

# An Exploratory Study on Types and Levels of Technological Innovation in Fashion Companies

Jin-ah Son<sup>†</sup>

*Assistant Professor, Dept. of Fashion design, Soongeui Women's College, Seoul, South Korea*

**Abstract** The purpose of this study is to explore the types and levels of technological innovation in fashion companies at different growth stages. For this purpose, this study used qualitative research methods. Qualitative research was conducted through in-depth interviews with 20 experts working for fashion companies, taking into account the supply chain within the fashion industry. The results of this study are as follows: First, the technological innovation types for fashion companies are divided into exploitative innovation and exploratory innovation. Second, the levels of technological innovation are found to differ according to the category of fashion companies. Generally, the fashion companies show higher levels of exploitative innovation than exploratory innovation. Third, the types and levels of technological innovation differ according to the growth stages for fashion companies. It is found that the companies in the high growth stage concentrate more on exploratory technological innovation, such as the development of new products and product diversification.

**Keywords** Technological innovation, Exploitative technological innovation, Exploratory technological innovation, Fashion company, Growth stage

**Citation** Son, J. (2020). An exploratory study on types and levels of technological innovation in fashion companies. *International Journal of Costume and Fashion*, 20(1), 74-87.

## Introduction

The continuous development of technology and rapid changes in consumer needs are accelerating and shortening product lifecycles. Additionally, fast-paced globalization and informatization are intensifying various types of competition. In this fierce business environment, innovation has always been emphasized as a way to revitalize businesses and the economy (Damanpour, 2014; Koo, 2019). Innovation destroys the existing order of markets and companies, creates new ways for competition, forms barriers to entry, and becomes a source of competitive advantage (McCarthy & Schoenecker, 1999; Porter, 1985; Schumpeter, 1942). Therefore, the innovativeness of a company is regarded as a key success factor in this era, regardless of the size of the industry or the company (Yoh, 2012). Among such innovations, the concept of technological innovation is

gradually expanding from only innovating products and production processes to broader innovation of the product, process, marketing, and organization (OECD, 2005). In addition, this is playing a key role in enhancing the productivity and competitiveness of a company (Chang & Kim, 2009).

However, researchers emphasize that innovation must be supported in a timely and proper manner, according to the company's decision-making process. The growth stage of a company plays a very important role in the relationship between innovation and performance. For example, innovation is very high at the time of a company's launch, but this level of innovation tends to decrease over time (Kimberly, 1979; Koberg, Uhlenbruck, & Sarason, 1996; Quinn & Cameron, 1983). In addition, the influence of other

Received May 18, 2020; Revised June 17, 2020; Accepted June 22, 2020

<sup>†</sup> Corresponding Author: sonjinah@sewc.ac.kr

factors affecting performance of innovation also depends on the company's growth stage. Therefore, it is necessary to develop and apply new innovations according to the company's growth stage in order to respond appropriately to changing environments, and not simply to change the way of innovation that has already been developed by other companies. In this regard, it is very important to discover the types and levels of technological innovation that have an impact on company performance according to growth stage.

The fashion industry itself is an industry that constantly pursues innovation, and it is an industry oriented around SMEs (small and medium-sized enterprises), presenting relatively low barriers to entry. Fashion companies can only survive and grow if they commercialize new ideas ahead of others and dominate the market. In particular, the wave of the 4th Industrial Revolution has also affected the fashion industry, converging on a variety of high-tech web technologies and applications, including e-commerce, RFID (radio frequency identification), web PDM (product development management), PLM (product life management), and 3D-simulation programs, in stark contrast to the existing labor-intensive sewing industry. However, the concept of innovation in the fashion field has been mainly focused on consumer innovation and usage innovation, due to its industrial characteristics, while issues of accessibility of data have made research on technological innovation in fashion companies insufficient.

Therefore, this study examines the types and levels of technological innovation for fashion companies, along with how these types and levels of technological innovation differ in each growth stage. This study helps in selecting and concentrating a company's limited resources by presenting guidelines on the acceptance of technological innovation, which is an important decision in prioritizing the cost, time, and effort put into business management.

## Background

### Technological Innovation

Innovation is variously defined and applied by scholars in a wide range of disciplines. Schumpeter (1942), the founder of

the concept of innovation, defines innovation as changing or shifting the balances that operate within a particular technological framework. The result of this brings new products for customers, new ways of manufacturing or transporting goods, new markets, new forms of industrial organizations, etc. Souitaris (2001) indicates that R&D efforts for technological innovation are ultimately an important source of innovation and one of the most important activities related to innovation. Gopalakrishnan & Damanpour (1997) also imply that the most basic form of innovation is technological innovation, which is becoming even more important in the 21st century, with the transition to a knowledge-based economy. Schumpeter (1942) defined technological innovation as producing and selling new products through a combination of production methods, such as processes, markets, raw materials, and organizations. Marquis (1969) also narrowly defined technological innovation as being limited to products and processes integrated with new technologies, manufacturing new products, and new-market development. From the OECD's (2005) Oslo manual, Technological Innovation Evaluation Manual, technological innovation has been broadly defined as concepts that include product innovation, process innovation, marketing innovation, and organizational innovation. Moon (2020) also introduced technological innovation in referring to product and process innovation, and as a major factor in improving a company's competitiveness and performance. Therefore, the technological innovation in this study is based on the OECD (2005) Technological Innovation Evaluation Manual and encompasses all features of product innovation, process innovation, marketing innovation, and organizational innovation, extending from definitions limited to innovation in products and processes alone.

Many studies on innovation in the field of business administration have been conducted with research on definitions and measurement methods for technological innovation, determinants and influence factors of technological innovation, and the relationship between technological innovation and performance. However, many of these studies have been limited to consumer acceptance of innovative products or technologies, despite the importance of innovation in the fashion industry. In addition, research on

innovation in fashion companies has not been actively conducted, due to issues with accessibility in data collection. For these reasons, research on the acceptance of technological innovation in fashion companies remains insufficient, and the technological innovation activities and associated levels of fashion companies are not well understood. Therefore, this study aims to enhance the understanding of fashion companies' technological innovation by exploring the types and utilization levels of technological innovation in the supply chain of the fashion industry.

### Innovation Type

Since the concept of innovation was first presented by Schumpeter (1942), many concepts related to innovation have seen continuous evolution up until the present day. However, the concept of innovation is still widely covered by many scholars, and it is classified into various types because of the difficulty of clearly defining it as a single concept. Types of innovation are classified in the following way: product innovation and process innovation, according to the object of innovation; radical and gradual innovation, according to the degree of innovation; major and minor innovation, according to the importance of innovation, etc. (Kwak & Suh, 2010; Langley, Pals, & Ort, 2005). It is generally also divided into management innovation and technological innovation (Daft, 1978; Evan, 1966). As such, innovations can be classified in various ways according to the standards, but they can also be divided and summarized as innovations for efficiency and innovations for new market creation. Technological innovation for efficiency is exploitative innovation that increases productivity and efficiency by utilizing existing products, technologies, services, structures, processes, etc., rather than pioneering new markets. In contrast, innovation for market creation is exploratory innovation that creates value and increases profitability by actively developing and applying products, technologies, services, structures, and processes in new ways to create new markets (Daft, 1978; Hamel, 2001; March, 1991; Robey, 1991). Therefore, this study aims to categorize the activities of technological innovation currently being used in fashion companies by categorizing them under exploitative innovation for efficiency and exploratory

innovation for new market creation.

Shin & Kim (2012) insisted that different approaches are needed depending on the type of innovation in order to improve performance, as the factors affecting performance vary according to the type of innovation. Song & Shin (1998) revealed that larger companies tend to focus on process innovation, while SMEs focus on product innovation, arguing that there are differences in the use of technological innovation, depending on the characteristics and scale of the company. Therefore, this study classifies different types of companies according to their location in the supply chain in the fashion industry and detects the utilization levels in technological innovation for different types of companies.

### Growth Stage of a Company

Companies grow in stages, and this is not easily changed. The growth stage changes the environment that companies face as they form activities and organizations suitable for their growth stage and establish associated business strategies (Lavoie & Culbert, 1978; Lee & Shim, 2007; Miller & Friesen, 1984; Quinn & Cameron, 1983). Many empirical studies have been conducted in accordance with this, such as on the criteria for distinguishing growth stages, performance by growth stage, and relationships between growth stages and business strategies. Scholars divide the growth stage of a company into either a three-stage model, four-stage model, or five-stage model (Flamholtz, 1995; Hoy, 2006; Miller & Friesen, 1984). Among these, the three-stage model, which divides the growth stage of a company into the generator, growth, and maturity stages, is the most widely adopted.

In general, companies need to consider different factors for each growth stage, such as the risk factors associated with the generator stage, how to organize, check, and evaluate the company during the growth stage, and whether to make changes during the maturity stage (Lippitt & Schmidt, 1967). Smith, Mitchell, & Summer (1985) argued that corporate executives should prioritize coordination efficiency in the generator stage and technical and strategic efficiency in the growth and maturity stages. Kim & Ha (2000) revealed the key success factors for different growth stages for domestic startup companies. They insisted that new-product development was a key success factor in the generator stage,

while customization and sufficient capital were the success factors for the early growth stage and high growth stage, and setting up an organizational management system was a key factor during the maturity stage. Bae, Choi, & Hwang (2001) also revealed that the success factors for SMEs are not uniform but differ in each growth stage. They summarized the success factors for each stage, such as motivation and autonomy regarding the task in the generator stage, company scale and marketing ability during the growth stage, and product line, market consistency, and quality advantages in the maturity stage. Lee & Chang (2001) also conducted research on startups to reveal differentiation in technology innovation, quality, and marketing as important in the early stages of the startup, but that differentiation of technological innovation and capital mobilization are key success factors as companies move into the growth stage and maturity stage.

Through the literature review, it was found that important success factors, such as the decision-making process and business strategy, changed according to the company's growth stage, and these results differed slightly, depending on the size of the company and the industry. It was also inferred that the required technological innovation varies, depending on the type of company and growth stage in the fashion industry, which has different characteristics from the general manufacturing industry. Therefore, this study examines the types and levels of technology innovation required for each growth stage of a fashion company.

## Methods

### Research Questions

The purpose of this study is to explore the types of technological innovation for fashion companies and to find out how these types differ according to their position in the fashion industry's supply chain. Additionally, the types and levels of technological innovation are examined in each growth stage for fashion companies. The research questions specifically selected for this purpose are as follows:

1. Investigate the types of technological innovation for fashion companies.
2. Investigate the differences between types and levels of technological innovation according to a company's position in the supply chain of the fashion industry.
3. Investigate the differences between types and levels of technological innovation in each growth stage for a fashion company.

### Data Collection & Analysis

The research methods in this study used qualitative research methods through in-depth interviews, as there exists no suitable framework for measuring technological innovation in fashion companies. In the fashion industry, there are various types of companies, such as fiber and textile companies, subsidiary companies, apparel manufacturers, other accessory manufacturers, distributors, and garment producers, depending on their position in the supply chain. In addition, it is speculated that there exist differences in technological innovation according to the types of fashion companies in the supply chain. Thus, classification was set as fibers, textiles, garment production, and apparel manufacturing and distribution, according to the position in the fashion industry's supply chain. A total of 20 companies were selected: for fibers (3 companies), textiles (2 companies), garment production (3 companies), apparel manufacturing and distribution (12 companies in total, for men's wear, women's wear, unisex casual wear, sports and outdoor wear, and underwear), and in-depth interviews were carried out. High-level experts were selected as interviewees, recognized as being able to fully understand and explain each company's business strategy and performance (average work experience = 14.2 years) with an understanding of the entire supply-chain process for fashion companies. Table 1 shows general information regarding the 20 companies, along with basic information regarding the interviewees. Respondents were evenly selected across various positions, from representatives to executives, and the departments were also spread out across various fields, such as merchandising, sales, design, production, general management, etc., and years of experience ranged from at least 4 to 25 years.

The interview guide approach by Patton (1990) was used for the interviews. First, a structured questionnaire was

Table 1. General Information of Interviewee and their companies

case	Company Type			Interviewee Characteristics		
	category	company name	details	position	department	experience years
1	Fiber	H	Chemical Fiber	General Manager	Planning/Sales	14
2		D	Cotton Spinning	Vice President	-. <sup>a</sup>	20
3		P	Chemical Fiber/ Post-processing	Director	-. <sup>a</sup>	19
4	Textile	J	Textile Design	CEO	-. <sup>a</sup>	21
5		L	Textile Design	CEO	-. <sup>a</sup>	25
6	Garment production (supplier)	S	Vendor	Manager	Sales Marketing	11
7		J	Vendor	CEO	-. <sup>a</sup>	22
8		M	Vendor	Manager	Sales Marketing	13
9	Apparel manufacturing & distribution	L (brand T)	Casual	Manger	Merchandising	12
10		M (brand B)	Casual	General Manager	Production Management	17
11		V (brand V)	Women's Casual	Manager	Design	15
12		S (brand O)	Women	General Manager	Production Management	15
13		H (brand T)	Women	General Manager	Production Management	19
14		J (brand B)	Sports	Manger	Sales planning	4
15		J (brand P)	Men	Manger	Merchandising	5
16		J (brand R)	Adult Casual	Manger	Merchandising	5
17		K (brand K)	Outdoor	Manger	Sales	6
18		Y (brand N)	Outdoor	Manager	Merchandising	10
19		D (brand A)	Sports	General Manager	Sales	21
20		S (brand Y)	Lingerie	Manager	Design	9

a: It does not belong to a specific department because he oversees the entire company

developed, based on which questions were posed. In the process of questioning and answering, if a question arose in relation to the content of a response, the question and answering process was performed once again. The interview was conducted at the interviewee's office and took place over the course of roughly 90 to 120 minutes. All interviews were recorded, and, during the analysis of the interview, two or three additional interviews were conducted, as needed. Interview questions were asked regarding the types and levels of technological innovation for the respective company and the performance of such innovation, and the fashion company's overall business process was then presented, along with the tasks occurring at each stage, specifically investigated using the value-chain technique presented by Porter (1985). In the process, if some aspect presented a great difference from other companies, or if a technological innovation had been instituted, it was highlighted for further explanation and to express the execution level for this technological innovation as 'very

high(3),' 'high(2),' or 'normal(1).' The growth stages for fashion companies were divided into three stages, based on the research by Lee & Shim (2007) and Lee & Lee (2009). The respondents judged the growth stages of their companies as being in the generator stage (S1), growth stage(S2), or maturity stage(S3), and were asked to divide these into three stages about other competitors, as there were not enough samples for each growth stage.

Interview data were analyzed using the four-step qualitative data-analysis method of Thompson (1997). First, each interview transcript was read as a whole through the intratext cycle, and the contents that appeared simultaneously in multiple interviews were categorized according to their topics. Second, an intertext cycle was used to analyze the homogeneity and differences between each interview. Third, all interview analysis was completed, and features of technological innovation were extracted, based on a newly developed understanding. Finally, the analysis was described

from a holistic point of view. As a result of this four-step analysis process, 48 elements were extracted that mentioned technological innovations for fashion companies. These elements were grouped and organized into similar concepts in terms of their meaning, and then, according to the results of the literature review, they were categorized into two levels of technological innovation: exploitative innovation for efficiency and exploratory innovation for market creation. In the entire analysis process, three researchers with more than five years of experience working in fashion companies participated in the analysis and tried to supplement the subjective judgment of the researcher to increase reliability.

## Results and Discussion

### Types of Technological Innovation in Fashion Companies

Despite slight differences in names, various scholars classify innovation types as basically divided into innovation for efficiency and innovation for new-market creation (Daft, 1978; Evan, 1966; Kwak & Suh, 2010). This study summarized the types of technological innovation and its factors in line with these two concepts through qualitative data analysis. After deriving keywords through in-depth interview analysis, similar items were grouped into detailed factors, and terminologies that included them were named. The definition of these factors was based on previous studies (Daft, 1978; Gopalakrishnan & Damanpour, 1997; Hamel, 2001; March, 1991; Robey, 1991). Through this process, the types of technological innovation for fashion companies were categorized into two types: exploratory technological innovation to create new markets and exploitative technological innovation to improve the efficiency of business operations. Table 2 and Table 3 summarize the types of technological innovation, detailed factors, and examples of fashion companies derived from qualitative data analysis.

### Exploratory technological innovation for market creation

Exploratory technological innovation involves an effort to

create a new market by exploring fundamentally new things (March, 1991). As a result of analyzing qualitative data, exploratory technological innovation efforts mentioned various contents, such as developing new products, upgrading existing products, diversification of products through continuous R&D (research and development) investment, diversification of industries, etc.

First, new-product development, which was expected to account for the most responses when asked about the concept of technological innovation, was mainly focused on fiber and textile companies. In the case of yarn companies dealing with chemical fibers, it was emphasized that, in order to create a new market and survive in this market, it is necessary to develop new products that differ from existing ones. This was seen in the following examples: *"We're looking for a new material — an entirely new one. This means high added value, but it's something no one else is doing. It's difficult, but we have to work continuously. It will determine the future of the company."* (Case 1) *"The only way to survive in this market is by developing a differentiated product that no one else offers. If you neglect this, you will be left behind."* (Case 3), and *"To grow independently, we need to develop well. We have developed a fabric that can only be made by us, meaning we can reliably patent it and take hold of the market."* (Case 4). These were referred to under 'New Product Development.'

Second, when asked about technological innovation, another comment that preceded the development of new products was that they would pioneer the market by improving the functionality of existing products and upgrading them into better products. This is seen in the following examples: *"It has been 60 to 70 years since the sewing industry disappeared in Japan, yet Japan's sewing machines still dominate 80% of the world market share. They constantly try to innovate and upgrade their machines."* (Case 6), *"Mixing the good points from each of the existing products or developing them by including new ideas."* (Case 1), and *"New-product development does not play a big role in sales increases, but it is ideal to upgrade the existing one, little by little."* (Case 2). These were referred to under 'replacement of existing products.'

Third, efforts toward product diversification by

Table 2. Exploratory Technological Innovation

Factor	Examples of description
New Product development	<p>"Our company has the important product strategy that is called the '4 Value' strategy. It's constantly developing new products that can't let other companies catch up with ours. (case 1)"</p> <p>"We have a R&amp;D institute in An-yang. Researchers's tasks are developing new material, applying new patents, combining multiple technologies, upgrading existing technologies, and so on. (case 3)"</p>
Replacement of existing products	<p>"Mixing the good points of each of the existing products or developing them by putting our new ideas in there. (case 1)"</p> <p>"Our sewing machine still dominates 80% of the market share in the world. We constantly try to innovate and to upgrade the machine. This is a manufacturing industry, which really needs a high level of technology. (case 6)"</p>
Product diversification	"Recently, we focus on not only to upgrade existing materials but also to find new materials for product diversification. we always try to diversify with existing ones. (case 5)"
Industry diversification	"Once total sales volume of a business area exceed over one billion dollars, there is no innovation except find a new business field. So, I heard that our company also has been proposed M&A chances for business diversity. (case 6)"

upgrading, benchmarking, or modifying a product are mentioned in a similar way as for the replacement of existing products. In other words, efforts were detailed on how companies create markets by producing small quantities of multiple products customized to reflect the diverse needs of their customers. This is seen in the following passages: *"What we focus on now is not only upgrading existing materials but also finding new materials for product diversification. We can also benchmark existing ones."* (Case 5), and *"We have machines, but we don't have any special technology. However, our products are differentiated by specializing in small-quantity production. We are manufacturing our own products as an order base. This is small-quantity multi-product production."* (Case 3). Therefore, the detailed factors for exploratory technological innovation for market creation are called 'product diversification.'

Lastly, efforts to boldly advance into other areas were uncovered in the process of finding breakthroughs in company growth, although these were not mentioned for many companies and were summarized as detail factors. Examples of these are as follows: *"Once total sales volumes in a business area exceed one billion dollars, there is no innovation except in finding a new business field. So, I have heard that our company has also been presented with M&A chances for business diversity."* (Case 6), and *"Fashion companies need vertical integration to create synergy with each other. That's why they're interested in new areas, because they think they need new business areas in order to grow."* (Case 4). These were mentioned

and named under 'Industry Diversification.'

### Exploitative Technological Innovation for Efficiency

Exploitative technological innovation comprises a company's innovation efforts to increase productivity and efficiency by improving and developing existing products, technologies, services, structures, and processes, rather than exploring new markets with innovations for efficiency (March, 1991). As a result of analyzing the qualitative data, various efforts by fashion companies toward exploitative technological innovation can be summarized as mechanizing, standardizing, and building systems, even when they involve high initial investment costs and efforts to maximize work efficiency. The most frequently cited statements regarding fashion companies' efforts toward exploitative innovation were about standardization of production processes and establishing a PDM system and PLM system. Not only fiber/textile companies but also clothing production and clothing manufacturing and distribution companies were seen to spend a lot of time and effort to standardize the production process, establish a PDM system, and establish a PLM system, despite high initial investment costs. This was mentioned in *"Technological innovation in the factory goes toward cutting costs. You can think of it as eliminating everything that doesn't present added value."* (Case 2). These efforts were mainly done for large-scale companies in terms of high investment time and initial investment in establishment, and such efforts ultimately had a very significant impact on the company's performance.

Table 3. Exploitative technological innovation

Factor	Examples of description
Standardization of production process	<p>"We have 8 partner factories that only run our brands. It is to reduce accidents by manualizing and standardizing all the work done in the factory. (case 12)"</p> <p>"It's been almost 10 years since we did the production process analysis. I kept updating it and computerized it. (case 13)"</p>
Product Development Management(PDM) system construction	<p>"Innovation? We've got 10 billion and put in an EIS system. Now just do everything computerized. I don't even need to call my partner. (case 9)"</p> <p>"The most time-consuming for the apparel company is the planning/ forecasting stage. We have created what is the best practice to efficiently change this stage and to increase the hit rate in the real market. (case 13)"</p>
Production Lifecycle Management(PLM) system construction	<p>"If the production schedule is late, the warning lights for each style on the computer are just on. And it shows right away at which stage it is delayed and the whole schedule is delayed. (case 9)"</p> <p>"We are fixed by fitting time, QC time. Over time, the computer rings an alarm. We have a fixed time to work on fittings and QC. If the fixed time is over, the computer will sound an alarm. (case 11)"</p>
Mechanization of product design	<p>"Our CAD system is highly utilized. We are all mechanized and computerized. The pattern is sent to the business via email. (case 16)"</p> <p>"As labor costs rise, the fabric itself is standardized in the case of woven, so we try to mechanize it by introducing high-tech machines. (case 15)"</p>
Standardization of product design	<p>"Originally, We worked on each pattern differently for each style. There were hundreds of patterns in one season. However, after standardizing the pattern, We have integrated it into a basic pattern and standardized it as 10 pieces for a man's suit and 5 for a knit goods. (case 9)"</p>

First, as for 'standardization of production process', it is mentioned in the following examples: *"It has a different outcome, because sewing is dependent on an individual person. Standardizing this is about technology. We are reducing accidents by manualizing and standardizing all the work done in the factory."* (Case 12), *"Every production process was analyzed in seconds, as per the style. Based on this, we set the process cost. It's been almost 10 years since we did the production-process analysis. We kept updating it and finally computerized it."* (Case 13), and *"The sealing material, needle, and thread are all well mixed to make a proper product, but there may be differences between factories. The production process must be standardized and manualized, and, basically, these are to be shared across the company."* (Case 6). This factor can be seen even for women's clothing, which is difficult to standardize because of the large differences that exist between designs and processes.

Second, it is mentioned under 'PDM system construction' with the following: *"Innovation? We've got 10 billion put into an EIS system. Now we just have everything computerized. I don't even need to call my partner. It's been about 3 years since this has been in place, and work efficiency has been getting better and faster, and it's really less about paper work that's just for reporting."* (Case 9), *"There is a best practice called*

*'innovation' in our company. The most time-consuming stage for an apparel company is the merchandising stage. It was created to efficiently change this phase and increase the hit ratio in the market."* (Case 13), and *"We do the entire merchandising process on a computer-programmed basis. Since everything is digitized, so many styles can be developed quickly and the hit rate is increased."* (Case 11). This factor can be seen alongside the merchandising process, which fashion companies consider a long way from being introduced as technological innovation, given the need to produce countless styles in a single season, and efforts were also being made to manage it as a system for efficiency.

Lastly, 'PLM system construction' is mentioned in the following: *"If the production schedule is late, the warning lights for each style on the computer are left on. This shows right away which stage is delayed, and how the whole schedule is delayed. All the partners are on the computer, so if you just enter the QR (quick response) into the computer, the QR pops up immediately, without needing to call anyone."* (Case 9), and *"We are fixed by the fitting time and QC time. Over time, the computer rings an alarm. We have a fixed time to work on fittings and QC. If the fixed time is over, the computer will sound another alarm."* (Case 11). However, there are too many variables to program, due to the characteristics of the fashion industry, so there are limits to the application of exploitative technological



innovation for efficiency, as seen in *“This industry has too many variables. So, some are operated through the system, and some are handled manually, case by case.”* (Case 6).

In addition, contents under ‘mechanization of product design’ and ‘standardization of product design’ using computers were derived as exploitative technological innovations for the efficiency of fashion companies. Examples of this are as follows: *“Our CAD system is highly utilized. Patterns for garments are still made by hand in many brands, but we are fully mechanized and computerized. The pattern is sent to the business via email.”* (Case 16), *“As labor costs rise, the fabric itself is standardized in the case of woven fabrics, so we try to mechanize it by introducing high-tech machines. It’s like a laser-cutting machine.”* (Case 15), and *“Originally, we worked on each pattern differently, according to each style. There were hundreds of patterns in one season. However, after standardizing the pattern, we have integrated it into a basic pattern and standardized it as 10 pieces for a man’s suit and five for a knit garment.”* (Case 9). It seems that it is still difficult to apply the mechanization and standardization of product design to all companies, but it has been found that efforts toward exploitative technological innovation to increase efficiency are focused on specific obedience, such as for men’s wear and sportswear.

### Differences in Technological Innovation by Fashion Company Category

The fashion industry is actually comprised of a group of industries that organically combine various types of enterprises, from technology- and capital-intensive fiber and textile companies to low-tech, low-capacity, and labor-intensive sewing companies (Choi, et al., 2015). Therefore, this study examined the differences in technological innovation according to different fashion company categories and based on previously revealed examples of exploratory and exploitative technological innovation.

First, as a result of analyzing qualitative data, many respondents suggested that the introduction of technological innovation is a difficult problem in the fashion industry. For examples of this, we see the following: *“There is an emotional part to being a fashion company, but if you put it*

*in the framework of this system, this tends to be excluded. Everyone says that it changes, just as with a financial company. It goes on, companywide, but the department for women’s clothes is greatly affected because the market is so sensitive to trends.”* (Case 9), *“There are three cogs in garment-production companies: sales, management, and technology. Technology is the most undervalued among them. Even if it seems that making one piece of clothing is nothing, changing the process or improving it can make a huge difference in productivity, but there is no investment there at all.”* (Case 6), and *“Innovation is generally conceived in line with creating something new in fashion companies. However, the concept of innovation to eliminate, improve, or upgrade existing things becomes more important for fashion companies.”* (Case 1). These statements refer to the characteristics of the rapidly changing market in consumer-oriented, emotionally-oriented, and SME-oriented fashion industries.

Chang & Kim (2009) researched at the impact of corporate innovation on profitability in the domestic manufacturing industry, also classified industries such as textiles, clothing, and footwear as low-tech industries based on the OECD classification table for different technology levels and innovation. Clothing and related businesses are an industry where innovation is difficult to introduce because innovation does not have a significant impact on the entity’s bottom line according to their research result. Through this study, it was inferred that among the fashion companies are more likely to accept the exploitative technological innovation that improves existing products, technologies, structures, and processes to increase efficiency rather than exploratory technological innovations for market creation. Based on the results of qualitative data analysis, Table 4 summarizes the differences in types and levels of technological innovation by category of companies on the fashion supply chain. In the case of fiber/ textile companies, which are relatively technology and capital intensive, they were focusing on both exploratory innovations for market creation and exploitative innovations for efficiency. They also emphasized that exploratory technological innovation for market creation is an important factor in a way away from the pursuit of developing countries such as China and

Table 4. Technological innovation level in supply chain of fashion industry

T.I	Factor	Fiber	Textile	Garment Production	Apparel Manufacturing & Distribution				
					Men's	Women's	Sports	Casual	Lingerie
Exploratory	New Product development	3 <sup>a</sup>	1				3		3
	Replacement of existing products	3	1				2		2
	Product diversification	2	1						3
	Industry diversification	1		1					
Exploitative	Standardization of production process	3		3	3	1	3		
	PDM construction				3	1	2	2	2
	PLM construction	2		2	3	1	2	2	2
	Mechanization of product design				3		3	3	3
	Standardization of product design				3		3		

a : Whenever the interviewee talked about technological innovation, they were asked to express the level in three steps.

The level of technological innovation execution is marked as 'very high(3)', 'high(2)', and 'normal(1)'.

Southeast Asia. In this regard, *"Looking at the market situation, it is impossible to have a price advantage by making products cheaper than developing countries. So, is there only a way to increase the value of the product to load with the bullets, research and development?"* (case 3), *"Domestic chemical fiber technology is very high in the world. And it has price competitiveness compared to Japan."* (case 4), *"If a new technology is not the basis, it is ruined and destroyed."* (case 1) were mentioned.

On the contrary, it was found that garment production, manufacturing and distribution companies located downstream in the fashion supply chain had a high level of implementation of exploitative technological innovation to improve efficiency. For example, *"Apparel companies have no technological innovation, so it's possible to perform computerization or processing management innovation."* (case 7), *"We keep getting vertical integration and getting bigger. In order to continue to innovate, we also introduce ERP (enterprise resource planning), improve our logistics system, and consult with ○○○ for risk management."* (case 6).

In addition, a factor which greatly affected the introduction of technological innovation was derived in the process of analyzing the qualitative data. It was mentioned in many companies that *"the president ○○○ has taken the lead. It's possible because he is young, and he has a conscious executive of the same age, and the chairman of enterprise always gives generous support to them."* (case

6), *"The president is very interested in developing our own unique material."* (case 3), *"○○○ was the company that they didn't use the system even if they had already it. On the other hand, here is inevitable because the president is interested in the system."* (case 9). In summary, it was found that the introduction of technological innovation and its levels influenced the way of thinking and organizational flexibility of top executives. These results coincide in previous studies (Ko, Jung, & Ryu, 2017; Verhees & Meulenbergh, 2004; Yoh, 2012) that the CEO's leadership has a positive influence on corporate innovation. It is considered that further research is needed on factors affecting technological innovation of fashion companies.

### Differences in Technological Innovation by Growth Stage of Fashion Companies

Although the growth stages of company are variously classified from the 3rd to the 7th stage depending on the researcher, they are generally consistent with the classification of generator, growth, maturity, leaps and decline stage (Flamholtz, 1995; Miller & Friesaen, 1984). However, the decline stage is usually excluded because there is a response error caused by the respondents' tendency not to recognize their company as a degenerate (Lee & Shim, 2007). Therefore, this study classified the growth stage of fashion company surveyed was into three growth stages based on the prior studies (Lee & Lee, 2009; Lee & Shim,

Table 5. Technological innovation level by growth stage of fashion companies

T.I	Factor	Fiber			Textile			Garment Production			Apparel Manufacturing & Distribution		
		S1 <sup>b</sup>	S2	S3	S1	S2	S3	S1	S2	S3	S1	S2	S3
Exploratory	New Product development		2 <sup>a</sup>	3	1	1	1						
	Replacement of existing products	2	2	3	1	1	1						
	Product diversification		2	3	1	1	1						
	Industry diversification									2			1
Exploitative	Standardization of production process		2	3					2	3		2	3
	PDM construction												3
	PLM construction			3					2	3			3
	Mechanization of product design								2	3		2	3
	Standardization of product design											1	2

a: Whenever the interviewee talked about technological innovation, they were asked to express the level in three steps.

The level of technological innovation execution is marked as 'very high(3)', 'high(2)', and 'normal(1)'.

b: Interviewees were asked to express the growth stages of their companies and competitors in three stages, it is indicated as generator(S1), growth(S2), and maturity(S3).

2007): generator, growth, and maturity stage. The qualitative research analysis showed that the types and levels of necessary technological innovation of fashion companies vary by growth stage and the type of technological innovation required varies depending on where they are located in the supply chain due to the nature of fashion industry where various category of companies exist together. In this section, the growth stages of fashion companies were divided into generator, growth and maturity periods, and the types and levels of technological innovation needed were found according to their location in the supply chain. Types and levels of technological innovation for each growth stage of fashion companies are summarized in Table 5 based on qualitative data analysis.

Fiber companies had higher levels of exploratory technological innovation for market creation through new product development and product diversification, and textile companies did not differ by growth stage. Specifically, *"The ranking is decided in our fiber industry. There are companies (Group 1) that have research labs and utilize all types of technological innovation to develop new products and lead them. Group 2 copies what Group 1 has done and diversifies the product. The group 3 specializes in only a few items with a cheap price, so they can't even think about technological innovation. The technological innovation is an excessive investment for group 3, so they think it's*

*cost-saving not to do it."* (case 1), *"Textile companies with large scale are just good at managing social networks. There's no particular difference. They have capital, so they set up their own factories to cut costs, but that has nothing to do with technology."* (case 5).

On the other hand, garment production and manufacturing/distribution companies were mainly focused on exploitative innovations for efficiency related to standardization as they were in the higher growth stages, while those in the lower growth stage were focusing on cost reduction. For examples, *"Since these technological innovations are costly, it is only possible to reinvest at a certain scale. As a result, the gap between the rich and the poor is getting bigger in this industry."* (case 6), *"No matter how innovative you are, the money goes into it. Companies in growth stage have no choice but to go in the direction of cost reduction. The most basic thing you can do is increase productivity, reduce loss, reduce costs."* (case 12).

Lee & Chang (2001) studied key success factors for startup companies. As a result, differentiating technological innovation, quality and marketing are important in the early stages of start-ups, and differentiating technological innovation and mobilization of funds are important key success factors in the growth and maturity stages. Lester, Parnell, & Carraher (2003) studied the financial industry, while a simple information processing system was introduced

in the generator stage, and a system for measuring member's capability and performance was introduced in the growth stage, and the importance of complex systems information processing is increasing as the company grows. It is difficult to generalize the results of these prior studies to the fashion industry due to the different types and levels of technological innovation required for each growth stage of fashion industry in which various types of companies exist together.

## Conclusion

In order to secure a competitive advantage in a rapidly changing business environment, companies must improve their existing products, services, and processes through innovation at all phases of the supply chain in the fashion industry or else create new ones that did not previously exist. In this aspect, this study identifies the types of technological innovation for fashion companies, examines the differences in types and levels of technological innovation, according to the company's category in the supply chain, and identifies types and levels of technological innovations, according to a company's growth stage. The findings of the study are as follows. First, the type of technological innovation of a fashion company was divided into exploratory technological innovation for new-market creation and exploitative technological innovation for efficiency improvement. As a result of analysis, exploratory technological innovation for market creation was organized into 'new-product development,' 'replacement of existing products,' 'product diversification,' and 'industry diversification,' and exploitative technological innovation for efficiency was summarized as 'standardization production processes,' 'PDM system construction,' 'PLM system construction,' 'mechanization of product design,' and 'standardization of product design.' Second, it was found that the level of technological innovation was different for each fashion company category within the supply chain. There exists a lack of resources and low technology demand, due to the characteristics of the fashion industry based around SMEs. Therefore, overall, fashion companies tended to be higher in their levels of exploitative technological innovation for

efficiency than in exploratory technology innovation for market creation. Specifically, companies related to fibers and textiles, which are located upstream in the supply chain and have relatively high technological demand, tend to be actively engaged in exploratory innovation for market creation. However, companies related to garment production, manufacturing, and distribution tended to have high levels of exploitative technological innovation to improve efficiency. Third, it was found that the types and levels of technological innovation for each growth stage in fashion companies were also different. In fiber companies, the more companies were involved in the high growth stage, the more likely they were to focus on exploratory technological innovation for new-product development and product diversification. Textile companies showed no difference according to growth stage. It was found that the higher the growth stage, the stronger the focus on exploitative technological innovation for efficiency related to standardization, and the lower the growth stage, the higher the tendency to focus on cost reduction in garment production, apparel manufacturing, and distribution.

Based on the above research results, the limitations and suggestions for follow-up studies are as follows. This study uses qualitative research methods to compensate for the lack of preceding research related to technological innovation in fashion companies and categorizes technological innovation. It contributes to deriving variables with high validity in measuring technological innovation and acceptance for fashion companies, but it has a limitation in not having been able to clearly verify the influence between variables. Therefore, in future studies, it is necessary to empirically verify the effect of a fashion company's performance depending on the type of technological innovation. In addition, this study shows that a CEO's leadership can influence the introduction of technological innovation, but it did not carry out quantitative verification on this. Follow-up research is needed to confirm how technological innovation contributes to performance, according to the leadership of the CEO.

Despite these limitations, this study has academic contributions in that it provided the basis for establishing a theoretical framework for a fashion company's business

strategy by comprehensively reviewing technological innovation and introduced the concept of strategic management research, which was previously relatively overlooked in the fields of clothing and textiles. In addition, it is expected to help research institutes and SMEs focused on developing and distributing technological innovation to pioneer and systematically approach marketing channels based on the research results. Lastly, this study offers great practical contributions in that it can be used as basic data for digital transformation, which has become an essential element in the advancement of the Korean fashion industry and the management of fashion companies in the post-COVID-19 era.

## Reference

- Bae, B. R., Choi, K. S., & Hwang, Y. (2001). A study on the success factors of venture business as life cycle. *Journal of Research Institute of Industry and Economy*, 32, 133-155.
- Chang, S., & Kim, H. (2009). Effects of innovation on firm profit: Using Korean innovative manufacturing firm data. *The Journal of Industry Innovation*, 25(3), 155-182. doi: 10.22793/indinn.2009.25.3.007
- Choi, S., Park, H., Son, M., & Jeon, Y. (2015). *21st century fashion marketing* (3th ed.). Seoul: Changisa.
- Daft, R. L. (1978). A dual-core model of organizational innovation. *Academy of Management Journal*, 21(2), 193-210. doi:10.5465/255754
- Damanpour, F. (2014). Footnotes to research on management innovation. *Organization Studies*, 35(9), 1265-1285. doi:10.1177/0170840614539312
- Evan, W. M. (1966). Organizational lag. *Human Organizations*, 25(1), 51-53. Retrieved from <https://www.jstor.org/stable/44125021>
- Flamholtz, E. (1995). Managing organizational transitions: Implications for corporate and human resource management. *European Management Journal*, 13(1), 39-51. doi:10.1016/0263-2373(94)00056-D
- Verhees, F., & Meulenbergh, M. (2004). Market orientation, innovativeness, product innovation, and performance in small firms. *Journal of Small Business Management*, 42(2), 134-154. doi:10.1111/j.1540-627X.2004.00102.x
- Gopalakrishnan, S., & Damanpour, F. (1997). A review of innovation research in economics, sociology and technology management. *International Journal of Management Science*, 25(1), 15-28. doi:10.1016/S0305-0483(96)00043-6
- Hamel, G. (2001). Leading the revolution. *Strategy & Leadership*, 29(1), 4-10. doi:10.1108/10878570110367141
- Hoy, F. (2006). The complicating factor of life cycles in corporate venturing. *Entrepreneurship Theory and Practice*, 30(6), 831-836. doi:10.1111/j.1540-6520.2006.00154.x
- Kim, Y. B., & Ha, S. W. (2000). An empirical study on the growth stage of venture companies: Success factors, environmental, CEO and external resources. *Journal of Technology Innovation*, 8(1), 125-153.
- Kimberly, J. R. (1979). Issues in the creation of organizations: Initiation, innovation, and institutionalization. *Academy of Management Journal*, 22(3), 437-457. doi:10.5465/255737
- Koberg, C., Uhlenbruck, N., & Sarason, Y. (1996). Facilitators of organizational innovation: The role of life-cycle stage. *Journal of Business Venturing*, 11, 133-149. doi:10.1016/0883-9026(95)00107-7
- Ko, C. Y., Jung, H. W., & Ryu, T. M. (2017). The relationship between style and organizational performance: Mediation by exploratory/exploitative innovation. *Journal of Human Resource Management Research*, 24(2), 63-86. doi:10.14396/jhrmr.2017.24.2.63
- Koo, J. (2019). A study on a stimulation and obstacle factors for organizational innovativeness: A relationship among creative climate, dimensions of learning organization (DLO), and organizational innovativeness. *Korean Review of Corporation Management*, 10(2), 255-274. doi: 10.20434/KRICM.2019.06.10.2.255
- Kwak, S. H., & Suh, C. J. (2010). A Comparison of Management Performance between technology Innovation and Management Innovation companies. *Journal of the Korean Production and Operations Management Society*, 21(3), 321-337.
- Langley, D. J., Pals, N., & Ort, J. R. (2005). Adoption of behavior: Predicting success for major innovations.

- European Journal of Innovation Management*, 8 (1), 56-78. doi:10.1108/14601060510578574
- Lavioe, D., & Culbert, S. A. (1978). Stages of organization and development. *Human Relations*, 31(5), 417-436. doi:10.1177/001872677803100503
- Lee, J., & Chang, S. (2001). Success factors of high-tech ventures across stages of growth. *Korean Journal of Management*, 9(2), 59-92.
- Lee, J., & Lee, S. (2009). Reasons of failure according to stages of new venture growth. *The Korean Small Business Review*, 31(3), 1-17.
- Lee, Y. H., & Shim, S. G. (2007). The study on the discriminant model of SME' growth stage. *The Korean Small Business Review*, 29(2), 23-39.
- Lester, D. L., Parnell, J. A., & Carraher, S. (2003). Organizational life cycle: A five-stage empirical scale. *International Journal of Organizational Analysis*, 11(4), 339-354. doi:10.1108/eb028979
- Lippitt, G. L., & Schmidt, W. H. (1967). Crises in a developing organization. *Harvard Business Review*, 45(6), 102-112. Retrieved from <https://hbr.org/1967/11/crises-in-a-developing-organization>
- March, J. G. (1991). Exploration and exploitation in organizational learning. *Organization Science*, 2(1), 71-87. doi:10.1287/orsc.2.1.71
- Marquis, D. G. (1969). The anatomy of successful innovation. *Innovation Magazine*, 1(4), 28-37.
- McCarthy, A. M., & Schoenecker, T. S. (1999). Commitment to innovation: The impact of top management team characteristics. *R & D Management*, 29(3), 199-216. doi:10.1111/j.1467-9310.2006.00437.x
- Miller, D., & Friesen, P. H. (1983). Successful and unsuccessful phases of the corporate life cycle. *Organization Studies*, 4(4), 339-356. doi:10.1177/017084068300400403
- Moon, C. (2020). The impact of technological innovation and organizational innovation on firm performance: Complementary effects of two innovation types. *Korean Review of Corporation Management*, 11(1), 71-90. doi: 10.20434/KRICM.2020.02.11.1.71
- OECD. (2005). *The measurement of scientific and technological activities: Proposed guidelines for collecting and interpreting innovation data, Oslo manual* (3rd ed.). doi:10.1787/9789264013100-en
- Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage publications Inc.
- Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance*. New York, NY: Free Press.
- Quinn, J. B., & Cameron, K. (1983). Organizational life cycles and shifting criteria of effectiveness: Some preliminary evidence. *Management Science*, 29(1), 33-51. doi:10.1287/mnsc.29.1.33
- Robey, D. (1991). *Designing organizations*. New York, NY:FreePress
- Rutherford, M. W., Butler, P. F., & McMullen, P. R. (2003). Human resource management problems over the life cycle of small to medium-sized firms. *Human Resource Management*, 42(4), 321-335. doi:10.1002/hrm.10093
- Schumpeter, J. (1942). *Capitalism, socialism, and democracy*. New York, NY: Haper & Row.
- Shin, M. S., & Kim, S. E. (2012). The effects of financial characteristics on the relationship between R&D investment and firm value. *Journal of Technology Innovation*, 20(1), 45-73.
- Smith, K. G., Mitchell, T. R., & Summer, C. E. (1985). Top level management priorities in different stages of the organizational life cycle. *Academy of Management Journal*, 28(4), 299-820. doi:10.5465/256238
- Song, W., & Shin, T. (1998). Analysis of success factors and policy of new technology start-ups. Seoul: Scien and Technology Policy Institute.
- Souitaris, V. (2001). Strategic influences of technological innovation in Greece. *British Journal of Management*, 12(2), 131-147. doi:10.1111/1467-8551.00190
- Tompson, J. D. (1967). *Organization in action*. New York, NY: McGraw-Hill.
- Yoh, E. (2012). Meaning of innovative company: Exploration through qualitative research. *Journal of Korea Society Clothing Industry*, 14(1), 37-47. doi: 10.5805/KSCI.2012.14.1.037