

THE IMPACT OF TECHNOLOGY INNOVATIONS ON THE ORGANIZATIONAL STRUCTURES OF FASHION COMPANIES

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1. Introduction

As reported by market segmentation, there are two types of fashion brands in the world: casual and luxury. First of all, those companies such as Zara, Topshop, Uniqlo, Miss Selfridges, etc. that share one mutual strategy – to offer a wide range of products, appeal to more customers with exceptional tastes. In contrast, those luxury brands have reputations of making high quality and lavish stuffs; these companies have been linked closely with celebs and luxury trends. There are giant corporations such as LVMH (owns Louis Vuitton, Dior, Kenzo, Fendi, etc.), Richemont, PPR Gucci Group (owns Yves Saint Laurent, Bottega Veneta, Balenciaga, Alexander McQueen, etc.) or Hermes, etc. The aim of this paper is not to investigate into the luxury segment but to investigate the casual side of the fashion industry, in order to achieve a comprehensive view of how tech innovations did affect to the corporate structures of those fashion firms. In the last two decades, the fashion retail which focused on fashion-forward designer and contemporary apparel has been blooming in an unprecedented way (Vesilind, 2006).

Based on the growth of fashion companies, fashion industry has had a long history of foreseeability. From the beginning, the fashion industry has had a dynamic nature. Over the last few decades, with the help of technology did enhance the pace of interaction between fashion companies and consumers. The world has changed ever since the appearance of technology. In the history of the fashion industry, it hasn't been affected considerably by any significant tech revolution. However, the global financial crisis in 2008 did have a significant impact on the industry (in a negative way). Kurian and Molitor (1999) stated that there are two abilities of human beings: cognitive and physical. Throughout the history of human being, robots can only replace human with physical tasks but nowadays, they can replace cognitive ones as well. In this 21st century, we have witnessed an unparalleled pace of technology, impacting every fields of every nations in the world (included fashion industry). Nowadays, technology revolutionized how the brand connects with customers; it also changed how their business operates. Technological tasks like data analytics or AI have been an indispensable and effective procedure. Overall, technology has been playing a big role in the fashion industry.

In this regard, the paper will indicate the connection between the development of corporations and the evolution of technology. The research will be examined based on related aspects. The second section will examine the effect of technology to fashion retailers. The third and fourth sections will discuss about organization structure of fashion retailers and investigate the impacts of three most advanced technologies at the moment to fashion retailers, respectively. The fifth section will predict what the future holds for the organizational form of fashion retailers. Some recommendations will be concluded for this research at the last part.

2. The impact of old technologies on fashion companies

Looking at the structure of fashion companies, it is easy to observe that before 1990s, the presence of big fashion brands was more persistent compared to what happened in the 21st century; and the connection between those were not too complex. Plenty of people had been nostalgic about that period of time, executives of these fashion companies got used

to the traditional way of applying. Before the blooming of Internet in 1990s, nobody could believe that someday, they could buy anything they want from 5th Avenue (New York City) to Oxford Street (London) without going there. It is believed that it is impossible to do everything you want with just a computer and your debit cards. Nonetheless, with the unprecedented advancement of technology, all fashion companies in the world have had to adapt with the situation and replace their old-school B2C (business to customer) transactions, applying more technology advances into their business and make life easier. Undoubtedly, technology evolution has not only made life easier for fashion companies but also made customers have more choices for their preferences. Furthermore, after Internet became trendy after 1990s, Taiwan witnessed a gradual strengthen in terms of economy in general and in fashion business in particular (Huang et al., 2016). After that period of time, consumers continued to look for other brands with more flexible purchase methods. Technology is not an exclusive product for a limited range of people; every person or every organization can take advantage of the use of technology. That advance made the competition in fashion industries become truly rigorous and technology has changed the face of fashion industry ever since. A research from Larraufie and Freuslon (2015) showed that customers are now paying less attention to brand relevance. They have started to evaluate more brands in order to find out the best products. Relentless tensions in the fashion industry forced brands to adjust themselves and restructuring the organizational structure was one of them. Any debate on the structure of fashion companies would be considered inadequate if we don't review those alters and impact on fashion brands.

The advancement of technology not only transformed the individual performance significantly but also boosted the link between individual to individual. Each company had their own way of applying technologies into their business, in order to maximize the efficiency of supply chains and service. The term 'technology' could be implied as internet, factories, materials or services. The type of technology that a company used would define the structure of that organization system. Employees in fashion companies had been considered as resources as well. Their competence combined with the development of technology will enhance organization performance.

Consequently, the revolution of technology not only decreased the workload for employees but also changed the way companies do the business transactions completely, followed by the unavoidable changes in organizational structure of fashion companies, and of course, it revolutionizes the fashion industry as stated above. In parallel with these actions, companies must renovate their management format as well as the connections between employees, that was the compulsory condition for a successful model of applying technology into business.

With the rise of e-commerce, there has been a lot of room to turn over a new leaf for small-sized and medium-sized companies, just by reviewing their strategy and improve the organizational structure. Nonetheless, giants in the fashion industry needed to take the changes in their organizational structure gradually, in order to avoid unnecessary errors. Petersen and Strongin (1992) discovered three main contexts of the effect of technology advance on the adaptation of organizations.

2.1 Progressive adaptation

Petersen and Strongin (1992) discovered the resemblance of institutional theory, corporate ecology and evolutionary theory that those three aspects all highlight the potent power of corporate inactivity and claim that the reaction of corporations to environmental alteration is merely incremental and decelerate.

Corporate ecology x Institutional theory

Appleby (1969) when defining the term *organization*, he didn't just give one but a variety of interpretations. In the area of management, *organization* could be described as the construction of relationships of individual to individual. Corporate structure's adaptation primarily is conducted at the population extent, and that structure is persistent in the corporation field. This dependable constancy contains a decent inertia. It is hard to provide a crucial change within the corporate structure effectively, even in the tempestuous outer environment. Moreover, continual standard in the corporate structure will oppose that change. On the book *Ecological Models of Organizations*, Carroll (1988) referred that the level of change in organization was ahead of ecological theories. In his research, he stated that *organizational ecology* is the new theoretical aspect that doesn't not follow the sense of adaptation model of corporate change (Amburgey and Rao, 1996). Ryder (1999) also strengthen this viewpoint by stating that reinforcing and fostering the current ideas and organizational arrangement instead of transforming into a brand-new model.

Evolutionary theory

Cripps (1991) stated that the primary ability of a company is its corporate procedure, which is produced by the cumulative expert knowledge and implied knowledge of the company. The change of outer environment merely affected the corporate structure. Searching for new practice outcome in the current corporate practice is the function of corporate change. Generally, this is the initial form of a company taken by new competitors in the business. Newbies usually benefit from tech changes. According to Seidenberg (1996), there are two kinds of innovation: supporting and disturbing. This difference doesn't emphasize the change of tech, but the modifications in the value scheme of companies, which is the modifications of how people normally value products.

2.2 Balance

According to Wiatrak (2013), the ability to be stable and inactivity was one of the mutual conditions of a corporation. After a comparatively long period of time of maintaining the inertia to develop, precipitous changes in structure systems could create chaos within the organization, plus the interferences from radical, revolutionary and calamitous technology. Technology evolution benefited organizations significantly, included changes in their strategies, constructions, power circulations or control schemes. Hence, which organizations could catch the opportunities and applying technology changes in order to turn over a new leaf, breaking the stable loops (cultural and structural paralysis), those companies would be successful in the future.

Collins (1996) claimed that one of most ordinary states of a company is constancy. During a long duration of stationary which is the time a company preserves the balance, as a result of unexpected appearance of interrupted tech and evolutionary paradigm, there are radical modifications in terms of structure during the time of turbulent environment. Those modifications contain not only changes in corporate structure but also changes in the division of power. Consequently, these radical periods furnish the rare chance for companies to separate the sustainability of culture and the control of structure. Pelc (1989) claimed that companies tend to present revolutionary modifications during a crisis (performance) or during the period of detrimental conditions, for example new tech that destructs capacities entirely. Due to the fact that progressive innovation identifies tech procedure is for a long duration, this duration is the time for a company to improve and strengthen corporate consistency. However, they could face a lot of challenges to forecast when disturbing tech will come out. Along with a more competitive environment, in order to become the best, they have to launch radical changes relentlessly. With that action, they can follow interrupted tech changes simultaneously, so as to accommodate themselves with fluctuated environmental conditions.

2.3 Strategic adaptation

For a couple of decades, *structure* had been considered as something irrelevant to *strategy*. But in fact, the relationship between *structure* and *strategy* is always bilateral. Elcock (1996) came up with an *Organizational Infrastructure Review* to illustrate the bilateral relationship between *structure* and *strategy*, this review investigated the change of corporate structure which resulted by strategic decision making. *Structure* is not just a diagram of a company, it is every element that form the company, including employees, technologies, operations, processes, culture, etc. Meanwhile, *strategy* is perceived as the design of corporation to handle an enterprise. Structure and strategy have a tight connection in order to accomplish organizational targets and goals. Elcock (1996) also stated that new tech innovation will only deliver the possibility of productivity. Organizations must discover the possible economic advantages of new tech; moreover, corporate innovation is the only way to perceive the advantages provided by tech innovation.

Finne (1991) claimed that the development and adaptation of a company is the not a random result made by the modification of the fluctuated outer environment, but the outcome of a complex learning process from the company. Finne (1991) believed that the most important factor for the success of corporate change is autonomy and induction. Induction refers to the ability of an organization to make informed decisions when facing new challenge or external drive forces. Worthley (1980) indicated that the more autonomy a company is, the more successful that company will be in the future. On the other hand, induction refers to the leadership of a company under the range of its current strategy by virtue of current corporate learning. Moreover, according to Wood (1995), the key of corporate management in fast-paced business with limited product cycle life is the to update latest innovations relentlessly.

3. The conventional types of organizational structure in fashion companies

3.1 Line structure

With many small fashion retailers, in the beginning stage, just some employees work collectively. Throughout the history of an organization, it has been inessential to have a complex organizational structure at that point but in reality, this structure still existed. As a rule, this type of organization shows that the power flows and the orders implement from the top to bottom. This organizational structure is also called as scalar organization which indicates a scalable chain of order is a part of this type of executive organization. Within the line-structure organizations, daily orders happen without any lacks in communication (Gibson, 2012), all employees acknowledge who is in command. In multi-structured organizations, the executives don't tend to identify disclosure from each individual. Because within this type of organization, everyone can perceive their functions and what they want to accomplish for themselves as well as the company (Mellinger, 2014).

Additionally, unlike companies from fabrication or machinery industry, working as companies inside the service industry, fashion retailers can primarily establish autonomous subsidiaries themselves. Nevertheless, in practice, there are not too many companies using this kind of structure (independent) due to the dependence on supply chains. More importantly, the reason is the pressure of profitability, companies tend to trade-off with irrational from consumers (Pugh et al., 1968).

3.2 Matrix structure

Matrix administration was established in the early 1960s and was first technically applied in the aerospace industries in America (Kuprenas, 2003). A matrix structure was described as an intersection between a practical ranking and a project ranking (Turner and Müller, 2003). On other hand, Larson and Gobeli (1987) claimed it as a blended administrative form in which a regular ranking is overlapped by another forms of power or connection.

For the purpose of having a better service, fashion retailers took one member from each department, create a task and let them do it together. The structure of the task is in accordance with the demand of organizations. Despite the fact that employees in the company were trained before, they were still struggled and spent a lot of time with some particular customers in selling merchandises. Matrix structure is the solution when a company needs to deal with complicated customer needs or technical problems, as well as when it requires the equality between service and portfolio. Likewise, this structure could comfort the tensions between groups within the organization. Lorenz and Hennrich (2007) did illustrate Nike's regional matrix structure (figure 1 below). Each staff will be allocated into a practical department like Marketing, Sales, Human Resources, Operations or Finance. Heads of departments will be responsible for their staffs in terms of managing. Later, products will be made by Operation department then the Marketing department will create marketing campaigns for Nike's products. Each customer segment will have specific managers for their preferences: apparel, equipment or footwear.

However, there are some drawbacks of this type of structure. First of all, matrix structure is only suitable for a few fashion companies, due to the fact that this type depends mostly on the ability of the leader. Therefore, the leader will have a lot of skills to learn and have good decision-making and judgement at the same time. If the leader failed and the executive doesn't realize that, it will cause ineffectual decisions. Secondly, conflict is the biggest infirmity of this structure. A clear owner-subordinate relationship is not existed, hence multi-functional staffs have to follow the instructions from their line managers, which could cause conflict with the instruction of multi-functional team managers.

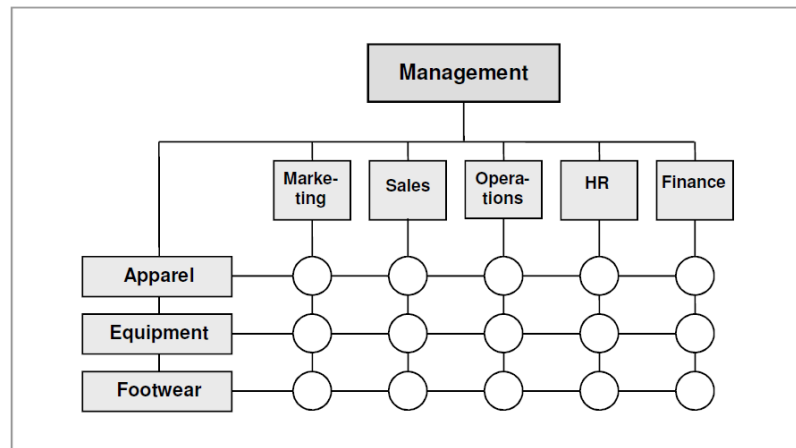


Figure 1. Regional matrix structure of Nike Inc. (Lorenz and Hennrich, 2007)

3.3 Functional structure

With larger and more complex structures, big fashion companies couldn't apply the line structure, they go for the functional structure instead. Functional structure is the most popular structures of corporate design. A company that is split into smaller groups by territories of feature such as: Marketing, information technology, finance, etc. is a functional-structured company (Fodor and Fodor, 1980) in order to group people with similar expertise together. Some researchers mentioned these practical areas as *silos* - objects that are vertical and incoherent from each other. In accordance with, top management board in the organizations usually includes many practical heads such as COOs or CFOs. In general, communication takes place within each practical department and will be forwarded across other departments through heads. In the fashion industry, this type of structure works better than line structure. It undoubtedly creates more efficiency performance as staffs with mutual abilities and knowledge are put in same group. Hence, each group of connoisseurs could work independently between functional departments. This organizational structure can help improving specialization.

As suggested by Clark (1973), one of the drawbacks of functional structure is that practical departments might not communicate well inside the company, which could lead to a decrease in resilience and invention. Additionally, this structure could occult the company to see a bigger picture as each department tend to understand the company only

from its own function. The newest tendency to fix this weakness is to create modern departments with ability to blend conventional departmental lines and the advancement of cross-functional connection. The functional structure has been presented in multiplicity of fashion retailers in the industry. The positive impact of this structure could be easily seen within big companies, small and medium-sized ones would be restricted by the communicative and innovative structure.

4. Next Big Things change the modern fashion companies' structure

One of the biggest threats for fashion companies nowadays is that generation Z (Millennials) is taking over the world, they become the most profitable customers of all segmentation. Generation Z force is rising each day goes by and very soon it is going to be the largest demographic in the workforce, that means the fashion industry need a new method to fit them. Not only they are ready spend more money for their favorite brands' products, they are also very different in their shopping routines. Unlike 20 years ago, nowadays, smartphones have become a default object that almost everyone in the world have one (at least), followed by other technology devices like tablets, smart TV, true-wireless earbuds. The speed of Internet is increasing with an excessive speed, in 2019 we've already had 5G – which could download a two-hour movie in ~ 3.6 seconds. That leads to an unprecedented development of e-commerce as internet and tech really changed our shopping routines, make our lives easier and more convenience. The rise of companies using shopping online has been significant, example in Vietnam, with the popularity of Facebook, shopping through Facebook pages has become unparalleled recently. In the past, in order to sell goods, fashion companies need good locations, beautiful stores, etc. to attract customers which could cost them a lot of investments: money, time, human resources, etc. But technology changed everything, shopping in-store declines.

Nowadays, talking about shopping, you just need a phone or a computer with internet connection, go to a website, after some simple clicks and then your order is on its way to your house. Technology improved the efficiency of fashion services considerably. Additionally, data collected from customers could be re-used, company analyzation, segment the customers, figure out the newest trends to apply more suitable ads, to create more trendy stuffs for customers, etc. Thanks to technology revolution, small and medium-sized companies can save some renting budget and invest more on shopping online. These examples proved that by applying technology into business, everything becomes easier for every company. According to a report by The McKinsey Global Institute, Manyika et al. (2013) listed 10 next big things that could heavily impact human-being lives in the future. They include mobile internet, automation of knowledge work, advanced robotics, etc., to name a few. Not only do those technologies minimize the tasks of human-being but they also transformed the way companies work. Those new techs will not only improve the efficiency and effectiveness of human being, but they will also revolutionize how companies operate. Simultaneously, Gibbs (2017) forecasted that the final spot of tech innovation could arrive from social communication completely. The intensity of companies in fashion industry has been really high since then, but with the technology era, it has changed to the next level of competition. One of the most important moments in the history of fashion industry came after the global financial crisis in 2008, which has been believed by a lot of experts to be the worst crisis since the Great Depression in 1930s.

During and after the 2008 crisis, there were dozens of obstacles for fashion retailers and the reasons for those difficulties were:

- In overall, the 2009 financial crisis damaged every single aspects of world economic across all industry, but it affected the apparel retail industry in a severe way (Staritz, 2010). The obvious consequence of the 2008 crisis was the subprime loan and the explode of housing bubble (Friedman, 2011). America was significantly affected by this crisis, unemployment rate increased and reach the highest point of 10.1% in October 2009 (Driscoll, 2011). Those things stroke directly to fashion industry by the downfall of international trade and customer spending. As companies saw reduced sales, suppliers were adversely affected because of low demand. Apparel retailers in America encountered decreased revenue, slow stock overturn and tight cash flows (Staritz, 2010).
- Additionally, the 2008 crisis made a significant change in customer behaviors and purchase will. They became more reserved and companies must adjust their strategy for the purpose of the *new* customers who want lower price but still have good values. During the recession, consumers recognized that they want good products without cutting off their shopping lists, hence it is essential for companies to be the most valuable in customer perceptions.
- Last but not least, price cut forced retailers to optimize their chains, included cutting supply chains, cutting employees, etc. The question was *Is there any optimal choice for this situation*. Yes, absolutely and that solution named *technology*. Fashion retailers needed technology to cut *hand-made* tasks, to save money on physical stores, etc. Technology did provide for fashion retailers and for other companies a platform (an opportunity) to create new business models as well as to innovate better service in the future. The fact is at that point, many retailers could foresee the huge impact of technology in the purpose of surviving and thriving during the 2008 financial crisis.

Now, let's investigate further the three *big things* that has changed the fashion retailers significantly for last decade; they are: The Internet of Things, cloud technology and 3D printing.

4.1 The Internet of Things (in co-operation with robots)

The Industrial Internet of Things (IIoT) aka Industry 4.0 is the name granted to the use of IoT technology in business industry (McClelland, 2019). The idea is the same as for consumers of IoT - to use a combination of sensors, wireless networks, big data and analytics to evaluate and optimize industrial procedure. The penetration of IoT urged fashion retailers to level up their organizational structure, improve every departments, create new business and ultimately – cutting cost. Porter (2001) discovered that Internet tried to transform company structures in order to decrease overall profitability, it could enhance business practice or take advantage against other competitors. Widespread e-commerce could help organizations to lower variable costs considerably, from that letting organizations to involve in price competition (Porter, 2001). During and after the 2008 recession, technology has played a vital role in lives. Digital networks link with almost every technology device, from smartphones to TV with multiplex access. Those innovations have brought the fashion business to the next level of capability, redefine customer experience and enhance customer

value proposal. Fashion retailers that applied the right technologies would create a big advantage of bettering products and enhance customer experiences (Chitrakorn, 2018).

Artificial Intelligence (AI) has been developing with an unprecedented speed in fashion industry recently. With the ability of gathering all data, analyzing them and turning them into valuable future data, AI can not only speed up the chains but also reduce the cost as well as enhance corporate flexibility (Engdahl, 2008). Furthermore, AI can assist companies in terms of forecasting or retailing planning. At present, thanks to the development of Artificial Intelligence (Chitrakorn, 2018), customers can expect better products as well as more superior services. Asos, a giant fashion retailer in the UK, is a typical example of applying appropriated tech into business; as they have used AI to re-modify their searching algorithm in order to make customers' shopping better. Right now, customers only need to download the Asos app (available from Google Play and Appstore), run the app, touch the camera icon and choose a photo of their favorite piece in phone's gallery, the app will automatically filter out all similar (design) product instantly (Boyd, 2017). Lots of hypothesis about the penetration of AI have been suggested by economists, they stated that AI could lead to higher unemployment rate, but the truth was unexpectedly reverse. In the book: *The impact of artificial intelligence on work*, The Royal Society (2018) reported that the genuine percentage of work potentially replaced by automation (included robots and AI) will be decreased through time, varying from ~ 0% to 30% (depends on each nation), for example 9% and 24% in India and Germany respectively. And according to the report *UK Economic Outlook* of PwC, over the last two decades in the UK, 20% of current jobs which replaced by AI has been likely to be pretty much the same as the sum of new jobs that has been created (Hawksworth et al., 2018). It is believed that by enhancing the efficiency and real earnings, better products will be created as a result. At the moment, the most automatic activities contain tasks in highly structured and foreseen environments. Previous researches of (Manyika et al., 2017) and Hawksworth et al. (2018) indicated that those tasks could comprise: transportation, gathering and converting data, accounting, etc.

In fashion industry, machine learning is an advanced feature of Artificial Intelligence which allow computers to conduct tasks as smart as human. That includes a complex process of getting used to data, learning the patterns of data, rather than just *copy and paste* like traditional algorithms. Recently, the abilities of machine learning have been thriving remarkably, followed by bigger data, advanced algorithms, etc. The world has witnessed a powerful penetration of AI to everything in our daily lives. Every virtual assistant in our phones and home applicants (even in the headphones) have been running by AI: Google Assistant (Google), Siri (Apple), Bixby (Samsung), Alexa (Amazon), etc., to name a few. With their advanced algorithms, AI machine learning analyzes and learns everything from users: face, fingerprint, voice, etc. and obviously, fashion retailers didn't want to miss the opportunity to take advantage of those benefits. They use advanced algorithms to track everything from customers, from viewing emails, clicking into the ad links, reviewing products, adding to basket, etc. and then give them recommendations to find the right products. Example, after you view a tee shirt, the website will display some recommended products in the next page, it suggests some jeans or accessories that match with the tee you looked at the previous page. That's the subsequent level of customer experience. Additionally, they create real-time interactions with online customers via chatbots in their websites to solve some

popular questions. Moreover, machine learning can analyze behaviors of customers in order to help fashion retailers predict the future trend. Another part that has been impacted significantly by AI or machine learning is warehouse department, they have seen a remarkable change in their KPIs: from productivity, order precision or stock accuracy, etc. (Guleria, 2018). The combination of AI and robots is perfect as it brings the best of each side to the business. For example, in 2018, an Uniqlo store replaced 90% of staffs in their new automated warehouse with AI robots which can deliver products, read electronic tags, confirm inventory numbers, etc. with a significantly faster speed. Only a limited number of staffs was needed to accomplish other tasks (Bain, 2018). Apart from these amazing benefits, AI still has its own weaknesses, one of them is its bias. Generally, AI is still a machine and machines depend on human (till now). Biased AI systems are currently becoming more popular as AI leaves the laboratories and flows into the real life (Marr, 2019). Experts have still debated about this topic but overall, the AI has been a trend and it shows no signs of slowing down in the future.

4.2 Cloud technology

Cloud computing is a model where a huge amount of systems is linked in private or public networks, to deliver actively hierarchical base for application, file and data storage (Torry Harris, 2009). Thanks to the arrival of this technology, the cost of hosting, data storage and delivery is diminished considerably. However, thing doesn't go well for cloud technology as Artificial Intelligence. Despite the fact that cloud computing has been ubiquitous across many other industries but in the fashion industry, it still faces a lot of challenges (Ali and Haseebuddin, 2015). Fashion industry didn't acquire the cloud technology fast enough, this technology can offer remarkable benefits such as lower costs, expandability, time saving or flexibility. In contrast, a survey was carried out by Microsoft for approximately 3,000 IT decision-makers and influencers in 13 countries; nearly 50% of participants from fashion retail industry confirmed that their organizations have already applied cloud technology, 33% was the percentage for those which are ready to use that tech soon (Microsoft, 2012).

On the other hand, cloud tech could indicate legal problems which can delay a mass approval. Dempski et al., (2013) reported that the competition between giant retailers and customer request will activate fast adoption ration in the fashion industry. They also predicted that the adoption rate of cloud tech in the industry will witness a massive rise from \$4.2 to \$15.1 billion from 2011 to 2015. Ali and Haseebuddin (2015) claimed that cloud tech could help collect and analyze data as well as real-time stock administration effectively. In retail sector, huge volumes of data are produced with the help of Point of Sale (POS) systems. Cloud tech companies supply storage service and gather data from their servers, which linked from the supply chain to independent cash points at small stores, and then store it in the cloud for retailers. The data is easily accessible from at any time or anywhere retailers want. There are three flows within supply chains: material, financial and information flow. These three flows are backed by three columns: processes – the capacity of logistics, new product advancement and knowledge administration; enabling techs – operation and information techs

for supply chain; organizational structures – the relationships between firms and internal/external companies plus administration approaches, performance quantification and award systems (Damodaram and Ravindranath, 2010).

Last but not least, by applying the use of cloud tech, retailers can collect data from customers to understand and enhance relationship with them. A cloud-computing machine is able to compare performance of products through periods of time. Cloud tech can identify the trend of each product based on customer preference and adjust the performance accordingly. After that, the analytical reports will be handed to retailers for further application. A good cloud tech company must help the retailers to determine the trend pattern, give predictions within huge databases in order to scale them dynamically.

4.3 Three-dimensional printing

The first 3D printer was released in 1986 by 3D Systems company. 3D technology allows manufactures to create three-dimensional substantial products. Commonly when creating an object, they start with removing segments from a material until the end of product design but with 3D printing, layers will be stacked because the printer releases the fabric from a container to build a 3D object (Wren, 2017).

The benefit of 3D tech is to help companies to minimize time in the manufacture process by skipping the delay between prototypes and final products, by not only reducing cost/time for design but also enhancing communication as well as decision making (Michalik et al., 2015). Additionally, 3D tech also helps saving raw material costs and cut manual post-processing steps of conventional fabrication (Carbon, 2017). In 2017, Germany sportswear giant – adidas, did release the first 3D sneakers ever, a collaboration with Carbon – a digital manufacturing company from Silicon Valley. Carbon is known for its break-through innovation named Digital Light Synthesis (DLS), which has been introduced for the first time at TED2015 in Vancouver. This innovation uses digital light, oxygen and liquid resins to produce objects (adidas Group blog, 2017) and like Joseph DeSimone – a chemist, a material scientist and CEO of Carbon claimed, DLS is 25 to 100 times faster than traditional 3D process. Thanks to the collaboration with Carbon (especially DLS technology), adidas was able to introduce the first pair of 3D-printed sneakers in the world and since then they have mass-produced 3D-printed sneakers globally. Last but not least, 3D tech diminishes impediments to concept testing. Designers will be able to test more prototypes in the same period of time throughout the R&D stage (Michalik et al., 2015). Lastly, in the production stage, 3D tech enables companies to overcome all existed obstacle with tradition manufacture methods. With 3D tech, the product is not restrained by any physical limitations of conventional fabrication (Michalik et al., 2015). In fact, designers can make any 3D model based on their preferences instead of sticking with restrained molds or tools (Weller et al., 2015).

In addition, 3D tech plays a vital role on manufacturing and supply chain administration as well. It processes customization as a new trend without investing in set-up or machine transitions, followed by the reduction of marginal cost of replication to zero. Consequently, stock problem is resolved due to the fact that companies now can create

products at any time they want (Weller et al., 2015). In 2016, adidas released the first FUTURECRAFT shoe which made at industry changing SPEEDFACTORY (adidas News, 2016). As the name indicates, SPEEDFACTORY focuses on speed of the production process. adidas will put in each big city a SPEEDFACTORY to collect real-world and lab data from runners. Next, the data will design upper digitally. The SPEEDFACTORY is more sustainable and effective than traditional factory. With this facility, adidas can cut the transporting product cost and cut production time. That means adidas can produce more sneakers faster, even if it's new silo or restock (Ismael, 2018). SPEEDFACTORY also put personalization to the next level as it could create a cutting-edge pair of shoes made for individual needs; that means there will be no more specific size for everyone, your shoe size is now labelled as ***your size***, an unique size unlike any traditional manufactures.

Nevertheless, 3D printing has its own limitations. The marginal costs of production are still considerably higher than traditional technology. This is because of the material costs and energy consumption by 3D machines (Weller et al., 2015). Experts also question about the product quality and commitment of designers to 3D tech with the lack of material. Not every company can afford the high cost of mass-production for 3D printing products at the moment, but it is believed that the cost will lower through time when more 3D tech suppliers join the fashion market.

5. The organizational structure of fashion companies in the future

In the research of future corporate structure, Probst and Büchel (1997) gave some predictions for the next one or two decades – in big corporations, the size of management level will be cut by half and the number of managers will be cut up to 70%. Within companies, tasks are going to be completed by expert groups through multi-department. And self-discipline of staffs is going to play a vital role on corporate control and cooperation, all thanks to information technology. Experts will manage themselves with the providence of huge volume of information from co-workers and consumers. Companies, particularly ones, they have one option – to convert into information technology. For the corporate structure of companies, the quantity of managers could be diminished significantly. Conversely, the main function of management is to assist distracted signals transferred in conventional pre-information companies.

However, instead of providing information, companies use their huge volume of data to control them. Accordingly, converting data into information requires expert knowledge. Companies which are based on information commonly require more experts than those with controlling type. Furthermore, experts will be put in the business division. Thanks to the unprecedented growth of tech recently, every aspects of human being have been significantly improved and fashion industry is not an exception.

5.1 Horizontal structure

Looking at figure 2 to see how the horizontal structure classify employees around center processes. Organization usually switched to a horizontal structure during a process named 'reengineering' (the reorganization from a vertical organization to horizontal one) (Hammer and Stanton, 1999). In a horizontal-structured company, everyone who work on a specific can access easily to one another, hence they can communicate and co-operate their tasks. This type of

structure gets rid of both vertical hierarchy and outdated organizational limitations. Technology 4.0 era emphasizes computers and network-based co-ordination. Consumers demand faster and better products and employees need freedom to optimize their knowledge, skills, intelligence and take a greater responsibility. Therefore, horizontal could be a model that fashion retailers should consider at the moment.

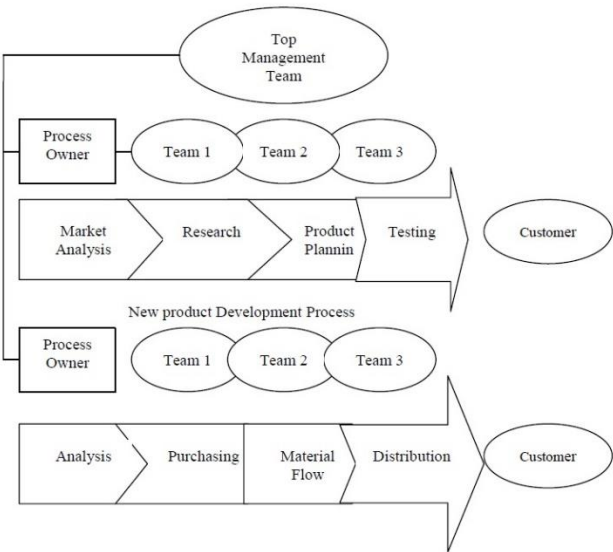


Figure 2. Processes in horizontal structure company (Ostroff, 1999)

Advantages and disadvantages of horizontal structure are condensed in the table below:

Pros	Cons
- Advances an attention to teamwork and cp-operation - Advances flexibility and quick response to changes in customer demands - Betters quality of life for employees by giving them opportunities to make decisions and be responsible for their results - Employee has a wider view of organizational targets	- Can reduce in-depth skill development - Conventional managers may be reluctant to give up power and authority - Demands changes in culture, administration philosophy, award and information systems - Demands unprecedented training efforts to make employees work efficiently in a horizontal team environment

• Let everyone focus on the production and deliver superior value to customers	• Identifying center processes is complex and time-consuming
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Figure 3. Advantages and disadvantages of horizontal structure

5.2 Virtual structure

A virtual form has been established with the purpose of dealing concurrently with higher levels of interdepartmental specialization and a bigger demand for fast adaptation that pursue from more volatility and disturbance within organizations. A virtual organization is a transient network of autonomous organizations – providers, consumers or even opponents – connected mainly to share skills through information technology (Druckman, 1997). An active company is one that determine a set of business capacities to highly productive operations, and then develop a virtual organization based on these capacities, letting the active company to create its business around the center, highly productive information and products (Zakrzewska, 2008).

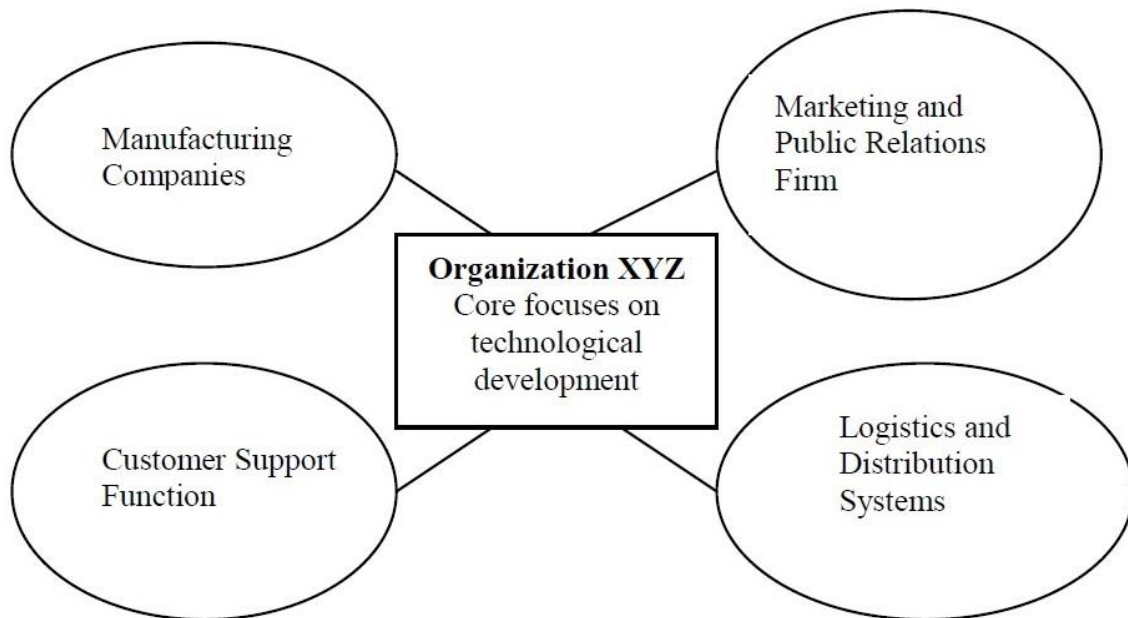


Figure 4. The virtual network structure (Daft, 2010)

Advantages and disadvantages of virtual structure are condensed in the table below:

Pros	Cons
• Allows small companies to obtain talent and resources worldwide • Provides the organization instant scale and reach without investing lots of money for factories, equipment or distribution facilities • Make companies flexible and responsive to changing demands • Lower management costs	• Managers do not have practical control over many actions and staffs • Demands much time to handle relationships and possible conflicts with contract companions • Risk of organizational failure if a companion flops to deliver or quit the business • Questions about the loyalty of employee as employee could feel they can be substituted by contract services

Figure 5. Advantages and disadvantages of virtual structure

5.3 Flat structure

Flat-structured companies comparatively have some or just one layer of administration. Within those companies, the *chain of order* from top to bottom is quicker and the number of employees that each manager control is bigger. Generally, they used the conventional organizations structure in big fashion companies, but in long-term period, it shows a lot of drawbacks. As a result of many levels of administration from executive to staffs, this type of structure takes lots of time for the decision-making process, leaving staffs to answer the delay to consumers which could diminish productivity. As a result of many levels of administration from executive to staffs, this type of structure takes lots of time for the decision-making process, leaving staffs to answer the delay to consumers which could diminish productivity. In contrast, flat-structured companies have less middle administration, which enables the company work with more comfort and less resistance. The enhancement of efficiency can lower the budget by getting rid of middle employees and reduce communication obstacles (Borkar, 2010). Organizations can divide tasks to other members by assigning lower-level employees more power or giving more responsibility to upper managers.

In addition, there are plenty of ineffective activities can be wiped out by removing some middle-level managers (Strinfellow, 2010). In flat-structured organizations, vertical limits are eliminated to flatten the hierarchy and horizontal limits are taken off in order to substitute functional departments with cross-functional groups and to set up activities around processes. When fully functional, boundary-less companies get rid the barrier of geographic gap from external division. The transition from vertical structure into flat structure offers several challenges to executives and business owners, however it can be solved by appropriate preparation and instruction (Pal, 2014).

However, in practice, there are some challenges for companies which apply the flat structure: (1) **Motivation** - Employees in flat-structured companies have less managers to motivate them and give them feedbacks. The challenge within flat-structured companies is to foster self-motivation and breaking individual performance records. (2) **Coherence** - Companies with less supervision emphasize can miss some operative policies, letting different employees deal with different situations in dissimilar ways. Or some employees may sell low-quality products, but others will get rid of those products, causing the disparity in quality control and production costs. (3) **Promotion** - In flat-structured companies, there are fewer managers to supervise the personal performance of employees. That could lead to the departure of well-performed staffs due to the lack of personal appreciation.

6. Recommendation

A multi-dimensional method to build organizational structures indicates the existence of certain characteristic that describe a structure as a whole as well as its specific dimensions, includes specialization, structure, concentration and formalization. The suitable choice of these characteristics decides the nature of the company, represents the foundation for collaborations and establish the efficiency of the company's operations. Despite that, there aren't any comprehensive solutions for structuring organizational structures as a result of the complex relations between individual dimensions within the company and from the unpredictable environments (both internal and external). The best choice for each company depends on many elements such as targets, plans, technology, environment, culture, etc. Over the last few decades, with the help of technology did enhance the pace of interaction between fashion companies and consumers. The world has changed ever since the appearance of technology. The impact of technology innovations to corporate structures in fashion industry is indisputable. Technology changes through time and fashion companies need to ready for constant changes in their organizational structures in the future.

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