

Chapter 1

Introduction to Fashion Supply Chain Management in Asia



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1 Introduction

Textile and apparel production is labor-intensive and creates millions of job opportunities in the emerging countries (Gereffi 1999). The textile and apparel industry has great impact on GDP generation and the stability of national politics. This especially holds true for developing countries such as India, Bangladesh and Vietnam. In order to continuously reap the benefits created by the textile and apparel industry, some Asian country's governments introduced low export taxes to attract international buyers and investors (Frederick and Gereffi 2011).

Global textile and apparel sourcing is currently in a state of change (Teng and Jaramillo 2005). China, the world's garment manufacturing powerhouse, is not only facing rising labor costs, but also labor shortage especially in coastal provinces (Lu 2016b). Also, the strength of the Yuan is squeezing manufacturers' margins. The steady appreciation of the Chinese Renminbi makes Chinese exports more expensive to international buyers. Brands find that they cannot pass along higher prices to their customers, but instead must focus on minimizing production costs (Zhen 2015). China at present aims to shift its manufacturing focus to high-end products, thus moving low-end and labor-intensive production outside China is acceptable. This naturally has led to a growth of textile and apparel manufacturing capacity in other Asian countries such as Bangladesh, Vietnam and India (Chen et al. 2017).

Fashion products face a high level of demand uncertainty because of fast-changing consumer tastes and other unpredictable market volatilities. Fashion firms that want to succeed in matching supply and demand have to design and implement an efficient

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supply chain system, leveraging the unique capabilities of every single supply chain member. In this paper, the aims are (1) to introduce the concept of fashion supply chain management, (2) to discuss the abilities of China, India, Bangladesh, and Vietnam in terms of their textile and apparel industry, and (3) to investigate several important new challenges and opportunities which Asia fashion supply chains are facing.

The structure of this chapter is given as follows. Section 2 provides the key knowledge about fashion supply chain management. Section 3 describes the textile and apparel industry in Asian countries. Section 4 discusses new challenges and opportunities of Asia's fashion supply chain and Sect. 5 concludes the paper.

2 Fashion Supply Chain Management

The objective of a supply chain is to fulfill buyer's requests and maximize the total supply chain benefits. A supply chain consists of many different members which all have their own interests and aim at maximizing the profit they can make from operating in the supply chain. This makes a supply chain system highly complex. A typical fashion supply chain includes raw material farmers/producers, fiber and textile producers, apparel manufacturers, transporters, warehouse, and retailers. Sometimes, after the products were sold to consumers, old/unused products are collected by third party collectors who remanufacture or reuse the old/unused products. The result is a closed-loop supply chain. Figure 1 depicts the stages of such a fashion supply chain.

The complexity of fashion supply chain structures increased as globalization and dynamics. Due to the fact that transportation cost steadily decreased over the last couple of decades, it became more viable for buyers to tap sourcing regions far away from the products' target markets. Hence, the geographic spread of fashion supply chain members increased and made it more difficult to manage the flow of information, products, and payment between them. Moreover, the number of participants in supply chain systems are increased. As consumers's demand is dynamic and

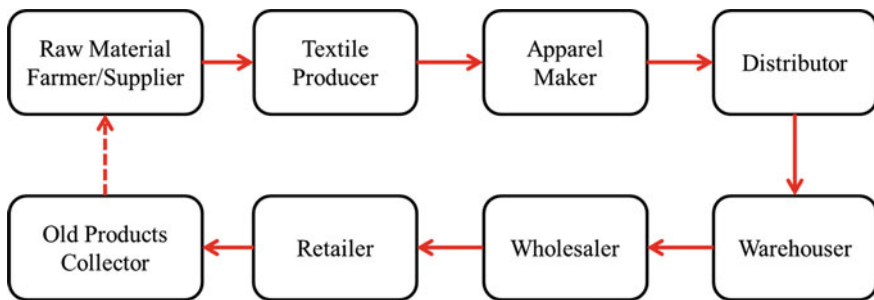


Fig. 1 Flow fashion supply chain model (closed-loop)

increasingly high, many fashion brands could not continue to produce their products in-house, and have to outsource parts of their apparel production to the cost efficient countries such as China. Therefore, new members were added to their supply chain. More exacting consumer demands required fashion firms to find suppliers which can produce the required specifications. Also, fiercer competition in the industry forced suppliers to specialize in producing certain types of textile and apparel products in order to differentiate from competing suppliers and attract more buyers.

In order to fulfill upstream buyers' requests, each supply chain member needs to work hard in his area of responsibility such as new product development, raw material sourcing, manufacturing and operations, distribution, marketing, finance, and customer service. To achieve centralized profit maximization, collaboration is strongly needed. Supply chain coordination includes that decentralized participants in different parts of the supply chain all work together and provide joint efforts toward reaching centralized decisions. Only then can shared processes be streamlined and maximum supply chain profit be realized. For example, the apparel maker may not only be in contact with the next party located up- and downstream in the supply chain, but also with parties located further up and down the stream, such as raw material suppliers or retailers. This of course makes communication and decision-making more difficult. However, information sharing in that way is likely to increase overall supply chain efficiency.

A supply chain is dynamic and consists of a constant flow of information, product, and payment between different members in various stages. In terms of information, retailers receive customer requests, which are important demand information, whereas suppliers observe machinery conditions and labor efficiency from time to time, which are important supply information. For example, retailers as the supply chain member being closest to consumers can convey information of customer feedback and customers' buying preferences to apparel makers which can check whether they and their suppliers are capable of creating products that respond to that knowledge about customers. Different ways of sharing information in a fashion supply chain are the reason why some supply chains work more efficiently than others. It is a fairly complex task to share valuable information not only between two parties, but make it available to multiple supply chain participants which can then work with the data and also make changes to it. The Internet and information technology enable supply chain members to continuously share information with each other and update information on a real-time basis. Nowadays, information systems such as Enterprise Resource Planning (ERP) systems integrate many different types of information in one commonly shared platform and are the backbone of successfully operating fashion supply chains. In the future, information sharing capabilities will even become more important for members in the textile and apparel industry when it comes to creating and maintaining a competitive advantage.

In terms of products, some fashion items face a high level of demand uncertainty because of fast-changing consumer tastes. They are so-called fashionable products. However, some products are basic such as a blank t-shirt which is functional, i.e., consumer demand for them is relatively stable. Whereas fashionable products have a short life cycle and are sensitive to the latest fashion trends, basic items are charac-

terized by a long life cycle and are used by consumers on an everyday basis. Thus, these two categories of products have different production requirements and satisfy different consumer needs. In order to increase speed to market for fashionable products, many apparel brands source these items in countries that allow for a fast transportation to the target market. For European countries as target markets, Turkey is often times chosen as sourcing location. On the contrary, basic items are often sourced in Asia although their target markets might be in Europe or North America. Brands benefit from lower production costs and can offer lower prices to consumers, and do not have to be afraid that after the long transportation lead time consumers' demand for these products has changed significantly so that they could not sell the products anymore.

In terms of payment, based on the bargaining power of different supply chain participants, buyers pay in advance, pay when the products arrived, or pay after the products are sold. Whereas buyers want to pay for the goods as late as possible, suppliers are eager to get paid as early as possible. In general, suppliers producing basic items have less bargaining power in the payment negotiations than suppliers of fashionable items. This is because basic items can be produced by many suppliers, whereas the production of fashionable items often requires special expertise and production equipment. The timing of payment significantly influences supply chain members' cash flows, which further affects supply chain efficiency. Figure 2 illustrates the constant flow of information, product, and payment in the fashion supply chain.

In the fashion supply chain, competitiveness refers to quality, responsiveness and cost. Quality consists of product quality, i.e., whether the manufacturer can produce the products with satisfying or the expected quality. Cost is the price for how much the manufacturer produces the product. The lower the cost of producing fashion items, the lower the price that can be offered to consumers. Hence, to be a competitive manufacturer/buyer, cost reduction is critical, especially when consumers are highly price-sensitive and their purchasing decisions heavily depend on product prices. Responsiveness is crucial in fashion because the right timing determines the success of a trendy fashion product in retailing. Fashion consumers are dynamic in terms of their tastes of fashion. If the retailer does not manage to sell its fashionable items

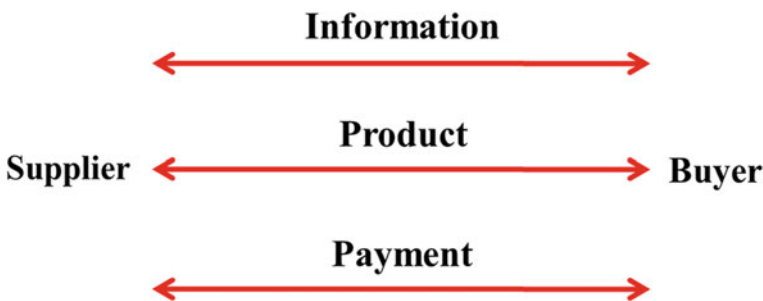


Fig. 2 Flow of information, product, and payment in the fashion supply chain

soon after retail introduction, the products have to be discounted or soon become out-of-season stock. To be truly responsive, manufacturers should be in the right place to produce the right products with right prices by making use of the right manufacturing skills. There always exists a trade-off between quality, cost, and responsiveness. For instance, if a manufacturer wants to produce high-quality products, its responsiveness might decrease and its production cost might increase compared to producing lower-quality products. In contrast, if the manufacturer wants to be more responsive, the product quality may not always be guaranteed or the cost may not be acceptable. Only fashion brands that know in detail about their consumers' needs and wants, and about the peculiarities of the market they operate in, can make appropriate decisions that find the best combination of quality, cost, and responsiveness. Figure 3 shows the three factors that determine competitiveness in the fashion supply chain.

3 Textile and Apparel Industry in Asia Countries

It is important to discuss fashion supply chain management in Asia in more depth. At present, Asia possesses of a more comprehensive supply chain system than other continents such as North America and Europe where the focus lies on product design and retailing, not on manufacturing (Chen et al. 2017). Whereas the textile and apparel giant China has already built up momentous textile and apparel manufacturing capac-

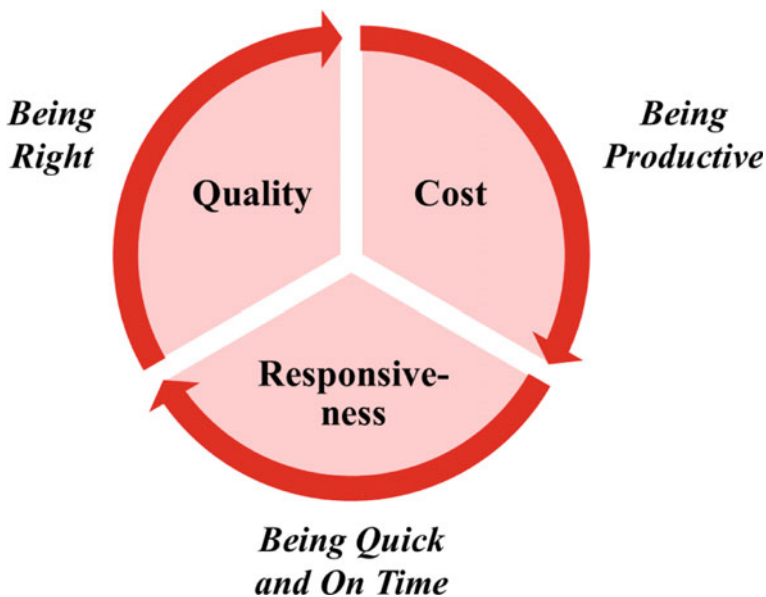


Fig. 3 Competitiveness factors in the fashion supply chain

ities, other Asian countries such as India, Bangladesh and Vietnam are increasingly promoting the textile and apparel industry in recent years (Berg and Hedrich 2014; Zhen 2015; Barrie 2016; Barth 2016). In this section, the industry conditions of the textile and apparel industry in China, India, Bangladesh and Vietnam are introduced and discussed. Additionally, it is investigated whether the logistics performance of each of these countries has an influence on the fashion supply chain efficiency of suppliers in these countries.

China

China is the world's largest textile and apparel producer and exporter. The industry plays a crucial role in the country's national economy. The output volume of China's textile and apparel industry accounts for more than half of the global one (Lu 2016a). China is the biggest apparel exporting country worldwide with an apparel export value of \$175 billion in the year 2015 (Textile Outlook International 2017).

The Chinese textile and apparel industry is highly diverse, with companies and factories working on cotton, chemical fiber textile and printing, dyeing finishing, wool textile and dyeing finishing, linen textile, silk textile finishing as well knitted and woven products. China is known as one of the top apparel manufacturers worldwide with an advanced supply chain infrastructure (Lam and Postle 2006). For instance, its internal transportation network, as well as its world-class ports and power sources are the foundation for efficient operations of players in China's textile and apparel industry and drive the country's success. Furthermore, China can source all the natural materials (both plant and animal based) that are needed in textile and apparel production in its own country. China has a strong workforce with the required expertise and is thus able to produce a huge amount of good-quality goods at low cost. It is predicted that the large domestic market will continue to maintain its size in the next years (Lu 2016a).

In recent years, the rising costs of energy, land, and labor have weakened China's position in the international competitive environment. Seeing the Chinese textile industry in the long term, when producing low-end products, manufacturing capacity will continue to transfer to other Asian countries that are cheaper. In comparison to previous years, China's manufacturing strategy has changed and is still in a state of development. Increasingly, investments in technological innovation and quality upgrades are made. Furthermore, the focus is set on achieving higher profit margins by producing fewer units but increasing the value of the output instead. Achieving economies of scale through producing as many units as possible is not the ultimate goal of all manufacturers anymore. As a result, the image of China as a low-cost country is fading away, while the image of China as a medium to high-tech manufacturer is becoming more and more popular. Owing to the constant development and the modernization of production processes, China is facing a lot of new challenges. Chinese manufacturers have to deal with higher production costs at home and respond to competition from cheaper sourcing countries around. The global economic slowdown as well as increasingly strict environmental policies is driving China's fashion manufacturing sector under pressure (Young 2016). However, given the current climate in Asia's textile and apparel sector, China will remain the leading

textile and apparel sourcing country in the world in the foreseeable future. There is no other country that will be able to match China in terms of scale, manpower, infrastructure, speed, efficiency, expertise, flexibility and stability.

India

India's textile and apparel sector is one of the oldest industries in the country. The market size of India's textile and apparel industry amounted to approximately US\$108 billion in 2015 and is expected to reach US\$223 billion by 2021. Textile and apparel constitutes 14% of India's industrial production output and contributes about 5% to India's GDP, creating employment for about 105 million people, and making it the country's second largest employer after agriculture (India Brand Equity Foundation 2017). India's major apparel export markets are the USA, EU, and UAE. India is characterized by the coexistence of many big factories using power-looms, and a large number of small-scale, labor-intensive weaving, and knitting setups. With a large agricultural sector, India is one of the largest cotton and silk producers in the world (India Today 2015). By being able to tap its own raw materials, the country is less dependent on raw material supply from foreign countries and thus faces less constraints to the ongoing growth of its garment sector.

India's textile supply chain is complex and fragmented, ranging from material procurement to the shipping of finished products. Since India has many upstream suppliers for fabrics, accessories, trims, coloring substances, and replacement parts for machinery, the country does not depend so much on imports and can realize shorter lead times when it comes to apparel production. By being increasingly exposed to demanding clients from Europe and the USA, Indian factories gain experience in exports management, factory compliance, and sustainability topics.

India benefits from its geography as the country generally suffers fewer natural disasters than other manufacturing nations in Southeast Asia. Compared to China and many Southeast Asian countries, India—sitting on the Indian Ocean trade route—enjoys advantages in its trade with Europe, Africa, and the Central East in terms of less transportation days needed for shipping goods to major ports in these regions. In the fashion industry, the importance of speed to market continues to grow, and companies seek sources close to markets, with responsive supply and sustainable production. This opens the door wider for Indian textile and apparel production being closer to the EU and UAE markets.

Another reason why India is attractive for textile and apparel buyers is its large consumer market. India is the world's second largest population. Its large consumer base has great potential for steady economic growth in textile and apparel consumption. According to a 2015 UN study of global population trends, India is even expected to overtake China to become the world's most populous nation by 2022 (BBC 2015). Attracted by the potential of India's domestic market, apparel brands such as Tommy Hilfiger, Superdry, Hugo Boss, and Diesel have already started operations in India. These brands know that Indian middle-class consumers are more willing to buy good quality apparel products and develop great loyalty.

Bangladesh

When sourcing from Bangladesh, there are several challenges such as infrastructure, transportation system, working conditions, and safety, which buyers have to take into consideration. The Southeast Asian country Bangladesh has poor working condition but low wages, and excessive overtime (Safi 2016). In Bangladesh, workers in the textile and apparel sector only receive poor salaries (Textile Outlook International 2017). What is worse, they often cannot get their salary, bonus, and overtime bills in time. In many cases, workers in Bangladesh's textile and apparel industry receive the legal minimum wage, which does not provide enough money for them to sustain their families (Safi 2016).

Fire was a common hazard in Bangladeshi factories (Textile Outlook International 2017). For example, on April 24, 2013, an eight-story complex of clothing factories called Rana Plaza near the country's capital Dhaka collapsed with 1127 people being killed, mainly young women (Taplin 2014). This disaster immediately attracted huge media attention because it occurred due to the fact that many leading fast fashion brands miss out on imposing and enforcing binding safety rules and regulations on their Bangladeshi manufacturers. Moreover, Bangladeshi government had recently taken steps to improve workplace safety in response to a number of industrial accidents in the sector (Taplin 2014).

Despite industrial accidents, the economy of Bangladesh is prospering in the past few years. The main reason for this is the ready-made garment sector.

Vietnam

The Vietnamese textile and apparel industry grew quite fast over the last two decades (Le and Wang 2017). Many manufacturers have shifted their production facilities from China to Vietnam (BDG 2016). For example, the sportswear giant Nike sources 42% of its products from Vietnam but only 30% anymore from China (Harris 2015). Cheap labor, favorable demographic and geographic conditions, growing export rates, and free trade agreements attract a lot of manufacturers to produce in Vietnam (BDG 2016).

Costs are an important factor for buyers to select Vietnamese companies as their textile and apparel manufacturers (Textile Outlook International 2017). Vietnamese factory workers get on average only one-third of the wages of workers in China (Harris 2015). While the wages in China are rising due to constant innovation and specialization, wages in Vietnam remain relatively constant and cheap. Another beneficial factor for Vietnam is that its population consists to 65% of people who are younger than 40 years. Young people have a high motivation to learn and develop professional skills, and therefore create an advantage for manufacturing (BDG 2016).

Vietnam is engaged into several free trade agreements (FTA). Especially the involvement into the Association of Southeast Asian Nations (ASEAN) and the Trans Pacific Partnership (TPP) (now abolished by Donald Trump until April 2018) emphasizes the openness of Vietnam toward global trade and makes it a determined participant in the world's economy (BDG 2016). Whereas Vietnam benefits from its free trade agreement participation, it still experiences major negative effects because

of a lacking raw material supply in its own country. Vietnam does not farm cotton or produce other kinds of textile materials (no matter natural fiber and man-made fiber). This weakness leads to Vietnam's huge demand of imported raw materials from the USA, and significantly increases the country's dependence on external suppliers.

Vietnam's stable political environment attracts a lot of investors to shift their production facilities to the country (Lomas 2017). The Vietnamese government is continuing its efforts to create an attractive business environment and a comprehensive legal framework in order to increase the country's competitiveness to become the destination of textile and apparel manufacturing (Nguyen 2014).

In the year 2015, the export value of apparel in Vietnam increased by 10% while the export value in China declined by 6% (Lu 2016a). Vietnam's close geographic proximity to China makes it easier for manufacturers who want to move their production from China to Vietnam to integrate their existing supply chains into the new setup (Niggel 2015). Overall, Vietnam is seen as China's main rival in Asia for apparel and textile manufacturing in the long term (Jennings 2017).

Country-Specific Logistics Performance as Determinant of Supply Chain Efficiency

Logistics plays a key role in facilitating international and domestic trade, and is central to a country's competitiveness and economic growth. An indicator which reflects the logistics situation in each country is the Logistics Performance Index (LPI). The LPI measures a country's logistics performance throughout the entire logistics supply chain and indicates the ease of moving products into, inside, and out of a country (<https://lpi.worldbank.org/about>). Countries with high LPI scores provide a better environment for textile and apparel producers as these can make use of more sophisticated infrastructure and logistics services in that country. This is likely to decrease product lead time and increase efficiency in their supply chain. Textile and apparel manufacturers also take a country's logistics environment into consideration when it comes to choosing a factory location. Overall, logistics presents both opportunities and challenges for the Asian countries. If governments allocate enough financial resources to building and maintaining infrastructure, they can attract a larger number of manufacturers. On the contrary, if a country has many logistics shortfalls, it becomes more difficult to attract producers which rely on inbound and outbound logistics for their raw material supply and finished goods transport. Also, an underdeveloped logistics system is unlikely to attract a lot of Foreign Direct Investment (FDI). The LPI helps countries to detect the strengths and weaknesses of their logistics performance, and enables targeted government investments into logistics areas that need development. The LPI also helps countries to set the right priorities when a budget constraint exists.

Figure 4 compares the logistics performance of China, India, Vietnam and Bangladesh, the four countries which were introduced. It can be seen that for the latest numbers of 2016, China scores highest among these four countries in all the six dimensions customs, infrastructure, international shipments, logistics competence, tracking and tracing, and timeliness. This is an explanation why China has such a strong textile and apparel industry, and why China will remain the number one

textile and apparel producer for some time in the future. No other of the four countries has a higher LPI score than China (3.66 out of 5). India scores 3.42, Vietnam 2.98, and Bangladesh 2.66. The countries rank 27, 35, 64, and 87, respectively, in the global LPI ranking. Looking at the bigger picture, China's logistics performance is far better than the average in other Asian regions such as South Asia and East Asia & Pacific, as China scores much higher in the six LPI dimensions than the regions South Asia and East Asia & Pacific.

Figure 4 shows that China achieves an especially high score in infrastructure. This is due to the fact that in the past, the Chinese government focused on strategically building infrastructure. China still plans to invest aggressively across key infrastructure sectors in the future to support and stimulate further growth. China's continuous investment into infrastructure also benefited textile and apparel producers that operate in the country. For example, the share of logistics cost of total product price could be decreased, and the number of goods lost during transportation in the country was minimized. Overall, China's sound logistics performance served as foundation for the growth of the Chinese textile and apparel industry, and facilitates, accelerates, and cheapens the supply chain operations of Chinese suppliers. Hence, Chinese suppliers could gain and still possess a competitive advantage over their rivals in other Asian countries.



Fig. 4 Comparison of the 2016 logistics performance of China, India, Vietnam and Bangladesh. Source <https://lpi.worldbank.org/international/scorecard>

4 New Challenges and Opportunities for Asia's Fashion Supply Chain

Asia plays an important role in contributing to the global economy and satisfying the demand of consumers for textile and apparel products. Enhancing supply chain efficiency and at the same time accommodating the latest developments in politics and technology brings various new challenges for Asia's fashion supply chain, but also provides opportunities to be seized. In the following, three major developments are presented that will shape the fashion supply chain landscape in Asia in the future.

The Belt and Road Initiative

The Belt and Road Initiative (BRI), also named One Belt One Road (OBOR), is China's most ambitious economic and diplomatic program. It is a development strategy proposed by China's leader Xi Jinping in September/October 2013 that focuses on connectivity and cooperation between China and Eurasian countries. The BRI consists of the land-based Silk Road Economic Belt (SREB) and the oceangoing Maritime Silk Road (MSR). The 'Belt' is a series of six overland corridors connecting China with Europe, via Central Asia and the Middle East, including some countries situated on the ancient Silk Road. The initiative covers around 60 countries in Asia, Oceania, Northeast Africa, and Europe which make up 65% of the world's population, one-third of the world's GDP, and a quarter of all the goods and services the world moves. In 2017, projects with investments of \$900bn were planned or underway.

The initiative aims at realizing China's ambition to play a larger role in global affairs with a China-centered trading network as base. The 'Chinese Dream' can be seen as renewal of an older order of overland and maritime relations that has been interrupted by European colonialism. The BRI fosters the extension of the infrastructure-driven economic development that China went through in the past decades. Whereas China currently faces sluggish growth in exports and weak internal demand, the BRI is set to pave the way for the Chinese economy's next growth step. The BRI might have the potential to reshape global trade. Developing infrastructural ties with neighboring countries will reduce physical and regulatory barriers to trade. This creates new markets for Chinese goods and technology. Until now, the BRI has proved successful in connecting China with developing countries and helped many countries to enhance their national economy through collaboration. The BRI has also demonstrated the power of China.

BRI strategy influences the layout of China's textile and apparel industry. China eliminated clothing import duties for 33 developing countries and less-developed countries, opened the import market, and encourages outgoing investment and inclusive development. Moreover, BRI strategy improves multilateral trade. In the textile and apparel industry, China has imported more raw materials and finished clothing, whereas exported more spinning machines and manufacturing equipment to less-developed countries. The Asian Infrastructure Investment Bank (AIIB) will contribute to the construction of infrastructure, which facilitates and accelerates moving

products and materials between different supply chain members. Furthermore, the AIB will promote industrial development and create more opportunities in the global fashion supply chain. Overall, the Belt and Road Initiative strengthens the position of Chinese and Asian textile and apparel manufacturers in the global fashion supply chain network.

Sustainability Issues in Fashion Supply Chains

Sustainability is another topic that will dominate the future of fashion supply chains. Textile and apparel is one of the most polluting industries in the world, having a direct impact on the health of the world's ecosystems.

Cotton is the most commonly used natural fiber for making clothes and makes up approximately 33% of all fibers that are found in textiles. The problem is that cotton farming is very water-intensive. To produce one cotton shirt, 2700 L of water is required, which is enough for one person to drink for 2.5 years (National Geographic). Cotton production can be especially damaging in areas that already face water stress. Clothing production is also responsible for water use and pollution. Worldwide, 5 trillion liters of water is used every year solely for fabric dyeing, and 20% of industrial water pollution is caused by garment manufacturing.

Garment not only consumes and pollutes water, but also leaves a carbon footprint, which size depends on the material used. Synthetic fibers such as polyester impact water and land less than grown materials such as cotton, however, they emit more greenhouse gases per kilogram. A polyester shirt has more than double the carbon footprint of a cotton shirt (5.5 kg vs. 2.1 kg). In 2015, polyester production for textiles set about 706 billion kg of greenhouse gases free, which is equivalent to the annual emissions of 185 coal-fired power plants.

With the latest consumer behavior, water stress and carbon emissions become even more severe. Fast-changing fashion trends and low prices make people consume more than in the past. The average consumer is now buying 60% more clothing items compared to the year 2000, but each garment is only kept half as long. 'Fast fashion' shortens fashion cycles and gets a garment from the designer to the customer within weeks instead of months. The number of fashion seasons per year has increased from two—spring/summer and fall/winter—to as many as 50–100 microseasons.

Apparel spending is forecasted to grow tremendously over the next decades, spurred by Asia where hundreds of millions of people in China and India will enter the global middle class. By 2030, there will be 5.4 billion people in the global middle class, compared to 3 billion in 2015. Consequently, an increased demand for clothes that define middle-income lifestyle is expected. If consumption continues at its current rate in the future, the world would need three times as many natural resources by 2050 compared to what was used in 2000.

Whereas some apparel companies will ignore environmental concerns and keep on operating their traditional business models, others will become aware of the urgency of finding solutions for the world's resource problem and will tackle the issues in their supply chain. Every stage in the fashion supply chain, from raw material sourcing and textile production to apparel manufacturing and distribution, consumes a significant

amount of natural resources and owes for the release of emissions that do harm to the environment. This is why each and every part of a fashion supply chain offers potential for improving sustainability.

A first step for textile and apparel companies is to measure their environmental impacts throughout their entire supply chain and understand in which areas they can improve. One suitable tool is the ‘Sustainable Apparel Coalition’s Higg Index’ that allows companies to measure their environmental, social, and labor impacts. There are already some companies that work on improving their resource efficiency. H&M and Zara, both pioneers of fast fashion, joined 33 other fashion companies pledging to increase their clothing recycling by 2020 and collecting and recycling used clothes at many of their stores. Other fashion companies publish water and emissions quantities on the webpage of each of their products. One important step for fashion firms is to realize that it is not only beneficial for the environment to improve the environmental impact of the garment produced, but also to produce less items overall. On the one hand, fashion companies want to produce enough quantity to satisfy demand and achieve economies of scale in production, on the other hand, they know that less production also consumes less resources and thus is more environmentally friendly. Obviously, especially low-price fashion firms face a significant trade-off between the ability to serve price-sensitive consumers and at the same time protect the environment. These companies are at the same time the ones which have the largest impact on the environment through their vast production volumes. Overall, in order to stay within planetary boundaries, consumers are required to consciously make apparel purchases, and the industry is called to return to ‘slow fashion’ (Drew and Yehoume 2017).

In Asia, the emerging countries all face sustainability issues. There are different ways that Asian textile and apparel manufacturers can use resources in a way that is not harmful to future generations. Possible measures they can take to achieve more sustainable fashion supply chains are eliminating chemicals in products and production processes which are hazardous to humans and the environment, promoting the ethical treatment of animals, and creating eco-friendly products that use materials from sustainable sources. Ideally, Asian suppliers voluntarily develop sustainable supply chain procedures and invest in clean technology in production. However, this is often not the case. Quick money is what many suppliers are looking for, not trying to lessen the impact of their activities on the environment. If manufacturers do not change their behavior themselves, one possible solution can be the enforcement of certain supplier behaviors in the legal way. National governments can become more active in introducing new rules and regulations that textile and apparel producers have to comply with. Moreover, international buyers can encourage and require their suppliers to adhere to environmental laws and improve their practices. Overall, it would be an essential step if Asian textile and apparel manufacturers initiated sustainable measures in the short-term future and committed to the reduction of their environmental impact and to the protection of ecosystems and biodiversity.

Sustainability does not only include topics related to nature and the environment, but also includes social dimensions such as respect for people. Corporate Social Responsibility (CSR) initiatives try to take into account the economic and social

interests of different stakeholders. It is known that employees of some Asian garment suppliers are exposed to inhuman working conditions. This is particularly true in the emerging countries such as Bangladesh. The poor and unsafe working conditions lead to challenges of managing social responsibility (Burke 2013). Truly sustainable fashion supply chains take care of workers' health and safety, respect their human rights and provide equal opportunities. To achieve that, Asian textile and apparel suppliers can assess risks related to their worker's health and safety and take steps to minimize these risks by providing a safe place to work in their factories. Furthermore, manufacturers can reject child labor, forced labor, and discrimination. Buyers can continuously raise their suppliers' awareness of workplace health and safety requirements, require them to comply with certain health and safety principles, and undertake unannounced visits and inspections. Supplier audits are an effective tool for buyers to check factory conditions and monitor suppliers' execution of sustainability policies.

Fashion brands that have implemented sustainable supply chains can communicate their efforts to consumers and revamp their brand image. This will attract conscious consumers and enable brands to set a price premium for apparel products that were produced in a sustainable way. As a result, brands investing in sustainability can expect monetary gains in terms of an increased willingness to pay from consumers.

The Impact of E-commerce on Fashion Supply Chains

E-commerce is becoming more and more popular among consumers in the world, who especially value the unrestricted accessibility and great convenience provided. Consumers are also purchasing fashion products online. For example, Chinese consumers may purchase a Ralph Lauren shirt from a US Web site, but actually that shirt may be produced in China. Thus, as matter of fact, to be able to respond more quickly to market demand, importers can allocate the apparel production to countries that are closer to that market. Asia is a big market for fashion. It is crucial for importers to manage transportation and warehousing in Asia, and connect online retailers with global consumers via efficient supply chain systems.

5 Conclusion

Textile and apparel is an important economic sector in Asia. Many emerging countries rely on their textile and apparel industry which creates jobs and raises living standards. Thus, gaining a better understanding of Asian fashion supply chains is critically important. Fashion supply chain management aims at fulfilling buyers' requests and maximizing the total supply chain benefits. Fashion supply chain management is a complex activity involving many different members and stages that have to collaborate and be gone through before the final product reaches the consumer. The typical fashion supply chain includes raw material farmers/producers, fiber and textile producers, apparel manufacturers, transporters, warehouses, and retailers. Each

stage of the supply chain has individual functions and objectives. Information (e.g., demand and supply information), products (e.g., fashionable and basic items), and payment (e.g., pay in advance, pay when the products arrived, and pay after the products are sold) are the three key elements that shape the interaction of supply chain parties.

With increasing production costs, it becomes gradually harder for China to maintain its competitive advantage in the textile and apparel sector. Other Asian nations such as India, Vietnam and Bangladesh are on the rise and take over more and more of the manufacturing share. The capabilities of their fashion supply chains show that they have caught up a lot and are legitimate competitors of China. However, due to the fact that these countries still lag behind China in regard to overall competitiveness and apparel manufacturing efficiency, China will remain the world's leading textile and apparel sourcing country and top choice for many buyers in the foreseeable future.

The diversification of textile and apparel sourcing challenges China's dominance heavily, but also provides a mass of unprecedented opportunities for importers and new production locations (Barrie 2016; Zhen 2015). Multinational brands have to evaluate their unique sourcing needs and sensitivity to certain factors when taking apparel sourcing decisions. Cost of labor, value-added tax, customs clearance, lead time, ease of entry, intellectual property protection, reliability, and political stability are only some criteria that need to be considered when choosing an apparel sourcing location. Whereas in the past, many buyers ended up sourcing their textile and apparel products from Chinese suppliers, they now have many other attractive sourcing alternatives. For textile and apparel buyers, it is now important to realize that apparel sourcing is not limited to China but that the increased number of sourcing options can be investigated and utilized. A balanced and diversified sourcing portfolio is the key for buyers because it minimizes supply chain risk and maximizes profit.

Newly emerged challenges and opportunities which Asian fashion supply chains face are presented by the Belt and Road Initiative, the development of sustainable supply chains, and the increasing popularity of e-commerce in fashion. The Belt and Road Initiative connects Chinese manufacturers better with many parts of the world and stimulates demand for Chinese goods through trade facilitation. Sustainable supply chain operations do not only decrease the environmental footprint of apparel companies, but also help them attract new customers and enhance their brand image, which will pay off financially in the end. As an increasing number of consumers prefer to buy apparel products via online channels, supply chain activities around distribution including transportation and warehousing are required to become more flexible to not only connect to physical but also to online retailers.

References

- Barrie, L. (2016). *Southeast Asia—A strategic sourcing review*. Retrieved September 15, 2017, from https://www.just-style.com/news/southeast-asia-a-strategic-sourcing-review_id127176.aspx.
- Barth, T. 2016. *Alternatives to China: Markets on the move*. Retrieved 15 September 2017, from <http://www.eppi-online.com/2016/12/19/alternatives-to-china-markets-on-the-move/>.
- BBC. (2015). *India 'to overtake China's population by 2022'*—UN. Available at: <http://www.bbc.com/news/world-asia-33720723>.
- Berg, A., & Hedrich, S. (2014). *What's next in apparel sourcing?* McKinsey & Company. Retrieved from <http://www.mckinsey.com/industries/retail/our-insights/whats-next-in-apparel-sourcing>.
- BDG, V. (2016). *Vietnam's thriving manufacturing sector, strategic advantages and free trade*. Available at <http://bdg-vietnam.com/de/about/news/details/items/vietnams-thriving-manufacturing-sector-strategic-advantages/>.
- Burke, J. (2013). Bangladesh factory fires: Fashion industry's latest crisis. *The Guardian*, December 8, 2013. Available at: <https://www.theguardian.com/world/2013/dec/08/bangladesh-factory-fire-s-fashion-latest-crisis>.
- Chen, W., Lau, C. K. M., Boansi, D., & Bilgin, M. H. (2017). Effects of trade cost on the textile and apparel market: Evidence from Asian countries. *Journal of the Textile Institute*, 108(6), 971–986.
- Drew, D., & Yehounme, G. (2017). *The apparel industry's environmental impact in 6 graphics*. Available at: <http://www.wri.org/blog/2017/07/apparel-industrys-environmental-impact-6-graphics>.
- Frederick, S., & Gereffi, G. (2011). Upgrading and restructuring in the global apparel value chain: Why China and Asia are outperforming Mexico and Central America. *International Journal of Technological Learning, Innovation and Development*, 4(1–3).
- Gereffi, G. (1999). International trade and industrial upgrading in the apparel commodity chain. *Journal of International Economics*, 48(1), 37–70.
- Harris, D. (2015). *China vs. Vietnam for product sourcing*. Available at <http://www.chinalawblog.com/2015/03/china-vs-vietnam-for-product-sourcing.html>.
- HKTDC Research. (2016). *Make in India: An alternative production base with a huge local market*. January 20, 2016. Available at: <http://emerging-markets-research.hktdc.com/business-news/article/Asia/Make-in-India-An-Alternative-Production-Base-with-a-Huge-Local-Market/rp/en/1/1X4UWAQG/1X0A50ME.htm>.
- India Brand Equity Foundation. (2017). *Textile industry & market growth in India*. Available at <https://www.ibef.org/industry/textiles.aspx>.
- India Today. (2015). *India becomes world's largest producer of cotton*. October 3, 2015. Available at: <https://www.indiatoday.in/education-today/gk-current-affairs/story/largest-producer-of-cotton-266164-2015-10-03>.
- Jennings, R. (2017). *China challenges Vietnam with a revival of its world factory status*. Available at: <https://www.forbes.com/sites/ralphjennings/2017/03/01/china-is-challenging-vietnam-with-a-revival-of-its-world-factory-status/>.
- Lam, J. K. C., & Postle, R. (2006). Textile and apparel supply chain management in Hong Kong. *International Journal of Clothing Science and Technology*, 18(4), 265–277.
- Le, T., & Wang, C. (2017). The integrated approach for sustainable performance evaluation in value chain of Vietnam textile and apparel industry. *Sustainability*, 9(3), 477.
- Lu, S. (2016a). *WTO reports world textile and apparel trade in 2015*. Available at <https://shenglufashion.wordpress.com/2016/07/27/wto-reports-world-textile-and-apparel-trade-in-2015/>.
- Lu, S. (2016b). *How is China's garment industry dealing with rising labor costs?* Available at: <https://shenglufashion.wordpress.com/2016/08/05/how-is-chinas-garment-industry-dealing-with-rising-labor-costs/>.
- Lomas, M. L. (2017). *Which Asian country will replace China as the world's factory?* Available at <http://thediplomat.com/2017/02/which-asian-country-will-replace-china-as-the-worlds-factory/>.

- Nguyen, T. D. (2014). *Why foreign investment in Vietnam is booming*. Available at <https://www.wforum.org/agenda/2014/05/foreign-investment-booming-vietnam/>.
- Niggel, J. (2015). 5 alternatives to sourcing from China. *Global Source*. May 21, 2015. Available at: www.globalsources.com/NEWS/SIC-5-alternatives-to-sourcing-from-china.HTM.
- Safi, M. (2016). Bangladesh garment factories sack hundreds after pay protests. *The Guardian*. Available at: <https://www.theguardian.com/world/2016/dec/27/bangladesh-garment-factories-sack-hundreds-after-pay-protests>.
- Taplin, I. M. (2014). Who is to blame?: A re-examination of fast fashion after the 2013 factory disaster in Bangladesh. *Critical perspectives on international business*, 10(1/2), 72–83.
- Teng, S. G., & Jaramillo, H. (2005). A model for evaluation and selection of suppliers in global textile and apparel supply chains. *International Journal of Physical Distribution & Logistics Management*, 35(7), 503–523.
- Textile Outlook International. (2017). Business and market analysis for the global textile and apparel industries. *Textiles Intelligence*, 189.
- Young, R. (2016). *New era for Chinese fashion manufacturers*. <https://www.businessoffashion.com/community/voices/discussions/can-china-still-compete-as-the-worlds-fashion-factory/new-era-for-chinese-fashion-production-manufacturers>.
- Zhen, S. (2015). Manufacturers step up search for low cost alternative to China. *South China Morning Post*. Retrieved September 16, 2017, from <http://www.scmp.com/business/companies/article/1863709/manufacturers-step-search-low-cost-alternative-china>.