

Analysis of clothing supply chain: Integration & Marriage of Lean & Agile

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Contents

Introduction	1
Lean and Agile Supply Chain	1
Particular ways of marring lean and agile paradigms	5
The Pareto Curve approach	6
The Decoupling Point	7
Separation of Base and Surge Demand	8
Case: Benetton	8
Case: Hennes & Mauritz (H&M)	10
Case: Zara	12
Conclusion	14

List of Tables

Table (1): Usage of Lean and Agile	2
Table (2): Difference in Lean and agile	3
Table (3): Market Winner and Qualifier Matrix	4
Table (4): Benefits of Leagile	5

List of Figures

Figure (1): The Pareto Curve approach	6
Figure (2): The Decoupling Point	7
Figure (3): Base and Surge Demand	8
Figure (4): Traditional Lean manufacturing process of garments	9
Figure (5): Benetton's Manufacturing Process	10
Figure (6): H&M's Supply Chain Model	12
Figure (7): Flow of Information at Zara	13

Introduction

Modern supply-chains are very complex, with many analogous physical and information flows occurring in order to certify that healthy products are delivered in the right quantities, to the right place in a cost-efficient manner. The current drive towards more efficient supply networks during recent years has resulted in these international networks becoming more vulnerable to disruption. To be precise, there often tend to be very little inventory in the useful professional organisation to buffer interruptions in supply and, therefore, any disruptions can have a rapid impact across the progressive supply networks. This paper contains the significant issues of modern clothing supply chain. Due to globalisation, of rapidly changing markets and vogues of clothing business make it specified in terms of stylish fashion and changing user behaviour. The fashion industries are changing and expending the business while outsourcing; based on shortest lead times. But now, as per the case study “Supplying Fashion Fast” today’s supply chain are not to just serving the market with shortest lead time but it is to react immediately on the demand. . *The challenge faced by a supply chain delivering fashion products is to develop a strategy that will improve the match between supply and demand and enable the companies to respond faster to the marketplace*” (Naylor, Towill and Christopher, 2000).

Lean and Agile Supply chain

For over a decade, companies have been achieving huge cost savings by streamlining their supply chains. While affluent, and thus pleasurable; these trends have also exposed organisations to new sets of paradigms such as Lean, Agile, Integration of Lean and Agile, Relationship driven supply chain etc. The question arise here is, Why there is a need to integrate the lean and agile supply chain? To find the answer the previous pages need to be turned; "Lean" is the name that James Womack gave to the Toyota Production System in the book “*The Machine that Changed the World.*” Lean was the term that best described Toyota's system versus the rest of the world's automotive manufacturers at the time. Many companies have since applied lean thinking to their organizations with

varying degrees of success. Applying lean to the entire supply chain is not a new concept, but very few have had success doing it. Naylor et. al (1999) defined the lean as, “Leanness means developing a value stream to eliminate all waste including time, and to enable level schedule.” Further the Agility means “using market knowledge and virtual corporation to exploit profitable opportunities in a volatile marketplace.” The leanness is basically to eliminate the waste with in the manufacturing to drive the lowest possible cost and highest quality of the product. Agility is to use the Voice of Customers (VOC) to develop new products to satisfy the demand, this is more flexible and high cost then leanness. “In lean production, the customer buys specific products, whereas in agile production the customer reserves capacity that may additionally need to be made available at very short notice” (Naylor, Towill and Christopher, 2000). Please see Table (1) for the use of lean and agile supply chain and Table (2) for differentiate the lean and agile supply chains. The tables developed by the author to demonstrate the difference, usage and benefits of Lean, Agile and Leagile supply chain paradigms. The table 1, 2 and 4 are influenced by the suggestions by the previous researchers such as Christopher, (2000), Towill, Christopher and Naylor (2000), Crocker & Emmett (2006), Naylor, Naim & Berry (1999) and the other literature found.

Table: (1)

Usage of Lean and Agile

<u>Lean</u>	<u>Agile</u>
<ul style="list-style-type: none"> • Fluent Manufacturing • Zero inventory • Just in Time (JIT) • Remove waste • Vendor Managed Inventory (VMI) • Total Quality Management (TQM) • Economies of Scale (Low cost) • Commodities • Continuous, Line and High Batch production process 	<ul style="list-style-type: none"> • Postponement • Collaborative scheduling • Just In Time (JIT) • Purchasing input capacity (PIC) • Supplier Trade off (Setup Vs Inventory) • House of Quality (HOQ) • Made to Order (High Cost) • Fashion Products • Integration of Micro and Macro environment • Project, Jobbing and low batch process

Source: The Present Author

Table: (2)

Difference in Lean and Agile

<u>Lean</u>	<u>Agile</u>
<ul style="list-style-type: none">• Containing little fat• Product oriented• Reduce stock to minimum• Plan ahead• Satisfy customers by eliminating waste• Measuring output criteria: Quality, Cost and Delivery• Low Cost• Efficiency• Less flexible• Low variety	<ul style="list-style-type: none">• Nimble• Customer oriented• Reducing stock in not an issue• Unpredictable demand planning• Satisfy customers by configuring order• Measure output Criteria: Customer satisfaction• High Cost• Effectiveness• High flexible• High variety

Source: The Present Author

As per the case study “Supply Fashion Fast” the fashion market is volatile and customer driven. Towill and Christopher (2002) suggested the market qualifier and winners in Lean and Agile supply chain (See Table 3). In Agile supply chain the market qualifiers are Quality, cost and lead time and the winner is who produce the high service level. But in Lean supply, the market qualifiers are Quality, Lead time and Service level and the winner is the cost. In addition; Naylor, Towill and Christopher (2000) suggested that agile supply chain is for fashion goods and lean supply chain is for commodities (See Table 3). Now the concept of integration of lean and agile paradigms is originated to capturing the advantage of lean and agile paradigms such as to maximize the efficiency and utilization of the operations and customization of high level of products. Christopher and Towill (2002) pointed that, “the lean concept works well where demand is relatively stable and hence predictable and where variety is low.” Furthermore “Agility is a business wide capability that embraces organisational structure, information systems, logistics process and in particular mind sets.”

Table: (3)

<p>Agile Supply Fashion Goods</p>	<p>1. <u>Quality</u> 2. <u>Cost</u> 3. <u>Lead Time</u></p>	<p>1. <u>Service Level</u></p>
<p>Lean Supply Commodities</p>	<p>1. <u>Quality</u> 2. <u>Lead Time</u> 3. <u>Service Level</u></p>	<p>1. <u>Cost</u></p>
<p>Market Qualifiers</p>		<p>Market Winners</p>

Source: Mason-Jones *et al.* (2000)

“Fashion products have a short life cycle and high demand uncertainty, therefore exposing the supply chain to the risks of both stock out and obsolescence. A good example of a fashion product is trendy clothing (Naylor, Towill and Christopher, 2000). To avoid degeneration and to fulfill the high demand uncertainty there is a need to combine the lean and agile to getting the best out of them.

This combined approach is known as ‘Leagility’ and, as it is packed with the best outcomes of lean and agile. Resultant; the integration of lean and agile supply chains can thereby adopt a lean manufacturing approach upstream, enabling a level schedule and opening up an opportunity to drive down costs upstream while simultaneously still ensuring that downstream should have an agile response capable of delivering to an unpredictable marketplace. The need of integration or marring the lean and agile supply chain is to react effectively on a volatile demand while reducing waste and cost and improving quality and service level. Please see table (4) for benefits of ‘Leagile’ supply chain.

Table: (4)

Benefits of Leagile

- Control & view inventory levels across a network
- Manage orders between trading partners
- Organise collaborative demand plans
- Plan replenishment across an internal or external network
- Enable Sales and Operation Planning
- Monitor and Alert on significant events
- Managing JIT approach
- Managing Vendor Managed Inventory
- Quick response to market
- Achieve benefits of postponement
- Standardisation of products
- Converting voice of customers (VOC) into products

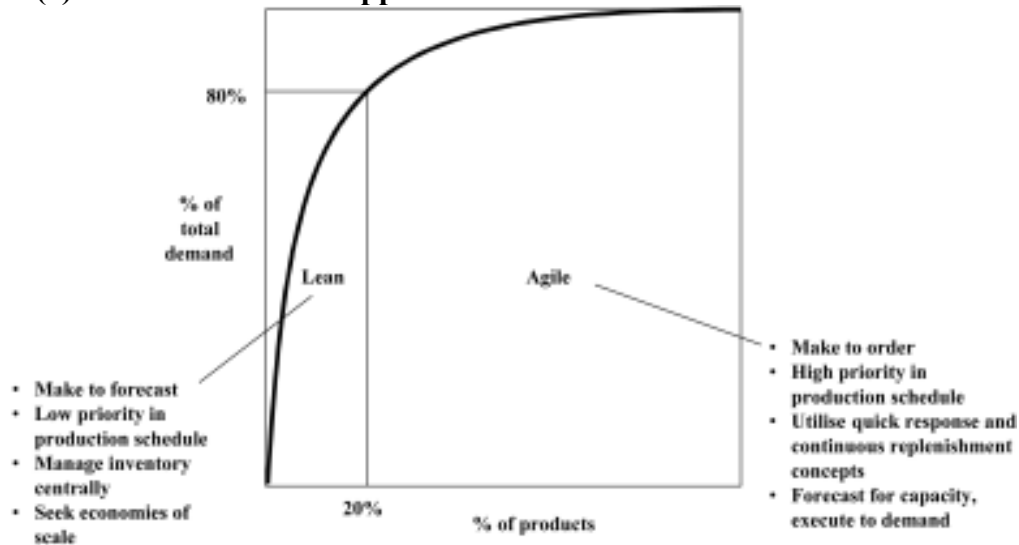
Source: The Present Author

Practical ways of marring Lean and agile paradigms

There are particularly three ways of marring lean and agile paradigms suggested by researchers such as, Pareto Curve approach, Decoupling Point and base and surge demand. These three ways of marring lean and agile can be used in any point of time and in any department, such as design, procurement, manufacturing etc. In a particular supply chain these approaches can be used frequently, such as Pareto 80/20 rules and separation of base & surge demand can be used in design, manufacturing, forecasting or while taking the critical decisions such as Standardisation of products, postponement decision etc. These approaches give flexibility to the process and enable to postpone the decisions and lower the inventory and most importantly minimizing the waste while optimizing the performance and quality. De-coupling point approach is the main idea to hold the inventory in shape of incomplete product shape and assemble the products instantly or in a shortest period on customers demand. The Dell computer is a well know example of decoupling approach practice. Practical implication of these approaches gives the benefit of integration of lean and agile supply chain. The practical ways of marring lean and agile

provide available and affordable products, (Christopher & Towill, 2001) instantly to the customers in a volatile demand such as Fashion.

Figure (1): The Pareto Curve approach



Source: Christopher and Towill (2001)

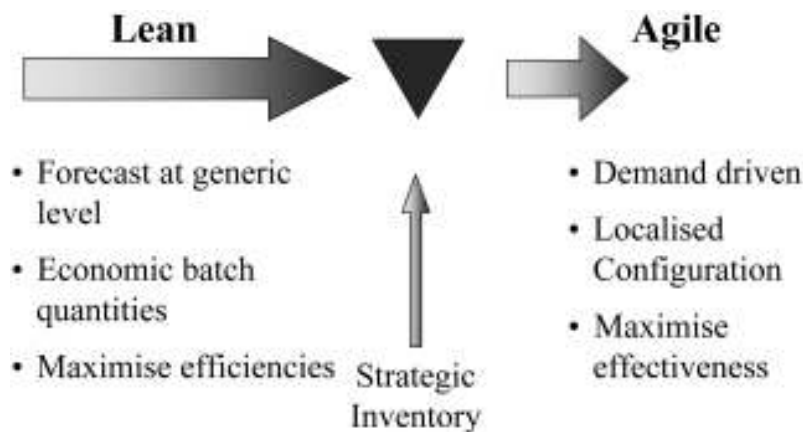
In the late 1940s quality management guru Joseph M. Juran suggested the principle and named it after Italian economist Vilfredo Pareto, who observed that 80% of income in Italy went to 20% of the population. Pareto Analysis is a statistical technique in decision making that is used for the selection of a limited number of tasks that produce significant overall effect; stated Towill, Naylor, Jones (2000), Christopher, Towill (2001) Haughey, (2007). It uses the Pareto Principle; is also know as the 80/20 rule, the idea that by doing 20% of the work you can generate 80% of the benefit of doing the whole job (Haughey, 2007). This rule can be applied on almost anything such as 80% delays arise from 20% of causes, 20% of system defects caused 80% of problems (Towill, Nayloy, Jones, 2000). *“The Pareto Principle has many applications in quality control. It is the basis for the Pareto diagram, one of the key tools used in total quality control and Six-Sigma”* (Haughey, 2007). In figure (1) Christopher and Towill (2001) suggested that, 20% of the

products are easily predictable and can be standardised and they lend themselves to lean manufacturing, furthermore the 80% of the products are in agile manufacturing because of less predictability, which require quick response to market”

Decoupling point

The further marring of lean and agile can be achieved by creating decoupling point; in a production process it is common to introduce decoupling points where production lead time is much longer then acceptable order lead time (Christopher and Towill, 2000). The decoupling point takes physical stock to achieve the advantage of different management and control tools to efficiently manage the both side (input & output) of the inventory (Velde and Meijer, 2007). The other side of decoupling point is the natural boundaries of organisations and departments with in the process (Christopher and Towill, 2001, Velde and Meijer, 2007). It is also the hub to meet the need and capability on either side of point. With in a supply chain there can be many numbers of decoupling points (Towill, Naylor and Jones, 2000). *“A decoupling point divides the value chain into two distinct parts; one upstream with certain characteristics and one downstream with distinctly different characteristics”* (Olhager, Selldin and Wikner, 2006). In figure (3) Christopher and Towill (2001) suggested that, *“by utilising the concept of postponement companies may utilise lean method up to decoupling point and agile method beyond that.”*

Figure (2): The Decoupling Point

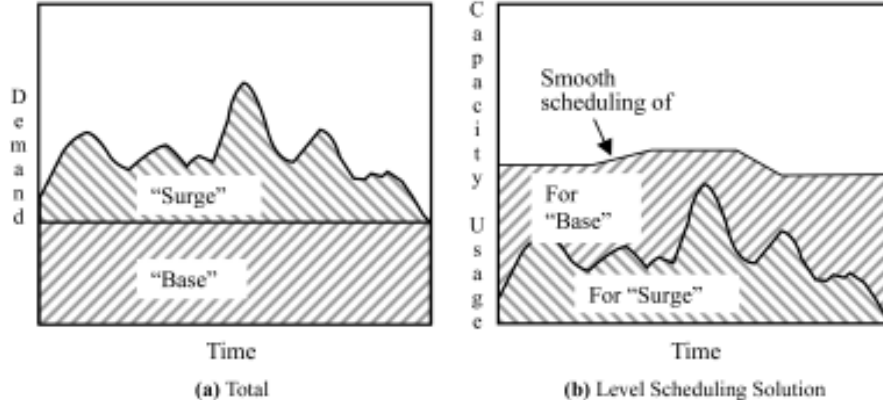


Source: Christopher and Towill (2000)

Separation of Base and Surge Demand

Separating demand patterns into “base” and “surge” elements is an employment of hybrid strategy. “Base demand can be forecast on the basis of past history whereby surge demand typically cannot. Base demand can be met through classic lean procedures to achieve economies of scale whereas surge demand is provided for through more flexible and probably higher cost, processes” stated (Christopher and Towill, 2001). Further Christopher and Towill pointed that; in fashion industry base demand can be sourced in low cost countries and surge demand to be topped up locally”. Base demand can be achieved by classical lean manufacturing with low cost and less flexibility and surge demand by agile with high cost and high flexibility.

Figure (3): Responding to combinations of “base” and “surge” demands



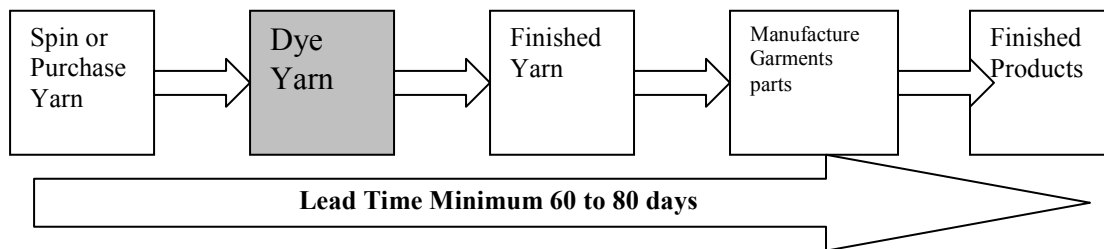
Source: Christopher and Towill (2001)

Case: United Colors of Benetton

The Benetton Group exists in 120 countries, with around 5000 stores and produce revenue of around 2 billions. According to the case study the group employs 300 designers and produces 110 million garments a year. The group owns most of the production units in Europe, North Africa, Eastern Europe, and Asia. 90% of the garments are being produced in the Europe and the group invested in highly automated warehouses, near main production centres and stores. Benetton’s stores sell mixed brands, such as the casual wear, fashion oriented products, leisure wear and street wear and the flash collections during the seasons. More than 20% of products are customised to the specific need of each country and reduced by 5-10 percent by standardising the products and strengthening the global brand image and reducing production cost.

According to case study Benetton's goals are to achieve expansion of sales network while minimizing the cost and increase the sales of fashion garments. In order to achieve these goals a higher degree of flexibility is required in the process. But it's very hard to achieve flexibility, as the lead times are long; in respect retailers are required to purchase in advance, and the most of the purchase plans depend upon generalising the orders. For example; if Benetton needs to wait for a specific number of orders from retailers to buy the fabric in bulk and start manufacturing in order to minimise the cost, but resultant the process will increase the lead time of the finished product in store. See figure (4) for a traditional (lean) manufacturing process of garments.

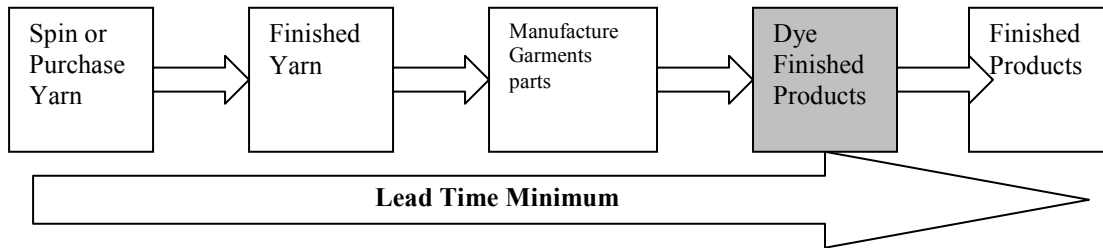
Figure (4): Traditional (Lean) manufacturing process of garments



Source: The Present Author

According to the case study Benetton the need of fashion industry is the quick response to the market. This requires a higher degree of flexibility in production and decision making. As per the corporate goals of the group, Benetton acquires the strategy of postponement and standardisation of the products. The benefit of the postponement is to enable Benetton to start manufacturing before color choices are made, to react on customer demand and suggestion and to delay the forecast of specific colors. Furthermore; the product and process standardisation benefits Benetton with the lower setup cost, manufacturing before dyeing and give flexibility to produce only a subset of the products.

Figure (5): Benetton's manufacturing process



Source: The Author

In figure (4) and (5) the manufacturing process is changed due to the dyeing finished products, in respect of the change in process the setup cost of manufacturing garments parts can be reduced further more the inventory level can also be reduced because the postponement of decision of dyeing the garments after manufacturing reduced the requirement if keeping much stock of different color of garments. Additionally; postponement is helping the Benetton to produce the fabric under lean manufacturing process while reducing and eliminating cost and waste. It also involves the flexibility to produce variety of colors in a short lead time. This also helped the Benetton to standardise the manufacturing process and further led to gain cost leadership and differentiation strategies. In the context; Dyeing unit is acting as a decoupling point where the lean manufacturing exists downstream of information flow and agility upstream.

As per the case study The Benetton's 90% of the production is based in the Europe and rest in low cost countries. Here the Pareto 80/20 rule can be applied because 90% of the production is based on to fulfill the surge demand, and the prompt actions can be made on the volatile demand. Reducing the number of customised products by the Benetton is also an attempt to increase the number of standardised products in order to achieve the lowest cost possible and make the product a global brand. The other reason is to gain the benefits of level scheduling of base and surge demand to ensure the usage of capacity.

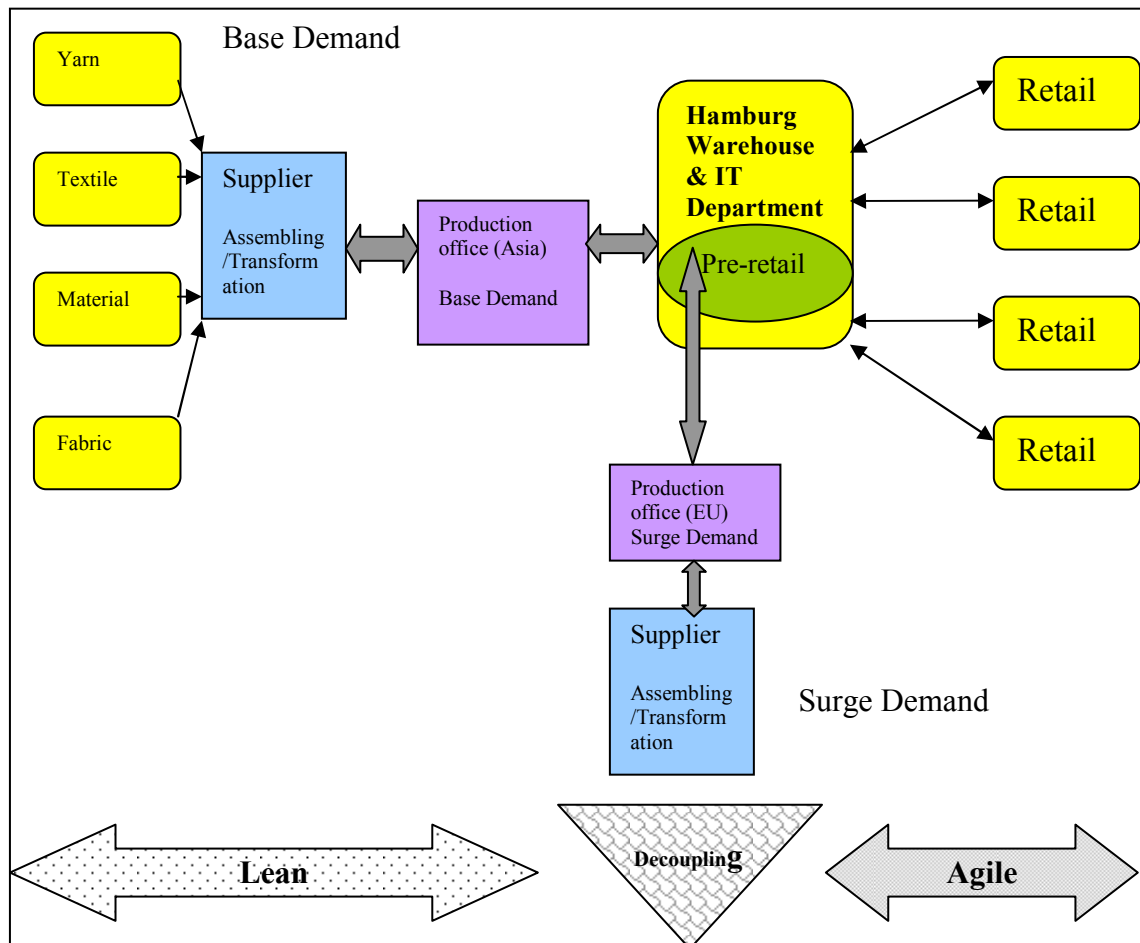
Hennes & Mauritz (H&M)

As per the case study and H&M internet media; H&M collections are created and placed centrally in the design and buying department to find the good balance of three

components Fashion, Quality and the best Price. H&M is a customer focused company and employees more than 100 designers. A team of 500 people works together to build the range and putting together the colors, fabrics, garment types and theme and provide a feel for new season's fashion. Furthermore; H&M do not own any manufacturing units, they have more than 700 suppliers in the Asia and Europe, but H&M owns the production offices working closely with the suppliers and ensuring the safety and quality of goods. H&M's lead time varies 2 weeks to 6 months based on the item. The main transit point of goods is in the Hamburg and company got more than 1500 own stores.

As per the company's business concept Fashion, Price and Quality; H&M produce most of the garments outside Europe to achieve the benefits of leanness. They buy fabric in advance as per the forecast in order to minimise the cost (Li Li, 2007). The production offices situated with in the origin of production act as the second hub of information flow downstream and ensure the quality and the work standard of the suppliers. The other reason of placing production offices is to maximise the efficiency of supplier to achieve the lowest cost and zero defects in the products and minimise the lead time. The transit point in the Hamburg works as a decoupling point, while managing the flow of goods and information upstream and downstream. As H&M is a customer oriented company and learning from customers and serving the surge demand by production in the Europe (Li Li, 2007). The author is tried to develop a model of H&M supply chain to illustrate the particular ways of marriage of lean and agile. To illustrate in easiest way the author had put only one supplier in the Asia and one in Europe, to make it easier the inventory points, are not also explained (see figure 6).

Figure (6): H&M SC Model.



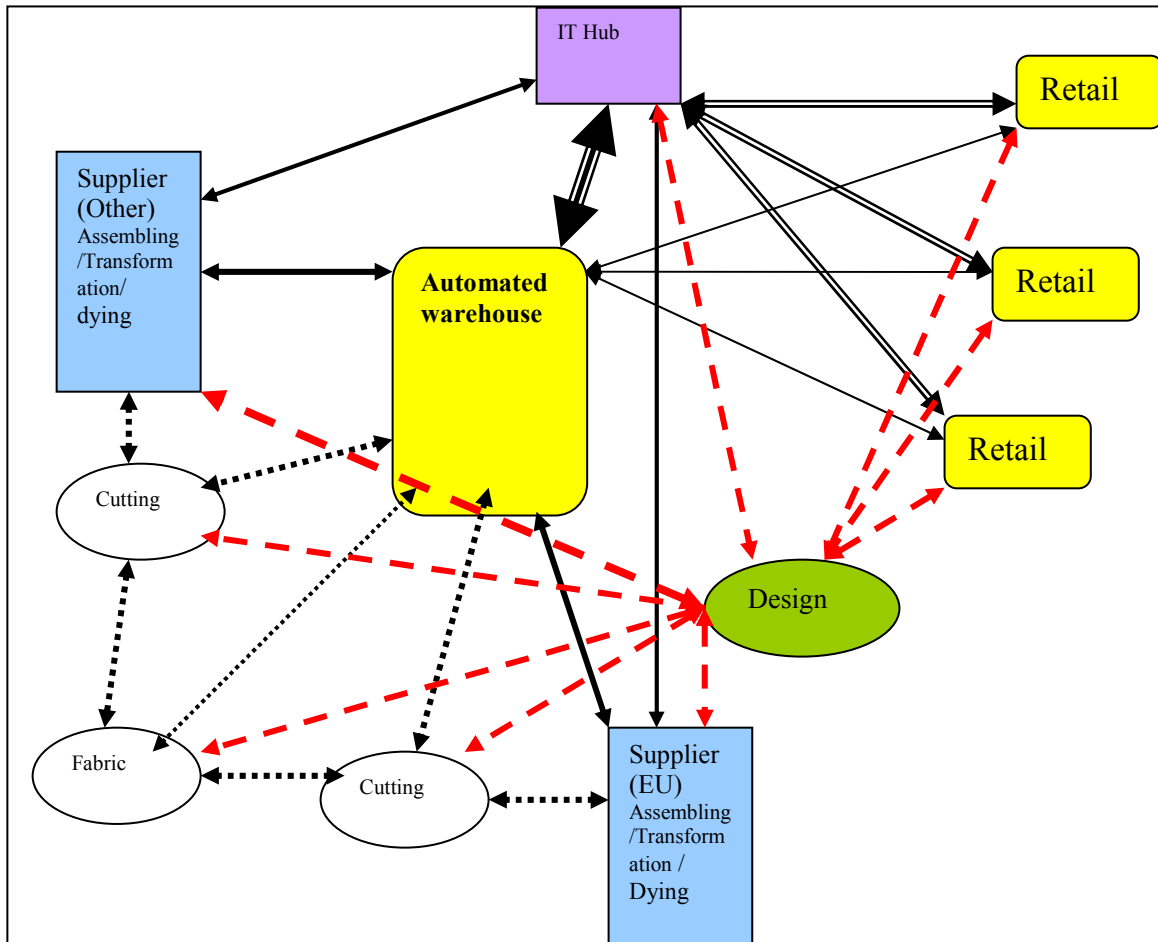
Source: The Author

Case: Zara

As per the case study; under the Zara model, the retail store is the eyes and ears of the company. Instead of relying solely on electronically collected data, Zara utilizes word-of-mouth information to understand more about their customers. Empowered store managers report to headquarters what real customers are saying. Products that are not selling well are quickly pulled and hot items quickly replenished. Their quick turn around on merchandise helps generate cash which eliminates the need for significant debt.

Zara hires young designers and trains them to make quick decisions. Decision-making is encouraged and bad decisions are not severely punished. Designers are trained to limit the number of reviews and changes, speeding up the development process and minimizing the number of samples made.

Figure: (7) Flow of information at Zara



Source: The Present Author

As per the literature available on Zara supply chain and the use of technology the author tried to develop the Figure (7). In the figure it is illustrated that the Zara supply chain starts from the retail stores and customers, the use and flow of information made Zara to convert the high degree of information into opportunity. The agility here is that the stores get feedback from customers and send the feedback to design team. Design team based on the fabric availability design the products by using the “Vanilla Box Design”. This

helps to make computerised designs instead to waste money and time in making actual samples. Zara is using Pareto 80/20 rule while choosing the designs to send into production. The design team sends the information to cutting department and fabric department to ensure the right pattern is produced, here in production Zara is using the lean manufacturing in specialized factories while standardisation of cutting, stitching and dying process, pointed; Anderson, (2007) Machouca, Lewis and Ferdows, (2005). Undyed fabric is produced in advance with the help of long term forecast. Design teams make sure they will only design the garments keeping in mind the availability of specified fabric. The other advantage of integration of all the departments is gaining the benefit of postponement; Zara is dying the finished garments as per the customer's reaction. Surge demand is managed by producing goods in Europe and base demand in other labor intensive countries (Machouca, Lewis and Ferdows, 2005).

Conclusion

The need of supply fashion fast in the volatile demand; led companies such as, Zara, H&M & Benetton to make the changes in lean and agile process and integrate the both to achieve the benefits of lean and agile. The main motive to achieve the leagile is to react fasted on the changing demand. This requires a better control and view of inventory levels across the network, enable sales and replenishment planning across the internal and external network. With the help of IT, Zara achieved the control and monitoring the different event on the market, they are able to act on with the quick response to the market. Zara and Benetton both achieved the benefits of postponement. All there companies achieved the benefits of standardisation. Although; Zara, Benetton and H&M, took the different approach to marring the lean and agile but the overall purpose is the same; "Supply Fashion Fast" with lowest possible price and highest degree of quality.

The Figures (4) & (5) Benetton; (6) H&M and (7) (Zara) is developed by the author with the help of the data found on the company website and based on articles and journals of Davanzo, Starr and Lewinski (2004); Machouca, Lewis and Ferdows, (2005); Anderson, (2007); Anderson and Lovejoy (2007); Li Li (2007) and Claburn (2007).

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