree and under certain conditions. marketing manager said "Of course, yes, in our industry the customer ever day needs more, and every unit saved from raw materials, or even time will make us better serve our customer. In addition to this we always search for continuous perfection we developed on our web site a line for suggestions and complaints to enable customer to easily reach us and enable us to gather the information which can help us to serve her better". The production manager in manufacturing plant (A) said "... In a last period they were making manual patrols, now we are using computerized ones, so I have saved a lot of raw material. Machines have also been exchanged with new one which makes collectively two activities together, and therefore saving human resources as well as all the costs associated with operating another production line which was responsible to do the second activity." Both production managers when asked about the most important lean principle for them, they answered 'waste reduction' since it is considered as the main goal for any production department. They also mentioned the 'achieving process flow'. However, the marketing manager and the CEO mentioned that the most important principle is 'the continuous perfection; where searching to be better will always make the people searching for means to be better in everything. In addition they also added that working to be better will achieve at the end customer satisfaction which is their own core aim. They argued that they can consider their company as a lean one except the CEO where she said "...based on these principles, I can say yes, however actually in the practical day- to day operations these principles are not easily implemented, we are trying to do what we can, especially our economy is still new opened one, where still competition is based on certain criteria and restricted in sometimes. So to be fair with you, I prefer to say that these principles are applied here inside my company as aims to be implemented and not of course I can ensure every time that I can apply fully and accurately. As I said before, there are several reasons affecting my implementation for such principles that may be out of my hand. For example, I can't depend completely on one supplier to provide me with the required level of quality and at the preset point of time".

Almost all of them agreed that a lean enterprise can affect positively its supply chain. For example the production manger in (B) said "Of course, yes, when the company is applying or possess lean thinking principles, its overall performance will be improved and this can encourage the other partners within the supply chain to improve also to be able to cope and match with high performance of the company, which will require from each partner high quality needs and thus the overall performance of the whole supply chain will be improved".

The above words show that a company working in an industry like that of the clothing one needs to be a lean company, either for casual wear or the lingerie wear. As the CEO said that the nature of the clothing industry is characterised by being seasonable and fashioned. This imposes on the companies working in it to apply successful business practices that enable them to cope with these characteristics. This has been obligatory especially to the Egyptian companies where its market has been opened for competition and that every company if not taking improvements into consideration, it will die quickly in such open competitive business environment.

Although the other managers considered their company as lean one, however the CEO argued that she can't consider it as a lean one. Although they are applying its principles, however, they are not applied completely and not with the qualified degree.

Therefore, she couldn't consider her company as a lean one, but the company is approaching to be, since they are trying to do as much as they can to achieve lean principles in their complete form. Finally all of the managers agree on the positive impact of the lean enterprise on its supply chain as all other partners will be encouraged to improve to be able to cope with the lean enterprise.

the interviewees were asked also about agility thinking and the impact of an agile enterprise on the whole supply chain. All mentioned that the nature of their industry requires from them to be agile. For example, the CEO said, *"I think that agility as a concept is firstly emerged for the industries which are characterised by high and rapid changes and our industry is so changeable,my product is fashioned and seasonable,.....our customer is our all concern and her satisfaction is our main aim, therefore we have to provide what will make her cope with the newest fashion but with our traditional regulations, therefore we have to be able to cope with any changes to serve her better."* In answering question 10, she said *".... As I said before there several factors affecting my implementation for any new business concept... and again I can say that although we are trying to apply these principles inside the company however I can't consider my company as an agile enterprise. However we are planning to approach it in the near future"*. Again the CEO mentioned *"....when one party operates well, all others are encouraged to improve especially with such concept where applying its principles inside the company requires the company to depend on external parties, for example, focusing on customer, can't be achieved if the company closed upon itself its boundaries, information about the customer needs are usually obtained through external information channels....."*

The above words show that the managers are aware of the importance of agility thinking and its necessity in their industry. Also the CEO can't consider its company as an agile enterprise although its principles are being applied there, but in its starting stage. It can be shown that the managers agreed on the positive impact of agile enterprise on its supply chain, and especially in such industry as the

clothing one where it is obligatory on them to search for means to cope with the changeable nature characterising its market and demand.

When the interviewees were asked about the relationship between leanness and agility thinking, most of the interviewees agreed on the existence of a relationship between both concepts. The exception one was the marketing manager where he said that they are contradictory to each other and can't be applied inside a company collectively. Since agility thinking is based on customer focus and coping with changes, and both require high skilled labour and information technologies costs, while leanness requires savings in everything, and therefore he argued that there is no relationship can exist between leanness and agility.

However, the rest suggested the existence of a relationship between them. They argued that achieving agility principles requires firstly to reduce waste and to save in everything as this can provide the company with the ability to focus on its customer, to manage changes and the other principles of agility. They also argued that agility can be considered as having a wider vision and a higher way of thinking that may include lean way of thinking.

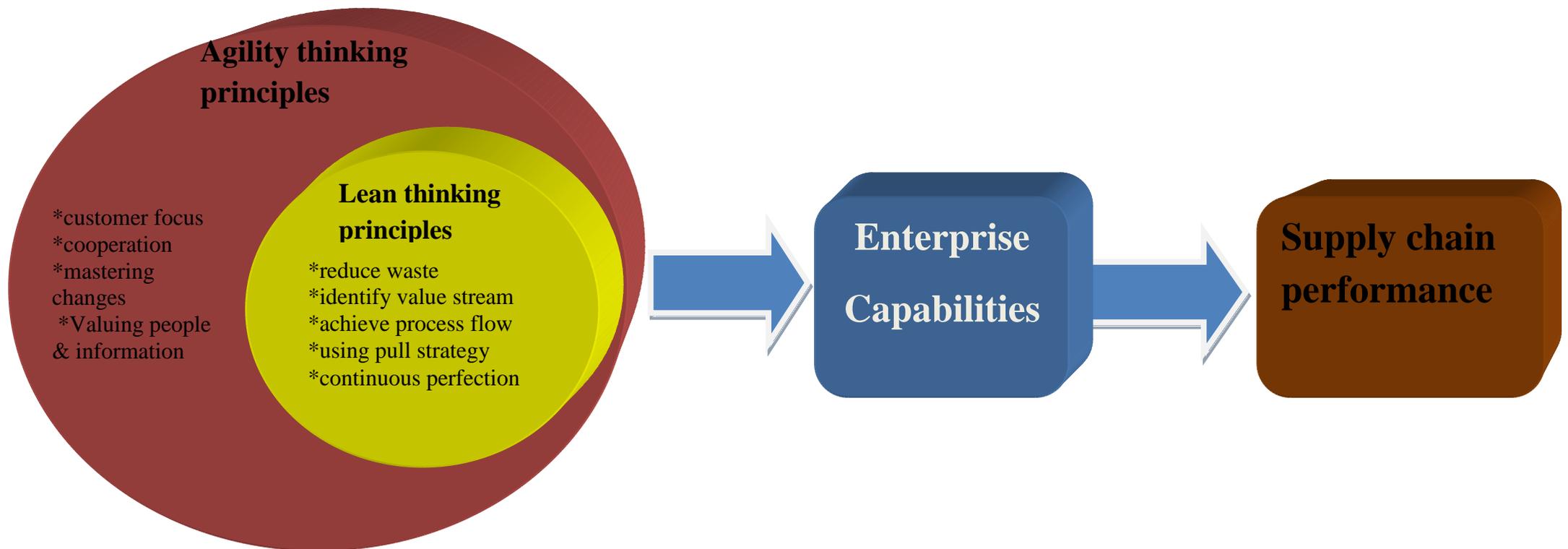
Then most interviewees agreed that the company, which possesses the leanness and agility capabilities, can affect positively its supply chain. As when achieving the leanness principles and the agility principles this will be a motive for other partners to improve and enhance their performance, even if not for their supply chain sake at the beginning, but for their own sake, at least, to be able to match with the company's requirements. The exception manager was the marketing one where he argued that separately they can affect positively their supply chain individually, as he didn't believe in the fact that they can be collectively applied together inside the same company.

The results show that there is a type of relationship between the Leanness and Agility ways of thinking. They can be considered as complementary ways of doing business and can be applied collectively within the same enterprise to improve its abilities to generally reducing waste and at the same time achieving customer responsiveness through mastering changes and uncertainties. The results show that lean thinking can be considered as the basis for applying the agility thinking. This has been suggested also by Van Hoek, et al., where he argue that lean thinking is one, if not the most element for achieving agility.

Finally, the results show that an enterprise possessing all the lean and agility capabilities can influence positively its supply chain performance. This can be achieved as a result of the fact that all the other partners will be encouraged to improve their performance, in order to meet such requirements and to cope with such enterprise.

Therefore, the following proposed conceptual framework is induced from the results of the primary data, and will be supported by secondary data.

FIGURE 1: The Relationship between Lean and Agility and their Impact on Supply Chain performance



From the above proposed conceptual framework, it can be shown that both concepts 'Leanness' and 'Agility' can be implemented interactively within the same enterprise. The results show that leanness may be considered as the first stage for implementing the agility way of thinking. They both can improve the enterprise capabilities in doing its business as well as in improving its own supply chain. Egypt as business market has been recently opened to high competition and this will impose on companies to improve to be able to cope with such high competitive criteria. Also the results show that agility thinking can improve the abilities of the organization especially, when the industry is characterized by high changeable nature. Therefore, it becomes obligatory. Again the results show that in Egypt the case study is not considered as agile enterprise however, they are moving towards the same track, Since they are applying its principles as much as they can and under the available business conditions.

The business environment today is characterised by being highly dynamic and complex. Therefore, companies are searching for ways to improve their abilities to cope and match with such business conditions. Among them is what has been termed as supply chain management. However, there is ambiguity characterising the literature on '*Supply Chain Management*'. This research focuses on assessing companies to improve their supply chain performance. This is through the use of two business philosophies '*Lean Thinking*' and '*Agility thinking*' together in a collective manner inside companies.

To achieve the research objectives, the research has provided an assessment and summarised the literature on the supply chain management including its importance; its definition and its practices. The research has also provided and summarised the literature on lean concept including its origin and definitions; given to lean manufacturing, lean enterprise, lean supply and lean logistics. Similarly, the research has provided and summarised the literature on agility concept including its origin and definitions; given to agile manufacturing, agile enterprise and agile supply chain. The research has provided also a chapter comparing between both concepts. It has provided the similarities as well as the differences between them.

The previous literature that have discussed the relationship between the two concepts are also evaluated. The research has used case study approach as the means for collecting the primary data. The aim of the empirical was to show the relationship between leanness and agility. In addition, to discuss whether they can be collectively used within the same company and the impact of this on the company's supply chain. The results showed that agility can not be achieved without achieving leanness. In other words, leanness can be considered as a core element of agility, as shown in the proposed conceptual framework. The results showed also that any enterprise can possess both lean and agility capabilities which can improve its supply chain performance. This will enforce and

encourage the other partners within the same supply chain to improve their performance at least to cope and match with the enterprise requirements. Therefore, the overall performance of the supply chain will be improved. The empirical study has taken place in an Egyptian Manufacturing Clothing Company. The results showed that they were aware of the importance of supply chain management, leanness and agility. Although the results showed that these concepts are not being applied in a complete manner inside the Egyptian Companies. However, they are going the path to approaching them in the near future with the increase in economic growth, as well as the informational and technological advances that exist nowadays inside the Egyptian market place.

5- RESEARCH CONTRIBUTIONS

The research provides a proposed conceptual framework showing the relationship between the two business concepts, and how they can be applied collectively together within the same enterprise to influence positively its supply chain performance. In addition, the research has conducted its empirical study in a manufacturing company in Egypt, a developing country with a recently opened competitive business economy, and where the researcher aims at helping the Egyptian companies in implementing such concepts to assist them in facing the high global competition.

6- RECOMMENDATIONS AND LIMITATIONS

As this research has its own contributions, also it has some limitations. The first is that the small number of interviews which can be due to the short time of the dissertation period. This didn't enable the researcher to take enough time in negotiating with more managers in more manufacturing companies. Although many companies were approached, many were not willing to participate. This makes the results can't be generalised across all the manufacturing sectors unless more empirical studies are conducted to verify the research results. The second limitation is that the empirical study was conducted in one case study, working in one manufacturing sector. So it is recommended that more future research studies are needed to test the conceptual framework in other manufacturing sectors as well in the service sector.

REFERENCES

- Aitken, J., Christopher, M., Towill, D., (2002), "Understanding, Implementing and Exploiting Agility and Leanness". *International Journal of Logistics Research & Application*, Vol 5, No. 1, pp59-74
- Baramichai, M., Zimmers, E., Marangos, C. A. (2007), "Agile supply chain transformation matrix: an integrated tool for ceating an agile enterprise". *Supply Chain Management: An International Journal*. 12/5 pp.334-348

- Bendell, T., (2006), "A review and comparison of six sigma and the lean organisations". The TQM Magazine. Vol.18,N0.3, pp.255-262
- Bryman, A., Bell, E., (2007), "Business Research Methods". Second Edition. Graphicraft Limited, Hong Kong, Printed by Legoprint S.p.A
- Christopher, M. (1992) "*Logistics & Supply Chain Management*", Pitmans, London, UK.
- Christopher, M.(2000), "The Agile Supply Chain: Competing in Volatile Markets". Industrial Marketing Management. 29,pp..37-44
- Christopher, M., and Towill, D., (2001) "An Integrated Model for the Design of Agile Supply Chains". International Journal of Physical Distribution and Logistics Mngement..vol.31,issue 4, pp.235-246
- Christopher, M., and Towill,D.R.(2000)"Supply chain migration from lean and functional to agile and customized". Supply Chain Management. Vol.5,no.4,pp.206-213.
- Collin,J. and Lorenzin, D.,(2006) "Plan for supply chain agility at Nokia: Lessons from the mobile infrastructure industry". international Journal of Physical Distribution &Logistics Management.vol.36,no.6,pp.418-430.
- Collis, J., Hussey, R., (2003), "Business Research: A practical guide for undergraduate and postgraduate students", Second Edition.
- Emberson, Caroline and Godsell, Janet and Harrison, Alan and Storey, John (2001) *Customerresponsive supply chains: an exploratory view of concepts and definitions*. In: Logistics Research Network Conference, 13-14 September 2001, Edinburgh, UK.
- Harrison, A. (2000). "The Agile Supply Chain". Available on line; <http://www2.theiet.org/OnComms/pn/manufacturing/agility.pdf>.
- Herron, C., and Hicks, C., (2007), "The transfer of selected lean manufacturing techniques from Japanese automotive manufacturing into general manufacturing (UK) through change agents". Robotics and Computer- Integrated Manufacturing. Pp.1-8
- Jackson, M., and Johansson, C., (2003), "An agility analysis from a production system perspective". Integrated Manufacturing Systems. 14/6 , 482-488
- Kannan, V. R., Tan, K. C. ,(2007), "The impact of operational quality: a supply chain view". Supply Chain Management: An international Journal.12/ 1, 14-19
- Li, S., Rao, S.S., Ragu-Nathan, T.S., Ragu-Nathen, B., (2005), "Development and validation of a measurement instrument for studying supply chain management practices". Journal of Operations Management. 23, 618-641
- Lin C-T., Chiu, H., Tseng, Y-H, "Agility evaluation using fuzzy logic". Internal Journal of Production Economics. 101, 353-368
- Mason-Jones, R., Towill, D., R.,(1999) "Total cycle time compression and the agile supply chain". international Journal of Production Economics,vol.62,pp.61-73
- McCullen, P., and Towill, D., (2001), "Achieving lean supply through agile manufacturing". Integrated Manufacturing Systems. 12/7, 524-533
- McIvor, R.,(2001) "Lean supply: the design and cost reduction dimensions". European Journal of Purchasing & Supply Management. 7,pp.227-242
- Narasimhan, R.(2006) "Disentangling leanness and agility: An empirical investigation". Journal of Operations Management.24,pp.440-457
- Naylor, J. Ben, Naim, Mohamed M. and Berry, D., "Leagility: integrating the lean and agile manufacturing paradigms in the total supply chain", International Journal of Production Economics, 1999, Vol. 62, pp 107-118.
- Papadopoulou, T.C., and Ozbayrak, M. (2005) "Leanness: experiences from the journey to date". Journal of Manufacturing Technology Management. Vol. 16,no. 7, pp.784-807
- Poppendieck, M., (2002), "Principles of Lean Thinking". Available on Line: www.poppendieck.com/papers/LeanThinking.pdf
- Power,D.,(2005) "Supply chain management integration and implementation: a literature review". Supply Chain Management: An International Journal. Vol.10,no.4,pp.252-263

- Presutti, D.W., and Mawhinney, J.R., (2007) "The Supply Chain- Finance Link". Supply Chain Management Review. pp.32-38
- Ramasesh, R., Kulkarni, S., Jayakumar, M., (2001), "Agility in manufacturing systems: an exploratory modeling framework and simulation". Integrated Manufacturing Systems. 12/7, 534-548
- Rigby, C., Day, M., Forrester, P., Burnett, J., (2000), "Agile supply: rethinking systems thinking, systems practice". International Journal of Agile Manufacturing Systems, 2/3, 178-186
- Samaranayake, P., (2005) "A conceptual framework for supply chain management: a structural integration". Supply Chain Management: An International Journal. Vol.10, no.1, pp.47-59
- Saunders, M., Lewis, P., Thornhill, A., (2000), "Research Methods for Business Students". printed and bound in Great Britain by Ashford Colour Press Ltd., Gosport
- Shah, R. and Ward, P., T., (2003) "Lean manufacturing: context, practice bundles, and performance". Journal of Operations Management. Vol.21, pp.129-149
- Sharifi, H. and Zhang, Z. (1999), "A methodology for achieving agility in manufacturing organisations: An introduction." international journal of production economics, vol. 62, p. 7-22.
- Sharifi, H., Ismail, H. S. and Reid, I. (2006) "Achieving Agility in Supply Chain Through simultaneous 'design of' and 'design for' supply chain. Vol.17, no.8, pp.1078-1098
- Sherehiy, B., Karwowski, W., Layer, J., K., (2007) "A review of enterprise agility: Concepts, frameworks, and attributes". international Journal of Industrial Ergonomics. vol.37, pp.445-460
- Silverman, D., (2000), "Doing Qualitative Research". printed in great Britain by The Cromwell Press Ltd, Trowbridge, Wiltshire.
- Swafford, P., M., (2006) "The antecedents of supply chain agility of a firm: Scale development and model testing." Journal OF Operation Mngement. vol.24, p.170-188
- Swafford, P., M., Ghosh, S., Murthy, N., N., (2006) "A framework for assessing value chain agility". International Journal of Operations & Production Management. vol.26, no.2, pp.118-140
- Van Hoek, R., I., Harrison, A., Christopher, M. (2001), "Measuring agile capabilities in the supply chain". Internal Journal of Operations & Production Management. Vol.21, no.1/2, pp.126-147
- Weber, M., M., (2002) "Measuring supply chain agility in the virtual organization". International Journal of Physical Distribution & Logistics Management, vol.32, no.7, pp.577-590.
- Womack, J.P., Jones, D.T., Roos, D. (1990). *The Machine that changed the world*. Macmillan, printed in USA.
- Yin, R., K. (1989). *Case study research: Design and methods*. London: Sage
- Yin, R. K. (2003). *Case study research*, Sage, Beverly Hills, CA.
- Yusuf, Y. Y., Sarhadi, M., Gunasekaran, A., (1999) "Agile manufacturing : The drivers, concepts, and attributes". International Journal of Production Economics. Vol.62, pp.33-43.