FASHION DESIGN INNOVATION ECOSYSTEM

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CERTIFICATE OF ORIGINALITY

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DEDICATION

This thesis is dedicated to my family.

Abstract

According to the resource-based view theory, innovation is a valuable resource to prompt competitive advantage under unpredictable and complicated circumstances. However, research has devoted scarce attention to the investigation and facilitation of Fashion Design Innovation (FDI) in a comprehensive and holistic manner. Regarding this obvious research gap, this research attempts to adopt the innovation ecosystem lens to explore the Fashion Design Innovation Ecosystem (FDIE) using mixed methodologies. Thus, Study 1 of this research identifies the FDI from the extensive literature review systematically. Then, Study 2 further investigates the measurement of FDI by using interview and survey methods in four sub-studies. Based on the results of Study 1 and Study 2, Study 3 aims to explore FDIE by conducting semi-structured interviews with key stakeholders. The objective is to build the FDIE model from the ecosystem-as-structure perspective and verify the performance of FDIE. Study 3 also takes policy-driven FDI as an example to illustrate various stakeholder roles and their pathways to achieve FDI in FDIE.

This research is the first study that defines, measures, and investigates FDI and its connection with FDIE. It contributes to the theoretical advancement of FDI and the innovation ecosystem field. The findings of this research suggest that FDIE can serve

as an inclusive, constructive, and systematic lens that could aid in the management of FDI. Furthermore, it has practical implications for the development of innovation strategies in the fashion sector and for the formulation of policies that foster FDI.

Publication

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Chapter 1

Introduction

1.1 Background

1.1.1 Design Innovation

"New products and new methods compete with the old products and old methods … at a decisive advantage that may mean death to the latter. This is how 'progress' comes about in capitalist society" (Schumpeter, 2013). The resource-based view theory provides a theoretical foundation for explaining competitive advantage. Based on the resource-based theory's value-rarity-imitability-organization (VRIO) framework, innovation has been considered a valuable, rare, and inimitable resource for sustaining a turbulent environment (Barney & Clark, 2007).

Both technology-driven and design-driven innovation contribute to rapid industrial development. The similarity and proximity between design innovation and technology innovation have been verified (Verganti, 2008, 2011). The combination of technology and design, or technology-based design, positively influenced economy growth (Luo et

al., 2014). The reverse effect of design in technology-based innovation enhanced market performance (Candi, 2016). As the boundary between these two polar is porous, innovation research should adopt a more inclusive, non-dichotomous approach to explore a holistic phenomenon (Hodges & Link, 2018). Since innovation powered by technology has been discussed profoundly, design innovation should receive more attention. As a paradigm of innovation, design-driven innovation has been proposed to explain intangible factors rather than substantial changes in technology innovation (Verganti, 2009). Although scholars have examined fashion innovation from various dimensions, such as function, material, and style, few studies have analyzed from the design perspective and attempted to coin the concept of Fashion Design Innovation (FDI) and investigate it in a comprehensive and holistic manner.

1.1.2 Innovation Ecosystem

Regarding how to facilitate innovation, “ecosystem” has gained prosperity due to its metaphor of relationship and network, which reflected an integrative and co-evolving phenomenon involving external and internal entities for value capture and creation (Adner, 2006; Baiyere, 2018; Hou & Shi, 2021; Jacobides et al., 2018; Moore, 1993). In the innovation field, the attachment of ecosystem has been proven effective in explaining disruptive or incremental development scenes and proposing relation-based development strategies (Adner, 2017; Baiyere, 2018; Ghazinoory et al., 2020; Ritala &

Almpanopoulou, 2017). Additionally, ecosystem was an advanced approach for the development of traditional textile and fashion entrepreneurship (Brydges & Pugh, 2021; Ramachandran et al., 2012). However, only one study, brokerage, has attempted to explain one aspect of the innovation ecosystem in the fashion industry. There appear to be few theoretical and empirical studies of the innovation ecosystem in the fashion domain. This scholarly trend must accelerate in the context of the fashion sector.

Regarding who facilitates product innovation, stakeholders such as firms, users, universities, organizations, and governments, could comprise the innovation ecosystem (Adner, 2017; Carayannis & Campbell, 2009). A previous study concluded a conceptual taxonomy of stakeholder roles and their interactions based on local innovation (Guercini & Runfola, 2015). Customers and managers as stakeholders have been extensively discussed (Rahman et al., 2020). The government being a key player in the innovation ecosystem presented a substantial increase in research (Evans & Chisholm, 2016). However, there have been few studies on the innovation ecosystem in the context of fashion, with the exception of a case of brokerage in the fashion business (S. Lin, 2018).

As a governmental measure in the innovation ecosystem, policy induced innovation intentionally and has been extensively utilized in the medical field and the energy industry (Quitzow, 2015). In the fashion industry, the government played a key role in

the innovation process and in the issuance of policies to support marketing activities (Guercini & Runfola, 2010). Although policy-driven innovation in fashion was embedded in fiber invention, fashion designer knowledge transfer, and industrial development, it was unclear how policy was exerted, namely the mechanism of policy-driven innovation within the Fashion Design Innovation Ecosystem (FDIE).

Compared to relatively mature topics on the innovation ecosystem, such as entrepreneurship, platform, and technology innovation, the innovation ecosystem in the fashion sector has received comparatively less attention (Gu et al., 2021). Since the innovation ecosystem in the fashion sector is an emerging topic, there is a need to synthesize literature in the aforementioned fields to address the novel phenomena in the specified context. (Torraco, 2005). This research aims to fill the research gap by proposing the Fashion Design Innovation Ecosystem (FDIE), which should include FDI, stakeholders, activities, resources, and the policy-driven innovation path in the fashion sector based on an ecosystem-as-structure perspective, in order to explain and investigate the existing and complex phenomenon of FDI. (Adner, 2017; Hou & Shi, 2021).

1.1.3 Resource-based View Theory and Stakeholder Theory

Recently, the resource-based view (RBV) scholars have advocated for the integration of RBV with other theories, the creation of greater content, and the expansion of the notion of strategic resources (Barney et al., 2021). Meanwhile, according to the resources synergy theory, innovation as a phenomenon requires resources such as financial, land, labor, and information (Chen & Chen, 2013). Hence, due to the fact that innovation is a competitive output resource produced by input resource synergy, RBV can be extended into the innovation domain. Not only resources, but also a broader context including stakeholders and their participation, even ecosystem, and the configurations granted innovation (De Massis et al., 2018). However, because RBV is rooted in contractual connections, it is unable to explain the implicit relationships inherent to the ecosystem. “The global business realities include a diverse set of complex and interconnected problems, which only something like stakeholder theory can address.” (Phillips, 2011). Regarding stakeholder theory, Freeman argued for a “business in society”-centric perspective as opposed to a business-centric view (Freeman, 2010; Phillips, 2011). Additionally, stakeholder theory disregards reciprocal interaction by excessively stressing the firm-centric interpretation (Valentinov, 2022).

Moreover, it was asserted that the resource-based view theory overemphasized the competitive advantage over other companies and people as labor resources. In the apparel industry, the stakeholder approach identifies key drivers for competitive

advantage as “how should apparel companies address the concerns and pressures from various stakeholders” (Hoque et al., 2022). The newly joint development of stakeholder theory and resourced-based view theory has valued the cooperative benefit and advised that “people are not resources, but stakeholders who bring resources” (Freeman et al., 2021).

The innovation ecosystem has the intrinsic rationale to address these issues, given that it views innovation as the unit of interest and employs a reciprocal coordination mechanism that treats both individuals and entities as stakeholders (Benitez et al., 2020; Jacobides et al., 2018; Zhong & Nieminen, 2015). This research attempts to deploy the innovation ecosystem in the fashion design domain based on the RBV and stakeholder theory.

1.2 Research Questions and Objectives

On the basis of the research background, two research questions are posed: what Fashion Design Innovation (FDI) is and how to facilitate Fashion Design Innovation (FDI) through an ecosystem lens? The purpose of this study is to explore a comprehensive innovation ecosystem for fashion design. It aims to develop a theoretical framework for the Fashion Design Innovation Ecosystem (FDIE). It

attempts to establish the model of the FDIE and specifically addresses the role of government in FDIE. It also strives to conceptualize Fashion Design Innovation (FDI) and Fashion Design Innovation Ecosystem (FDIE). Table 1.1 presents research questions and research objectives.

Table 1.1 Research questions and research objectives

RQ	1. What Fashion Design Innovation (FDI) is?	2. How to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?
Objective	1.1 To review literatures on Fashion Design Innovation (FDI)	2.1 To develop a theoretical framework for the Fashion Design Innovation Ecosystem (FDIE)
	1.2 To determine the measurement of Fashion Design Innovation (FDI)	2.2 To establish the Fashion Design Innovation Ecosystem (FDIE)
	1.3 To conceptualize Fashion Design Innovation (FDI)	2.3 To generate a model of Fashion Design Innovation Ecosystem (FDIE)
		2.4 To conceptualize Fashion Design Innovation Ecosystem (FDIE)
		2.5 To reveal the policy-driven Fashion Design Innovation (FDI) path. 2.6 To design a model of policy-driven Fashion Design Innovation (FDI)

1.3 Research Significance

This research will provide an opportunity to advance the fashion innovation domain and the innovation ecosystem field. The highly exploratory nature will fill a research gap on how to foster innovation in the fashion sector through an innovation ecosystem lens. The research treats the innovation ecosystem as a container for both stakeholder theory and resource-based theory. The theoretical foundation of the research on FDIE is illuminated by debates on two theories that mutually informed each other (Barney et al., 2021; Freeman et al., 2021). It crystallizes the concepts of FDI and FDIE and provides a conceptual framework and a model for future exploitative research into a variety of domains. It helps to categorize and evaluate FDI that few scholars are concerned about. Therefore, this research has theoretical significance in the realms of strategy, innovation, and fashion.

At a practical level, this research will inform managers on how to identify specific stakeholders, their relationships, and pertinent issues to achieve FDI. The research also suggests that the policy-driven FDI path can be considered by policymakers to design and issue policies and by practitioners to seek out and obtain appropriate policy resources. Overall, it will make a contribution to fashion innovation management and strategy management for practitioners, as well as policy creation and implementation for policymakers.

1.4 Research Design

Due to the study's intention to merge the interdisciplinary domains of fashion, design, and innovation ecosystem, both qualitative and quantitative methodologies are employed, and a diverse-approaches strategy is appropriate (Kawamura, 2011). Table 1.2 shows that nine highly-cited publications on the innovation ecosystem applied qualitative methodology (Feng et al., 2021). As a result of the study's exploratory nature, it can be argued that the main methodology for FDIE is a variant of the generalized qualitative study with mixed methods and procedures "*as in the articles in the leading journals just cited*" (Yin, 2016). Additionally, in order to enhance the validity of research conclusions, it is also important to triangulate from more than two points or perspectives, as well as by using a variety of methods and data sources (Denzin & Lincoln, 2018).

A general research design is shown in Figure 1.1. The research design of each sub-study is elaborated in detail in the corresponding chapter. Based on the research questions and objectives, three sub-studies were designed. Study 1 conducted an extensive literature review using both software and manual analysis. Study 2 investigated the

measurement of FDI mainly using the survey method. Study 3 explored FDIE by employing in-depth semi-structured interviews.

Table 1.2 Highly cited literature on innovation ecosystem

Title of top-cited articles	Year	Number of citations
Connecting local entrepreneurial ecosystems to global innovation networks: open innovation, double networks and knowledge integration	2011	51
Entrepreneurship in innovation ecosystems: entrepreneurs' self-regulatory processes and their implications for new venture success	2013	355
Industry platforms and ecosystem innovation	2014	434
Innovation through institutionalization: A service ecosystems perspective	2015	226
Innovation ecosystems: A critical examination	2016	147
Ecosystem as structure: an actionable construct for strategy	2017	287
Unpacking the innovation ecosystem construct: Evolution, gaps and trends	2018	68
Managing ecosystems for service innovation: a dynamic capability view	2019	55
Innovation ecosystems: a conceptual review and a new definition	2020	22

Source: (Feng et al., 2021)

Regarding the sampling strategy, two sets of samples were independently recruited for the interview and the survey. Interview respondents were anticipated to include experienced fashion designers, academic professionals, industry experts, association leaders, and officials. While participants in the survey were expected to be fashion practitioners and fashion college students.

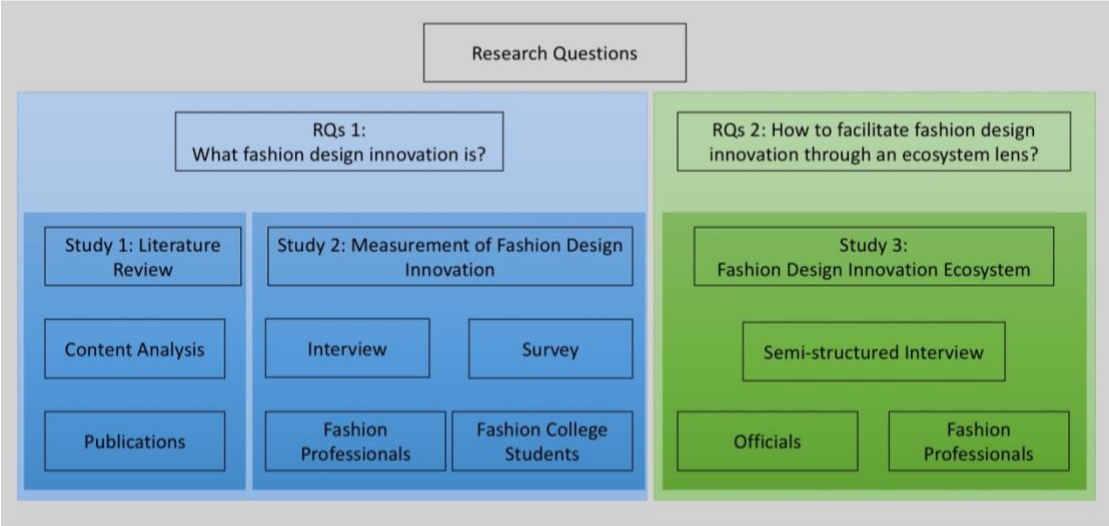


Figure 1.1 Research design

1.5 Thesis Organization

The thesis consists of seven chapters. Chapter 1 offers the study background and contextualizes the research within the fashion design and innovation ecosystem fields.

Research design and implications are highlighted. Chapter 2 summarizes and synthesizes pertinent literature in a patchwork manner, results in five propositions, and then culminates in a theoretical framework. Chapter 3 discusses the Study 1 literature review on FDI. Chapter 4 discusses Study 2 the measurement of FDI. Chapter 5 discusses Study 3 FDIE. Chapter 6 presents discussions and conclusions by validating propositions and the model of FDIE. Chapter 7 elaborates on research significance, limitations, and future research directions.

Chapter 2

Literature Review

2.1 Chapter Introduction

The chapter begins by examining the field of design innovation, focusing specifically on fashion design, i.e. Fashion Design Innovation (FDI). The second session reviews innovation ecosystem, which provides a holistic and historical view from the initial metaphor of ecology to ecotone, from structure to successful factors, leading to a contextual knowledge of the Fashion Design Innovation Ecosystem (FDIE). The third theme focuses on policy-driven papers connected to innovation that are generally dispersed across disciplines and districts, while are indispensable when discussing innovation ecosystem. Figure 2.1 presents the literature synergy. A theoretical framework is finalized through the synergy of literature in three domains.

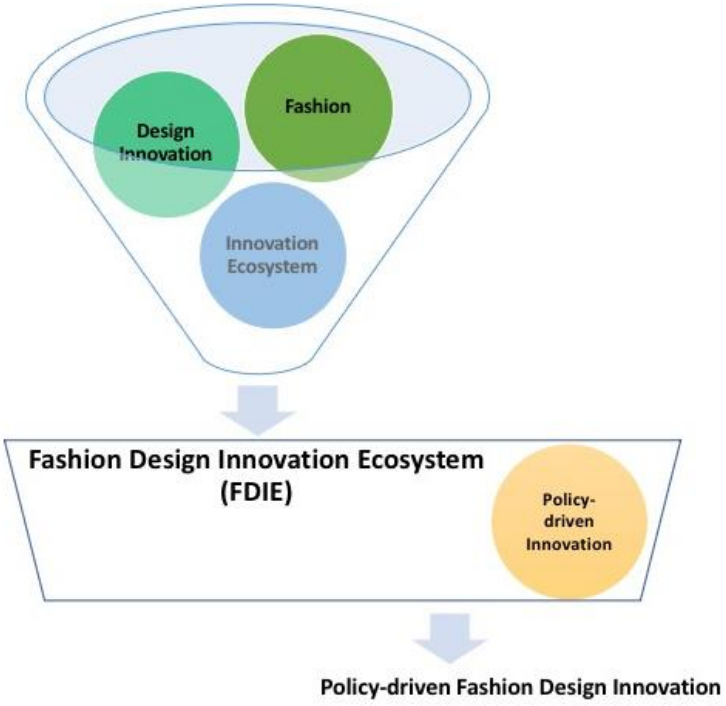


Figure 2.1 Literature synergy

2.2 Design Innovation

The concept of innovation was proposed by economist Schumpeter in the 1930s. Innovation theory has gained its maturity in terms of typology, characteristic, process, context, and application (Baregheh et al., 2009). Regarding innovation in design research, some schools have coexisted in terms of chronology, geography, or epistemology, such as Design Innovation Group (DIG) and Politecnico di Milano. In 1979, Walker and Roy founded Design Innovation Group at the Open University in the UK. Another center of DIG was the Institute of Manchester of Science and Technology

(Walker & Roy, 1999). DIG scholars treated design and innovation separately and claimed that design was vital and necessary to innovation, considering design as one of the inputs into innovation or one of the subcategories of innovation (Roy & Riedel, 1997; Walker & Roy, 1999; Walsh, 1996). In the following decades, the relationship between design and innovation has been investigated widely from different viewpoints (Cautela et al., 2014; Dong, 2015; Na et al., 2017).

Scholars have integrated design and innovation into design innovation as a competitive tool with a positive impact on firm performance, whether the design was a mature or emerging tool or strategy in the firm (Ardayfio, 2000; Gemser & Leenders, 2001; Landoni et al., 2016). This verification consolidated the significance of the design innovation research. Design innovation was defined as *"a process of design innovation produces characteristics that are novel from several aspects, including component features, functionality and ease of operation, and manufacturing processes associated with the new design*" (Ardayfio, 2000). Another definition of design innovation was *"the introduction of designs that are original or new in the sense of being truly different from designs developed at an earlier date by competitors"* (Gemser & Leenders, 2001). These definitions of design innovation emphasized newness, novelty, differentiation, and originality and manifested in multifaceted aspects, such as aesthetics, function, utility, and production. However, there is no universally accepted definition; rather, it

is dynamic and frequently redefined due to the rapid changes of Science & Technology and society. Researchers tend to develop their own one or just not to mention it because of the necessity for revision in a particular context.

At the product level, design innovation was manifested by technical function, ease of use, X-factor i.e., ‘wow’, and quality (Walsh, 1996). Its polar profile maps comprised technology, performance, features, style, quality, cost/price, and range (Roy & Riedel, 1997). Appearance, function, material, and usage constituted design decisions (Gemser & Barczak, 2020; Gemser & Leenders, 2001). Among these factors, aesthetic innovation and stylish innovation have been highlighted in many studies. For example, it was expressed as the X-factor or ‘wow’, which included shape, configuration, color, materials, and finish (Walsh, 1996). Visible design attributes, such as product shape, were quantitatively investigated as a design innovation strategy, that promptly had visual appeal to customers and might stimulate new product lines (Berkowitz, 1987). Color and texture together were aesthetic triggers even for the evolution of technology products (Eisenman, 2013). This visual appearance was used for differentiation purposes (Talke et al., 2009). A completely new aesthetic or style paradigm was essential for the rapid and successful diffusion of design innovation (Cautela et al., 2018; Tran, 2010).

Evidently, a product has not only a facial appearance; its intrinsic meaning must be essential to design innovation that contributes to value creation (De Goey et al., 2019). With the emergence and flourishing of design-driven innovation research at Politecnico di Milano, the successful practices of design innovation in Italy have made a benchmark contribution to this strand. Verganti introduced meaning into design innovation by examining the emotional and semantic properties of products, and proposed design-driven innovation, which he defined as "*pushed by a firm's vision about possible new product meanings and languages that could diffuse in society*.". He quoted the Chairman of Ernesto Gismondi Artemide's words, *"Market? What market? We do not look at market needs. We make proposals to people"*, to distinguish design-driven innovation from market- or customer-centered innovation. Verganti claimed and substantiated the similarity and proximity of design-driven innovation and technology innovation (Verganti, 2008, 2011). Design-driven innovation was declared to be closer to the economic innovation (Bernardo & Medeiros, 2021). Old things' meaning could be explored to support design innovation without inventing an entirely new product (Dell'Era et al., 2017). An upgraded version of design-driven innovation, vision-centered innovation targeted new scenarios such as society that users didn't ask for and could be educated (Dell'Era et al., 2018; Verganti & Öberg, 2013). The combination of radical innovation and meanings has attracted researchers' interest (Altuna et al., 2017;

Verganti & Öberg, 2013). Meaning was meaningful to stakeholders as an intangible value (de Goey et al., 2017).

Systematically speaking, design innovation is comprehensive and complicated, and it may be studied from several dimensions, levels, and perspectives. Fruitful frameworks, models, and structures have been proposed conceptually and verified empirically. For example, a design/innovation polar profile map was used to analyze product characteristics such as function, ease of use, and quality (Walsh, 1996). The design innovation spectrum offered a holistic understanding by interpreting "where", "who", "what", "why/when", and "how" (Na et al., 2017). Gemser also devised a similar structure with "what", "why", "when" and "how"(Gemser & Barczak, 2020). A holistic system was augmented by involving dimensions such as context, structure, type, dimension, degree of novelty, and outcome (Bernardo & Medeiros, 2021). Some frameworks were grounded in the process approach. DIG generalized a meta-structure of design innovation, "the development funnel" based on a "clean" model [proposed by Clarke and Wheelwright in 1993], into a "dirty" one that featured uncertainty (Walker & Roy, 1999). The input-moderator-output (IMOI) framework stressed the causality between "input" and "output" (Dong, 2015). Supply chain and lifecycle were converging to emphasize that design innovation varied by process position and lifecycle phase (Montagna & Cantamessa, 2019). In this sense, design innovation is a process

with a privileged position in this study, with diversified input from industry and investors to government and universities and sustainable output from economics and sociology to humans and the environment.

Categorizing design innovation to scope the study is typically a good start for research. Some scholars have assumed pertinent dimensions such as triggers, leaders, and outcomes (Cautela et al., 2014). Regarding outputs or results, there were four types of innovation: technological design innovation, product/service design innovation, process design innovation, and organizational design innovation. On the basis of the magnitude of change, incremental innovation and radical innovation were two forms of innovation (Baregheh et al., 2009; Na et al., 2017). According to its drivers, innovation can be categorized as technology-driven, design-driven, market-driven, and customer-driven (Norman & Verganti, 2014; Verganti, 2008, 2011). While there has been no policy-driven innovation identified and studied in the design discipline. Contextual factors influenced design innovation (Roy & Riedel, 1997). Only when theory is applied to a particular setting or sector can it grow and consolidate.

2.2.1 Fashion Design Innovation (FDI)

"*Fashion is accompanied by a process of continuous innovation in which new designs are developed*" (Pesendorfer, 1995). The lifecycle of fashion items is short with styles

being rapidly replaced. However, fashion design could be "*non-innovative novelties*" in the absence of technological change (Piatier,1984). Walsh nonetheless captured innovation in the fashion industry by introducing computer technology in design, machine, and retail stock in the knitwear industry, resulting in low-cost designs (Walsh, 1996). Some research on design innovation has used fashion or clothing as examples, although one of which was an unsuccessful clothing project (Na et al., 2017; Roy & Riedel, 1997). The Mini skirt of the 1960s as a specific case, has been considered as the result of meaning-driven rapid innovation in the field of design innovation research (Bernardo & Medeiros, 2021; Norman & Verganti, 2014). Regarding the previously described design innovation domain, fashion-related research is scarce and no definition of FDI has been offered. It can be assumed that the neglect of FDI research is likely attributed to design innovation academics' unfamiliarity with the fashion sector.

Recently, given the prosperous innovation research in the management field and the fact that fashion is one of the most innovative industries, research on fashion innovation has begun, albeit in a fragmented state (Raustiala & Sprigman, 2006). In terms of embellishments, colors, and fabrics, fashion innovation features incremental; in terms of changes in materials and function, it is disruptive (Dalla Chiesa et al., 2022).

Based on the impetus, innovation by design in the fashion industry can be categorized into five types, including product-driven innovation, process-driven innovation,

technology-driven innovation, culture-driven innovation, brand-driven innovation, and consumer-driven innovation (Hodges & Link, 2018). It can be revised that fashion innovation has connections with product innovation, such as product development, textile, and quality; with technology innovation, such as technology and knowledge; with organization innovation, such as industry, management, impact, performance, model, strategy, and networks; with consumer innovation, such as behaviour and consumption. Another paper outlined fashion innovation based on circular economy into four stages: textile innovation, design innovation, relationship innovation, and commerce innovation (Sugg, 2022). Extant fashion studies that have claimed their research is innovation or innovative relevance, are in a vast amount and distribute across diverse areas that feature multidisciplinary. Thus, it is essential to propose, conceptualize, and investigate the concept of FDI, that is one of the research questions "What Fashion Design Innovation (FDI) is?". The first proposition is established.

Proposition 1: Fashion Design Innovation (FDI) can be evaluated at the product level using elements including style, color, material, function, technology, and meaning.

2.3 Innovation Ecosystem

Regarding how to achieve innovation, Adner stated "*successful innovation requires tracking your partners and potential adopters as closely as you track your own development process*" (Adner, 2006). Granstrand & Holgerson defined innovation ecosystem as "*the evolving set of stakeholders, activities, an artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an stakeholder or a population of stakeholders*" (Granstrand & Holgersson, 2020). The conception of a national design innovation ecosystem was coined by integrating the innovation ecosystem within the design discipline as "the stakeholders, context(s) and interactions required to support design as an enabler of people-centered innovation" (Evans & Chisholm, 2016).

Ecosystem is more applicable than system or network, in the sense of an infinite reciprocal cycle or co-evolution, which is akin to the biological concept in nature (Jacobides et al., 2018; Moore, 1993; Ritala & Almpanopoulou, 2017). Oh et al. criticized that innovation ecosystem was a metaphorical and fuzzy-logic term, as opposed to a rigorous construct, and did not add much value (Oh et al., 2016). Ritala & Almpanopoulou responded with the paper "*In defense of 'eco' in innovation ecosystem*" which referred back to Moore's perspective, namely co-evolution among interdependent entities and the boundary issue that could be traced by geographical scope, temporal scale, openness, and flow types (Moore, 1993; Ritala &

Almpanopoulou, 2017). Moreover, Oh et al. (2016) failed to acknowledge Adner, an academic leader of the innovation ecosystem, who almost simultaneously clarified the distinction between the ecosystem and other alternative structures such as platforms, networks, supply chains, and industrial architecture (Adner, 2006, 2017). The debate was extended with the introduction of a new metaphor "innovation ecotone" in an effort to resolve the boundary issue between the knowledge ecosystem and the business ecosystem (Ghazinoory et al., 2021). This study attempts to pinpoint the fashion sector, thus adopts a consolidated, mature, and well-accepted concept, namely innovation ecosystem (Ferasso et al., 2018; Granstrand & Holgersson, 2020; Jacobides et al., 2018).

Adner analyzed the innovation ecosystem from a structural standpoint, identifying activities, stakeholders, positions, and links were four components (Adner, 2017). Based on "*ecosystem as affiliation*", organizations and individuals, public and private sectors were involved as an organism (Adner, 2017; Moore, 1993; Ritala & Almpanopoulou, 2017). More specifically, the stakeholders included supplier, producer, competitor, user, industrial company, government agency, university, and research center, all of which have a focal value goal (Adner, 2017; Moore, 1993; Yaghmaie & Vanhaverbeke, 2020). Continuous expansion of participants would breach the boundary of an ecosystem. For example, the innovation ecosystem has evolved from the "Triple Helix", which connected industry, government, and academia to encourage

innovation, to the “Quadruple Helix”, which added the public as the fourth helix (Carayannis & Campbell, 2009; Etzkowitz & Leydesdorff, 2000). A case study from the EU extended framework entities and incorporated the natural environment as a major stakeholder (Fernández et al., 2019). Coopetition and interdependence among stakeholders have affected the balance of the innovation ecosystem (Valkokari et al., 2017).

When dealing with components or factors, some researchers have been tempted to map the innovation ecosystem in a linear fashion, such as starting from project innovation and ending with the consumer or using a value-added model from inputs to outputs (Adner, 2006; Arena et al., 2021). A parallel frame was an alternative to stress the equilibrium of a network (Fernández et al., 2019; Suseno & Standing, 2018). A holism-oriented research explored activities, stakeholders, and themes simultaneously (Granstrand & Holgersson, 2020). The pie model was leveraged to investigate stakeholders, activities, and value creation (Talmar et al., 2020; Whicher & Walters, 2017). All kinds of resources, such as finances, suppliers, customers, and information were captured. Resources were allocated within the stakeholder network (Ferasso et al., 2018).

Resources, governance, strategy and leadership, organizational culture, human resources management, people, technology, futures, and clusters have been identified

as factors leading to successful innovation (Durst & Ståhle, 2013). Oh et al. acknowledged Graham's opinion that quantitative indicators such as licensing income were unreliable and invalid as metrics because the innovation ecosystem was a non-linear and co-evolutional model (Oh et al., 2016; Ritala & Almpanopoulou, 2017). As evidence, nine highly-cited papers on innovation ecosystem employed qualitative methodology, as shown in Table 1.2 (Feng et al., 2021).

The application and subcategory of the innovation ecosystem were further defined by innovation as the target of ecosystem, sector, context, and boundary. According to the boundary framework, the innovation ecosystem can be categorized into global innovation ecosystem, national innovation ecosystem, regional innovation ecosystem, city-based innovation ecosystem; enterprise innovation ecosystem, sectoral/industrial innovation ecosystem, and open innovation ecosystem (Feng et al., 2021; Ferasso et al., 2018; Fernández et al., 2019; Granstrand & Holgersson, 2020; Oh et al., 2016; Ritala & Almpanopoulou, 2017; Suseno & Standing, 2018).

2.3.1 Design Innovation Ecosystem

Most research on innovation ecosystems has been conducted in the context of high technology. Regarding the design discipline, few studies have been involved. Innovation ecosystem at the national level was defined as "*the stakeholders, context(s)*

and interactions required to support design as an enabler of people centered-innovation" (Evans & Chisholm, 2016). Another definition based on social enterprise was provided as " *(DInE) is an environment that initiates and supports the design of… enterprises to promote their growth*" (Kwon et al., 2021). Both definitions stress supporting design, which can be interpreted as the aim and function of the design innovation ecosystem. Design users, support, promotion, stakeholders, designers, education, research, policy, and funding were mapped as components (Whicher, 2017; Whicher & Walters, 2017). Compared to the abundant research on the innovation ecosystem, research on the design innovation ecosystem appears insufficient and unsatisfying.

Even less is known about the design innovation ecosystem in the fashion sector. When searching for the design innovation ecosystem and fashion in the Web of Science, the only publication was the investigation of brokerage that contributed to the design diffusion (S. Lin, 2018). A comparable study is the Entrepreneurial Ecosystem (EE) in the context of Toronto's fashion industry (Brydges & Pugh, 2021). Considering impoverished handloom artisans, an empirical investigation discovered that a producer ecosystem had been built unintentionally along a problem-solving path after the development of the market and organization (Ramachandran et al., 2012). The role of design in the Entrepreneurship Ecosystem was emphasized in the similar context of a

less developed country (Nthubu, 2021; Nthubu et al., 2022). The fragmentation and deficiency of research inform that a FDIE is required to explore the profound FDI process, inputs and outcomes, the relationships and interactions among various stakeholders, as well as activities and events. In addition to existing theories on the fashion sector, such as supply chain and industry cluster, the alternative theoretical orientation may benefit policymakers and practitioners who embed and engage FDIE from an open, cross-disciplinary, and co-evolutionary perspective. It also presents the theoretical funneling from the innovation ecosystem into FDIE. Because this study focuses on fashion goods rather than a specific firm like a focal firm, positions in Adner's construction and competitors in most research are excluded. Consequently, regarding the research question of "how to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?", propositions are established as below.

Proposition 2: Components of Fashion Design Innovation Ecosystem (FDIE) consist of stakeholders, activities, and resources.

Proposition 2.1: Fashion Design Innovation Ecosystem (FDIE) includes stakeholders, such as companies, suppliers, users, the government, and universities.

Proposition 3: Fashion Design Innovation Ecosystem (FDIE) is diverse, interactive, and expansion-capable.

2.4 Policy-driven Innovation

Innovation according to its drivers could be categorized as technology-driven, design-driven, market-driven, and customer-driven (Norman & Verganti, 2014; Verganti, 2008, 2011). While there is no policy-driven innovation identified and studied in the fashion field. Borrowing the stakeholder theory lens in innovation ecosystem research helps to understand governance structure and value creation (Freeman, 2010). Stakeholders in the design innovation ecosystem consist of firms, users, universities, research institutes, and the government (Adner, 2017). Triple Helix and subsequent Quadruple Helix, namely Model 2 and Model 3, recommended the inclusiveness of government to promote innovation and innovation ecosystem (Carayannis & Campbell, 2009; Etzkowitz & Leydesdorff, 2000). Fruitful research has been dedicated to the relationship between governmental policy and innovation (Xiong & Xia, 2020). The importance of innovation in policy-making was investigated (Whitham et al., 2019). However, how policy and government intervene in fashion innovation is barely studied.

By comparing policy-driven and spontaneous clusters, cluster research has explicitly clarified the former connotation. The policy-driven type was developed as a result of government's initiatives, whereas the latter type was prompted spontaneously by stakeholders in a geographic location (Hassan & Abu Talib, 2015; Huang et al., 2012;

Su & Hung, 2009). Comparing the policy-driven category to the researcher-driven category revealed a new perspective on the policy-driven category (Moatti et al., 1994). However, in a relatively mild institutional environment, energy policy was found to have a moderate inhibition on firm innovation (Zhang et al., 2020). Using patent data demonstrated the policy-driven effect of catch-up instead of incentive on innovation (de la Tour et al., 2011).

The policy-driven research field has expanded globally and been empirically validated in Malaysia and Croatia, among other nations (Anić et al., 2019; Hassan & Abu Talib, 2015; Omar et al., 2017). EU member states and China contributed the majority of research in the policy-driven field. EU capitalized on policy-driven practices and attracted scholars to explore, investigate, and exploit policy-driven study (Georghiou, 2001; Marin et al., 2015). National-level research networks such as the EU policy-driven model of Framework Programmes (FPs), demonstrated their effectiveness in terms of participant engagement, evolutionary approach, and innovation. Government intervention has transformed China from an innovation follower to an innovator as a developing country (Quitzow, 2015). Hong Kong and Singapore were contrasted to illustrate the impact of government intervention on innovation, with more intervention having a beneficial effect in Singapore (Wang, 2018). Scholars in Malaysia have been

passionate about policy-driven research due to the Multimedia Super Corridor (MSC Malaysia) (Hassan & Abu Talib, 2015; Omar et al., 2017).

From the industrial perspective, researchers focused on the biomedical industry, the energy industry, the electric vehicle industry, and the environment-related industry, and adopted a supply-demand framework. Particularly, photovoltaics (PV) was believed to be a policy-driven industry, that influenced the market from the supply side (Quitzow, 2015; P. Wang et al., 2017). Comparing design policies in the UK and China using the identical demand-supply model revealed that demand-side policies were more effective (Sun, 2010). The integration of demand-pull and government policy, i.e. the government exerting as a customer, sparked both customer-driven and policy-driven innovation (Omar et al., 2017). The objective of the "Innovation-demand-policy" (IDP) framework was to explore drivers of the innovation ecosystem in the new energy vehicle industry, which compassed technology innovation, the market, and policy (Wu et al., 2018). "Industry-specific institutional policy" improved innovation performance (Yi et al., 2020).

Regarding the policy-driven linkage between universities and industry, several levels of government have contributed distinguished performance to the regional innovation system, which called for balanced development with policy support (Sohn et al., 2009). Moreover, a policy-driven agency or a policy-driven broker was necessary to

coordinate stakeholders (Klitkou & Godoe, 2013; Leick & Gretzinger, 2020). As a policy-driven tool, Industry 4.0 institutionalized an innovation system involving these stakeholders (Reischauer, 2018). Two policy-driven innovation networks were evaluated through structure and composition (van der Valk et al., 2011). Furthermore, a policy-driven innovation ecosystem was proposed and verified in the context of vaccine development (Li & Garnsey, 2014).

Resource theory was integrated with policy and innovation. Based on resource-based theory, policy embeddedness built a regional network for the knowledge exchange of Information and Communication Technology (ICT) (Larty et al., 2017). Based on resource dependence theory, innovation in small firms in Taiwan would benefit relatively more from policy-driven parks (Huang et al., 2012); credibility and legitimacy played a key role in the policy-driven innovation network in the context of the Dutch electric vehicle industry (van Rijnsoever et al., 2014).

Regarding the fashion-related sector, few studies disperse and no mechanism or pathway has been formulated. Environmentally sensitive fiber was recognized as a policy-driven innovation (Geum et al., 2016). An extreme case referred to oligarchy in Indonesia caused discrepancies in the growth of clothing businesses in two provinces (Achwan, 2013). In addition, it was revealed that despite the government's establishment of an R&D center to incentivize textiles and clothing, as innovation

output, patents in Hong Kong did not significantly surpass those in Singapore due to insufficient policies (Wang, 2018). In order to flourish the fashion industry, British policies advocated cross-border knowledge transfer, especially the movement of fashion designers, and through the education system (McRobbie, 2016).

Although policy-driven innovation and related topics have been extensively investigated, no clear definition and mechanism have emerged. Few studies have explored policy-related FDI and FDIE, regardless of the intimate bundle of fashion and politics, and whether the policy-driven effect was positive or negative. The interdisciplinary path that combined policy, resources, innovation, and fashion functioned as a black box and urged investigation (Teixeira & Silva, 2013). In order to answer the research question "how to facilitate Fashion Design Innovation (FDI) through an ecosystem lens", one of the goals of this research is to fill in those research gaps by exploring the channel of a stakeholder, the government, to innovation in FDIE. Overall, the fourth proposition is generated as below.

Proposition 4: The government positively drives Fashion Design Innovation (FDI).

2.5 Theoretical Framework

The multidisciplinary literature review in three fields is synthesized into one theoretical model based on an 'ecosystem as structure' view and the research questions: "what Fashion Design Innovation (FDI) is?" and "how to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?", as shown in Figure 2.2 (Adner, 2017).

The conceptual map combines and visualizes pertinent themes, including FDI and innovation ecosystem (Maxwell, 2013). It presents two primary parts: the left part focuses on FDI, which necessitates a comprehensive investigation from an overview perspective because different categories of FDI are comprised of distinctive stakeholders, activities, and resources; the right part explores FDIE, which includes stakeholders, activities, and resources that can contribute to FDI. These two parts are connected by the logic that stakeholders, activities, and resources in the proposed FDIE depend on what FDI in the left part is. For instance, in the FDIE paradigm, the material category of FDI requires stakeholders such as scientists, raw material suppliers, and yarn manufacturers, as well as activities such as R&D. It is not about the specifics of FDI, such as the technical path, but rather FDI from the perspective of strategic management. In reverse, stakeholders, activities, and resources of the proposed FDIE on the right motivate the FDI categories on the left. The line connecting FDI and FDIE illustrates their reciprocal relationship.

A channel from the government in FDIE to FDI fosters the policy-driven FDI, as presented by the blue lines. The path mediated by policy connects FDI to the stakeholder. The policy-driven roadmap expands the interpretation of the FDIE mechanism, either from an input-output or supply-demand perspective. Governmental embeddedness, such as the relationship between the government and other stakeholders, together with activities such as financial support, provide both essential and complementary resources to encourage FDI categories identified in the preceding literature analysis.

Using three studies and based on the framework and research questions, propositions are set to elaborate FDI and form FDIE. The purpose of Studies 1 and 2 is to address the research question and proposition 1 on FDI. Study 3 attempts to explore the proposed FDIE and the policy-driven FDI initiated by the governmental stakeholder, taking into account the research question and propositions 2, 2.1, 3, and 4, regarding FDIE.

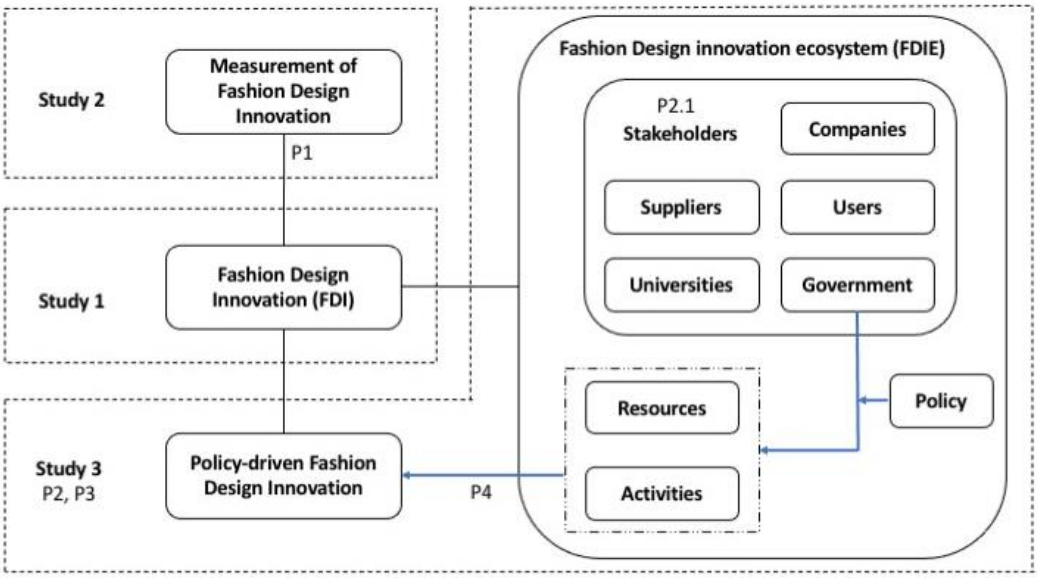


Figure 2.2 The theoretical framework of Fashion Design Innovation Ecosystem (FDIE)

2.6 Chapter Summary

The chapter illuminates three domains: design innovation, innovation ecosystem, and the policy-driven innovation, and attempts their synergy to introduce the Fashion Design Innovation Ecosystem (FDIE). Five propositions are generated based on the literature review regarding the evaluation of FDI, components, and characteristics of FDIE, and policy-driven FDI path. Finally, a theoretical framework is established for further research in the following chapters.

Chapter 3

Study1 Fashion Design Innovation Literature Review

3.1 Chapter Introduction

This chapter discusses the methodology and findings of Study 1. Design innovation in the fashion industry has not garnered much interest. Study 1 examines literature about design innovation in the fashion domain and categorizes research groups in this area using the prevalent literature analysis software, namely CitNetExplorer and VOSviewer, as well as the subjective method, in order to investigate the academic development. This chapter elaborates on research design, data collection, and data analysis, introduces paper distribution by year, journal, and region, illustrates two clusters and three main paths, and proposes the domains of FDI.

3.2 Methodology

3.2.1 Research Design

Before the investigation of the phenomena of interest, it is necessary to generate new concepts and constructs. A concept is a more generic, less well-defined notion that depicts or interprets reality, whereas a construct delineates a domain of traits that may be measured similarly to a quantified variable. Both the concept and the construct present parsimony and consensus. It is believed that the concept precedes the construct and that it is essential to first discover the concept that can guide the design and validation of the construct (Gioia et al., 2013).

The research method was inductive and bottom-up. The steps included data collection, data analysis, and conclusion, as shown in Figure 3.1. The sample pool was restricted to the Web of Science (WOS) database, considering academic authority and internal validity.

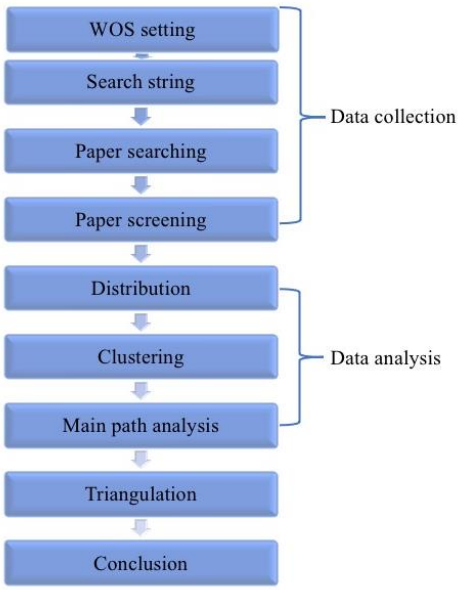


Figure 3.1 Study 1 research process

3.2.2 Data Collection

The procedure of data collection consisted of the search setting, the determinant of the search string, as well as the refinement and execution, as illustrated in Table 3.1. The precise steps began with identifying the target literature using Web of Science due to its rich metadata and strong academic influence. The advanced search from the Web of Science's core collection was used to collect data. The Conference Proceeding Index for Science (CPCI-S) and Conference Proceedings Citation Index – Social Science & Humanities (CPCI-SSH) were omitted. The literature was retrieved without a timeframe that could be traced back to the earliest record in WOS, in order to produce a relatively complete result and explore the status quo of FDI. The WOS database contains records dating back to 1970, which is the earliest year available. Only published journal papers should be included.

Keywords included fashion, design, and innovation. The expansion was conducted with synonyms of "fashion", such as apparel, cloth, clothing, clothes, and garment. The terms "costume" and "attire" were excluded since they refer to subjects unrelated to the industry. The search utilized a topic search which covered title, keyword, and abstract. Boolean operators, such as OR and AND, were used to connect the keywords in order to broaden and narrow down the search. Using the article type as a filter, conference

papers were eliminated. The search string was “TS=((fashion* OR apparel* OR clothes OR clothing OR garment*) AND design AND innovat*) AND DOCUMENT TYPES: (Article)”. The literature search in Web of Science was conducted in December 2020. The outcome was 915 papers.

Table 3.1 Flow of data collection

Phase 1 Search setting	Web of Science core collection
	Advanced search
	Language & file type
	Time span
	Citation indexes
Phase 2 Determinant of search string	Test & overview
	Expansion with synonyms of “fashion”
	Narrowing down with “design” and “innovation”
	Alarm
Phase 3 Refinement & execution	Only including published journal papers
	Exclusion of irrelevant journals
	Adding the selected articles to the “marked list”
	Export to the marked list
	Saving pdf file

Table 3.2 Journal list for refinement

Fashion and textile domain	Title with “innovation”
JOURNAL OF FASHION MARKETING AND MANAGEMENT	JOURNAL OF PRODUCT INNOVATION MANAGEMENT
FASHION PRACTICE THE JOURNAL OF DESIGN CREATIVE PROCESS THE FASHION INDUSTRY	EUROPEAN JOURNAL OF INNOVATION MANAGEMENT
INTERNATIONAL JOURNAL OF CLOTHING SCIENCE AND TECHNOLOGY	CREATIVITY AND INNOVATION MANAGEMENT
INDUSTRIA TEXTILA	INDUSTRY AND INNOVATION
RESEARCH JOURNAL OF TEXTILE AND APPAREL	TECHNOVATION
FASHION THEORY THE JOURNAL OF DRESS BODY CULTURE	
FIBRES TEXTILES IN EASTERN EUROPE	Management and business domain
CLOTHING AND TEXTILES RESEARCH JOURNAL	JOURNAL OF CLEANER PRODUCTION
FASHION STYLE POPULAR CULTURE	SUSTAINABILITY
JOURNAL OF THE TEXTILE INSTITUTE	INTERNATIONAL JOURNAL OF RETAIL DISTRIBUTION MANAGEMENT
TEXTILE CLOTH AND CULTURE	MANAGEMENT DECISION
FASHION AND TEXTILES	JOURNAL OF BUSINESS INDUSTRIAL MARKETING
JOURNAL OF GLOBAL FASHION MARKETING	PRODUCTION PLANNING CONTROL

TEXTILE RESEARCH JOURNAL	INTERNATIONAL JOURNAL OF OPERATIONS PRODUCTION MANAGEMENT
CLOTHING CULTURES	EUROPEAN PLANNING STUDIES
INTERNATIONAL JOURNAL OF FASHION STUDIES	INTERNATIONAL JOURNAL OF CONSUMER STUDIES
TEKSTILEC	MARKETING INTELLIGENCE PLANNING
TEXTILE HISTORY	ORGANIZATION STUDIES
DRESS THE JOURNAL OF THE COSTUME SOCIETY OF AMERICA	ASIA PACIFIC JOURNAL OF MARKETING AND LOGISTICS
FILM FASHION CONSUMPTION	CHINESE MANAGEMENT STUDIES
	EUROPEAN JOURNAL OF MARKETING
Design domain	JOURNAL OF BUSINESS RESEARCH
DESIGN JOURNAL	JOURNAL OF KNOWLEDGE MANAGEMENT
ART DESIGN COMMUNICATION IN HIGHER EDUCATION	JOURNAL OF PRODUCT AND BRAND MANAGEMENT
CRAFT RESEARCH	REGIONAL STUDIES
JOURNAL OF DESIGN HISTORY	RESEARCH POLICY
	SUPPLY CHAIN MANAGEMENT
	TECHNOLOGY ANALYSIS STRATEGIC MANAGEMENT
	BUSINESS PROCESS MANAGEMENT JOURNAL

Further refinement was performed by selecting journals in the domains of fashion and textile, art and design, and management, as well as journals with “innovation” in the title, as shown in Table 3.2. A total of 51 journals were recognized. Those journals such as EXPERIMENT TECHNIQUES, APPLIED ENERGY, and ELECTROCHIMICA ACTA, were excluded. The rationale for such a broad scope of journals was to avoid relying on a small number of papers from a relatively narrow range of journals, such as the top ten journals, which would cause even worse results in the subsequent analysis by CitNetExplorer and VOSviewer. Consequently, 274 papers were identified.

Twelve papers with “early access” icons in the marked list were removed because CitNetExplorer would collapse if they were included. The final result was 262. The marked list was exported using the “Tab-delimited(Win)” option and the “full record and cited references” option. CitNetExplorer and VOSviewer used the saved file for the data analysis that follows.

3.2.3 Data Analysis

To explore the status quo of FDI, firstly the literature analysis using CitNetExplorer was objectively undertaken. CitNetExplorer is a professional software for literature network analysis. Its functions include clustering, grouping, and conducting path analysis. Data was analyzed automatically by the application.

The co-occurrence function in VOSviewer enables all keywords to be constructed and visualized their density. Additional exploration of prominent keywords that are highlighted in the density map creates overlay networks to show connections between these keywords. The overlay visualization also indicates the concentration of published years for each keyword. The co-authorship network is used to discover the area in which the most influential authors are engaged. Therefore, these findings confirm the output of CitNetExplorer and the results of manual grouping.

The publications that could not be clustered objectively by the software were manually examined in a subjective way. A staged review was performed based on the cluster result from CitNetExplorer. First, the titles were scrutinized to determine which cluster they were pertinent to. Next, keywords and abstracts were initially read for confirmation or discard. If the publication remained ungrouped, less scrutiny was placed on the introduction, methodology, and findings. A more thorough examination was conducted by reading the entire article. During the initial review and in-depth review, more themes were identified and critically evaluated compared to the clusters identified by CitNetExplorer, such as traditional culture. The operations of drilling down, grouping and ungrouping, selecting, and clearing selection were iterated during the process of data analysis.

The following result is based on the analysis by CitNetExplorer and the researcher's manual grouping.

3.3 Results

915 papers were extracted from the WOS core collection with the previous settings of article type and indexes for SCI-EXPANDED, SSCI, A&HCI, and ESCI within the period of 1970 to 2020. The earliest paper in the retrieved result is traced back to 1996, suggesting that this is a relatively recent research area. After the refinement by journals, a total of 274 papers were located, which represents one-third of the original number of results. Due to the inability of CitNetExplorer to process publications with the "early access" icon, which causes the software application to fail, therefore, these papers must be excluded from the marked list. As a result, a total of 262 were retained for further analysis of distribution and clustering. The percentages in Table 3.3 show that the decreasing amount of sample may potentially threaten the external validity of this selection method.

Table 3.3 Results of data collection

Process	#	% to the previous result	% to the result of the search string
Search string	915		
Refinement by journals	274	30	
Marked list by excluding “early access”	262	95.6	28.6

3.3.1 Distribution of Publications

The following analysis of paper distribution is based on 262 publications on the marked list in WOS.

3.3.1.1 Distribution by Year

The papers on the marked list date back to 1996, indicating a relatively new research field. From 2014 to 2015, the number of papers dramatically grew from 9 to 23. In 2018, 42 papers were published, presenting a steady increase. While the number of 33 decreases slightly in 2019 and 2020. Further research can explore potential reasons, such as the influence of COVID19, as shown in Figure 3.2 and Table 3.4.

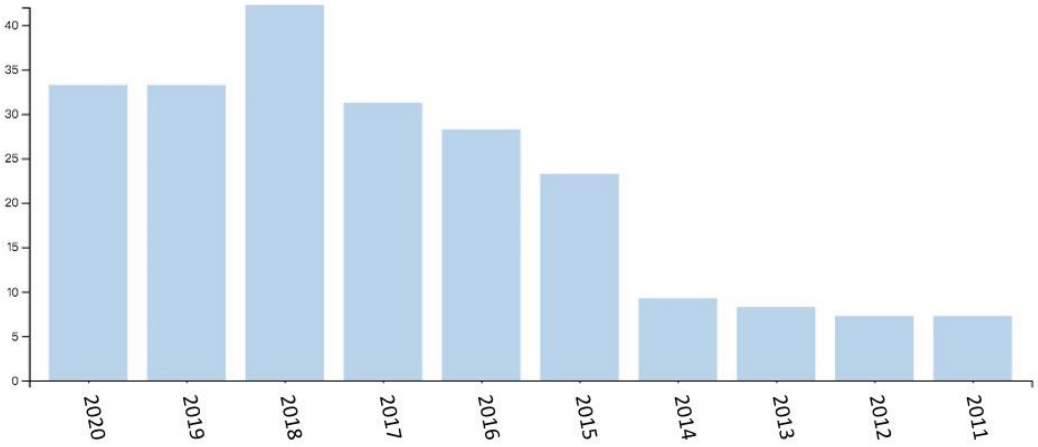


Figure 3.2 Distribution chart by year (Source: WOS)

Table 3.4 Distribution by year (Source: WOS)

Select	Field: Publication Years	Record Count	% of 262	Bar Chart
☐	2020	33	12.595 %	
☐	2019	33	12.595 %	
☐	2018	42	16.031 %	
☐	2017	31	11.832 %	
☐	2016	28	10.687 %	
☐	2015	23	8.779 %	
☐	2014	9	3.435 %	
☐	2013	8	3.053 %	
☐	2012	7	2.672 %	
☐	2011	7	2.672 %	
☐	2010	8	3.053 %	
☐	2009	6	2.290 %	
☐	2008	7	2.672 %	
☐	2007	5	1.908 %	
☐	2006	3	1.145 %	
☐	2005	2	0.763 %	
☐	2003	3	1.145 %	
☐	2002	1	0.382 %	
☐	2001	1	0.382 %	
☐	2000	1	0.382 %	
☐	1999	2	0.763 %	
☐	1998	1	0.382 %	
☐	1996	1	0.382 %	

3.3.1.2 Distribution by Journal

The list of the top ten sources includes 7 journals in the clothing and textile domain. The Journal of Fashion Marketing and Management has 17 papers, followed by the Fashion Practice with 15 papers and the International Journal of Clothing Science and Technology with 14 papers. The fifth-ranked Journal of Cleaner Production has 11 papers. The Design Journal with 10 papers, ranks sixth. There are 8 papers in the International Journal of Retail Distribution Management. Because of the precedent selection of source titles during the process of refinement, this distribution highlights "sustainability" and "business". There is little difference between two adjacent journals; 1 to 3 papers fill in the gap, as shown in Figure 3.3 and Table 3.5.

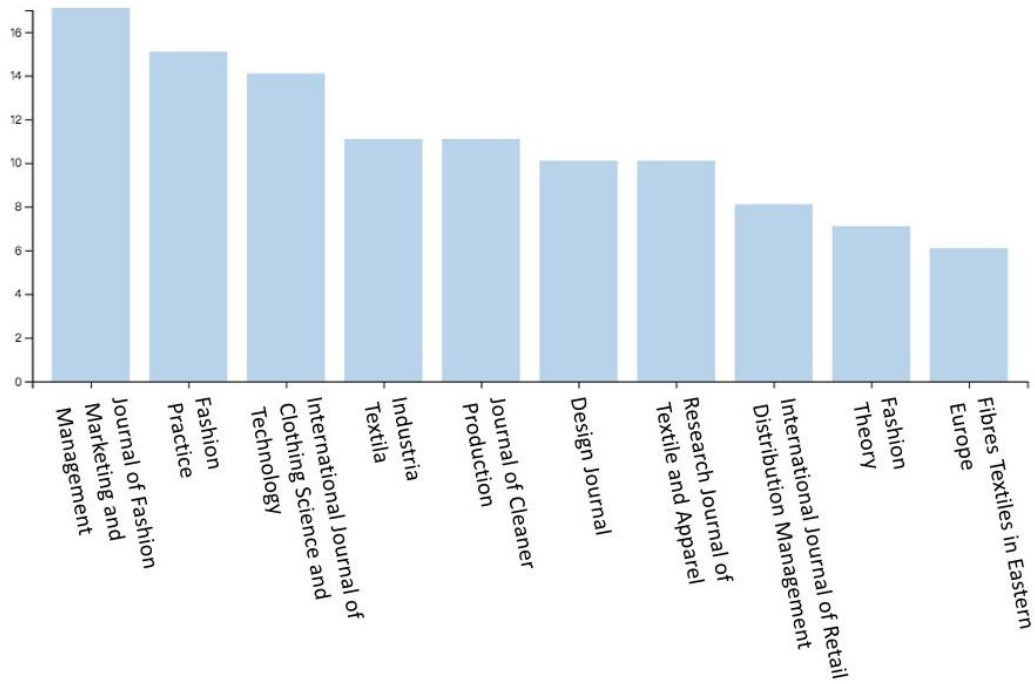


Figure 3.3 Distribution chart by journal (Source: WOS)

Table 3.5 Distribution by journal (Source: WOS)

Select	Field: Source Titles	Record Count	% of 262	Bar Chart
☐	JOURNAL OF FASHION MARKETING AND MANAGEMENT	17	6.489 %	
☐	FASHION PRACTICE THE JOURNAL OF DESIGN CREATIVE PROCESS THE FASHION INDUSTRY	15	5.725 %	
☐	INTERNATIONAL JOURNAL OF CLOTHING SCIENCE AND TECHNOLOGY	14	5.344 %	
☐	INDUSTRIA TEXTILA	11	4.198 %	
☐	JOURNAL OF CLEANER PRODUCTION	11	4.198 %	
☐	DESIGN JOURNAL	10	3.817 %	
☐	RESEARCH JOURNAL OF TEXTILE AND APPAREL	10	3.817 %	
☐	INTERNATIONAL JOURNAL OF RETAIL DISTRIBUTION MANAGEMENT	8	3.053 %	
☐	FASHION THEORY THE JOURNAL OF DRESS BODY CULTURE	7	2.672 %	
☐	FIBRES TEXTILES IN EASTERN EUROPE	6	2.290 %	
☐	JOURNAL OF BUSINESS INDUSTRIAL MARKETING	6	2.290 %	
☐	JOURNAL OF PRODUCT INNOVATION MANAGEMENT	6	2.290 %	
☐	MANAGEMENT DECISION	6	2.290 %	
☐	PRODUCTION PLANNING CONTROL	6	2.290 %	
☐	SUSTAINABILITY	6	2.290 %	
☐	CLOTHING AND TEXTILES RESEARCH JOURNAL	5	1.908 %	
☐	FASHION STYLE POPULAR CULTURE	5	1.908 %	
☐	INDUSTRY AND INNOVATION	5	1.908 %	
☐	INTERNATIONAL JOURNAL OF OPERATIONS PRODUCTION MANAGEMENT	5	1.908 %	
☐	JOURNAL OF THE TEXTILE INSTITUTE	5	1.908 %	
☐	TEXTILE CLOTH AND CULTURE	5	1.908 %	
☐	CREATIVITY AND INNOVATION MANAGEMENT	4	1.527 %	
☐	EUROPEAN PLANNING STUDIES	4	1.527 %	
☐	FASHION AND TEXTILES	4	1.527 %	
☐	INTERNATIONAL JOURNAL OF CONSUMER STUDIES	4	1.527 %	

3.3.1.3 Distribution by Region

England, the USA, and Italy occupy the top 3 positions in this distribution, respectively, with numbers of 56, 53, and 45 papers; the overall proportion is 58.8%; 6 out of 10 papers originate from these three regions. If English and Scottish papers are counted together, there will be 59 of them; the UK will list the top one. This is reasonable, given that the apparel and textile industry in the UK predates the Industrial Revolution, and the establishment and definition of the creativity industry originated in the UK. Over 87% of the papers come from Europe and the US. 43 papers from Asia, including China, South Korea, Taiwan China, India, Japan, and Sri Lanka, account for 16.4% of the total. There are only 5 papers from Brazil in South America and none from Africa in the top 25. The regional distribution is shown in Figure 3.4 and Table 3.6. It may indicate that FDI as a research domain mainly locates in regions with a well-developed fashion design industry. The distribution indicates an implicit relationship with three leading fashion activities, namely London Fashion Week, New York Fashion Week, and Milan Fashion Week, which is evidence of practice-oriented theoretical research. Despite being a leading fashion capital and metropolitan area, Paris has comparatively few academic accomplishments.

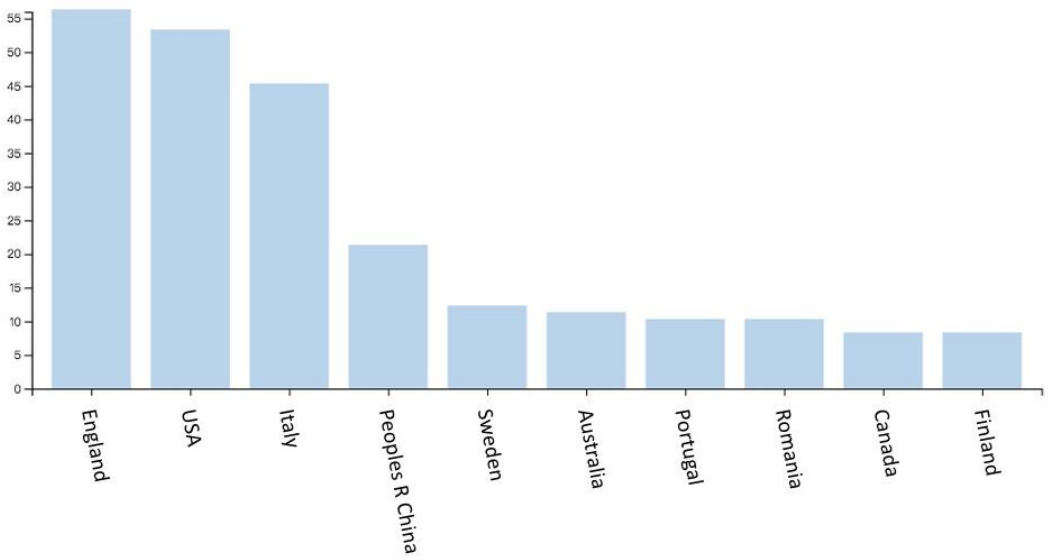


Figure 3.4 Distribution chart by region (Source: WOS)

Table 3.6 Distribution by region (Source: WOS)

☐	ENGLAND	56	21.374 %	
☐	USA	53	20.229 %	
☐	ITALY	45	17.176 %	
☐	PEOPLES R CHINA	21	8.015 %	
☐	SWEDEN	12	4.580 %	
☐	AUSTRALIA	11	4.198 %	
☐	PORTUGAL	10	3.817 %	
☐	ROMANIA	10	3.817 %	
☐	CANADA	8	3.053 %	
☐	FINLAND	8	3.053 %	
☐	SOUTH KOREA	8	3.053 %	
☐	FRANCE	6	2.290 %	
☐	POLAND	6	2.290 %	
☐	BRAZIL	5	1.908 %	
☐	NETHERLANDS	5	1.908 %	
☐	DENMARK	4	1.527 %	
☐	GERMANY	4	1.527 %	
☐	INDIA	4	1.527 %	
☐	NEW ZEALAND	4	1.527 %	
☐	SPAIN	4	1.527 %	
☐	TAIWAN	4	1.527 %	
☐	JAPAN	3	1.145 %	
☐	SCOTLAND	3	1.145 %	
☐	SLOVENIA	3	1.145 %	
☐	SRI LANKA	3	1.145 %	

3.3.1.4 Distribution by Domains

Sorting by WOS, the majority of research areas or categories of results includes business (44.7%), materials (21.8%), and art humanity (17.18%), as shown in Figures 3.5, 3.6, and Tables 3.7, 3.8.

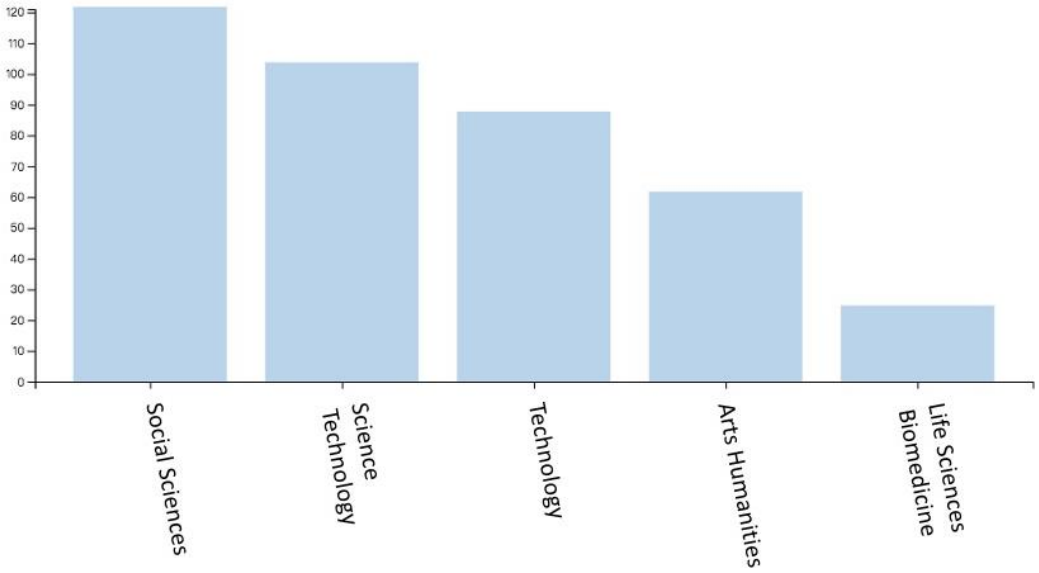


Figure 3.5 Distribution chart by general categories (Source: WOS)

Table 3.7 Distribution by general categories (Source: WOS)

Select	Field: General Categories	Record Count	% of 262	Bar Chart
☐	SOCIAL SCIENCES	121	46.183 %	
☐	SCIENCE TECHNOLOGY	103	39.313 %	
☐	TECHNOLOGY	87	33.206 %	
☐	ARTS HUMANITIES	61	23.282 %	
☐	LIFE SCIENCES BIOMEDICINE	24	9.160 %	

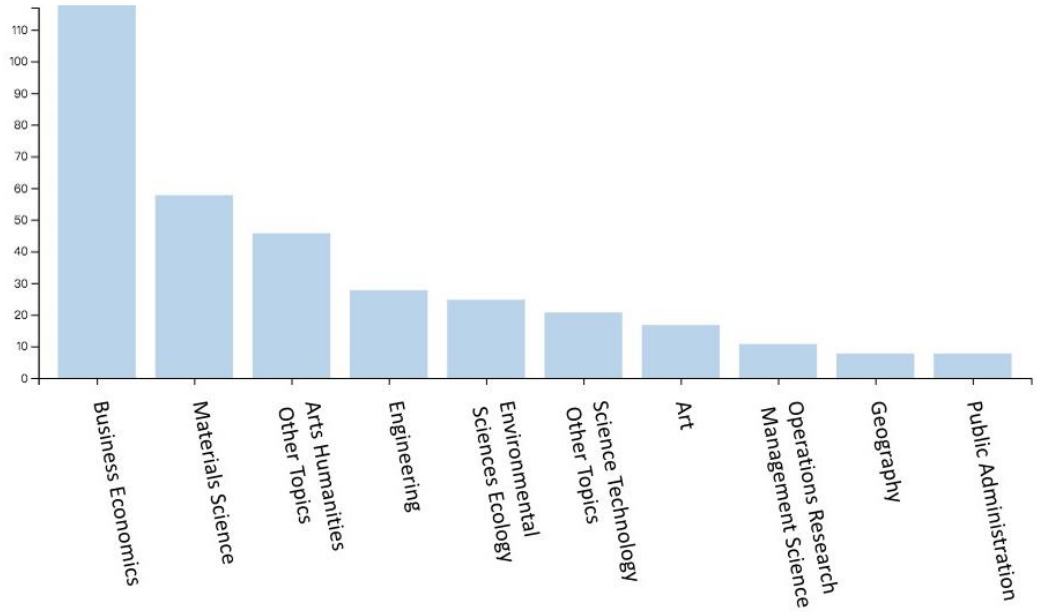


Figure 3.6 Distribution chart by research areas (Source: WOS)

Table 3.8 Distribution by research areas (Source: WOS)

Select	Field: Research Areas	Record Count	% of 262	Bar Chart
☐	BUSINESS ECONOMICS	117	44.656 %	
☐	MATERIALS SCIENCE	57	21.756 %	
☐	ARTS HUMANITIES OTHER TOPICS	45	17.176 %	
☐	ENGINEERING	27	10.305 %	
☐	ENVIRONMENTAL SCIENCES ECOLOGY	24	9.160 %	
☐	SCIENCE TECHNOLOGY OTHER TOPICS	20	7.634 %	
☐	ART	16	6.107 %	
☐	OPERATIONS RESEARCH MANAGEMENT SCIENCE	10	3.817 %	
☐	GEOGRAPHY	7	2.672 %	
☐	PUBLIC ADMINISTRATION	7	2.672 %	
☐	SOCIAL SCIENCES OTHER TOPICS	5	1.908 %	
☐	URBAN STUDIES	4	1.527 %	
☐	INFORMATION SCIENCE LIBRARY SCIENCE	3	1.145 %	

3.3.2 Groups

3.3.2.1 Objective-grouping Clusters

CitNetExplorer clustering outputs two distinct clusters, encompassing the topics of sustainability and the design domain. Figure 3.7 depicts the configuration of CitNetExplorer's clustering with a resolution of 1.00 and a minimum cluster size of 10. There are a total of 91 citation links among the recognized papers. 202 out of 262 publications were not affiliated with any cluster. The clustering results obtained by using CitNetExplorer are displayed in Table 3.9.

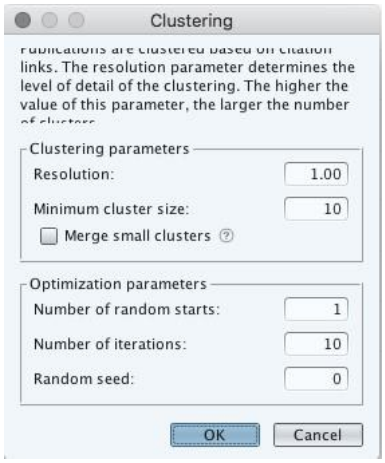


Figure 3.7 Clustering setting in CitNetExplorer

Table 3.9 Clustering results by CitNetExplorer

Cluster		Paper #	Citation links	yr	Subcluster
1	Fashion design innovation (FDI) related to sustainability	31	44	2011	Design, product development, materials, business, supply chain
2	Fashion design innovation (FDI) in the design domain	29	39	1999	Stylistic domain/ NPD, technology, region

Cluster 1: Fashion Design Innovation (FDI) Related to Sustainability

Cluster 1 has 31 papers with 44 citation links. The visualization is shown in Figure 3.8. FDI related to sustainability is a rising domain with a duration of 13 years. The earliest paper on the topic is Niinimaki's "Emerging design strategies in sustainable production and consumption of textiles and clothing", exploring a broad spectrum of sustainability issues, involving design strategy, production, and consumption, with a focus on benefiting both the customer and the environment (Niinimaki & Hassi, 2011). Therefore, this publication has garnered an antecedent position with a high citation score of 14. Social and environmental barriers and opportunities are indicated in the fashion industry's design and production sectors through experts' online study. These include knowledge transfer but do not extend to upstream suppliers and downstream

consumers (Pedersen & Andersen, 2015). Subcategories have been identified within this cluster pertinent to sustainability and FDI.

Cluster 1-1: Design and Materials

It is worth noting that there is a focus on design, product development, and materials concerning sustainability. Kozlowski et al.'s research on innovative tools in the fashion industry concerning sustainability is fruitful. The authors explain a set of tools called reDesign canvas that is specifically designed for micro-sized companies. These tools aim to assist in brand building and provide universal, participatory, and evaluative capabilities for fashion designers (Kozlowski et al., 2019). The Eileen Fisher case upgraded the relationship between designers and upper suppliers from a distant distance to a hand-in-hand one and led to form a sustainable design strategy (Curwen et al., 2013). Being a Co-design fashion designer entails possessing a range of competencies, such as holistic thinking, process management, active interaction and facilitation among stakeholders, and integration of sources and information (Lee et al., 2018). An open and democratic design strategy of creating value through consumer involvement is facilitated by do-it-yourself (DIY), do-it-together (DIT), and participatory design (Hirscher et al., 2018). Digital innovation in the value chain is exemplified through various scenarios such as design and pattern making, from the perspectives of challenges, competencies, and opportunities (Larsson, 2018). Research on post-

consumer material was prompted by the recognition of textiles as priority materials for reuse and recycling by the UK government agency WRAP (Waste & Resources Action Programme), with the goal of creating fashionable and commercial style (Han et al., 2017). There is only one paper exclusively related to innovative material, which specifies a tailor-shaped method aiming at zero-waste through the cultivation of bacterial cellulose (Chan et al., 2018).

Cluster 1-2: Product Management

Product Life Management (PLM) was not widely adopted until 2020, when two studies were published. These articles deal with product cycle management and assessment, respectively, marking the beginning of research on this enterprise-wide strategy in the manufacturing of the fashion industry. An empirical research in Brazil compares the impact of disposable diapers versus cloth diapers, deepening the product life paradigm from the perspective of assessment, through a method called Life Cycle Assessment (LCA), to explore a more eco-friendly business model (Hoffmann et al., 2020).

Product-Service system (PSS) is a business model that focuses on product life management at the retail-costumer level. PSS is viewed from two different perspectives: positive and negative. On the positive side, it is seen as a way to meet needs and increase satisfaction. On the negative side, there is a lack of trust in the service producer and

issues with ease of use. Conlon's paper solely consists of a literature review, which reveals a shift towards product service system and leads to the need for the coordination between academics and enterprise (Conlon, 2020). PSS is also understood differently by different age groups. The younger generation focuses on activities such as takeback, swaps, and consultancy, while the older generation is more concerned with redesign, maintenance, and customization (Armstrong et al., 2015). A novel PSS was introduced with three dimensions of orientation: product, usage, and result. However, it does not encompass the environment (Gaiardelli et al., 2014).

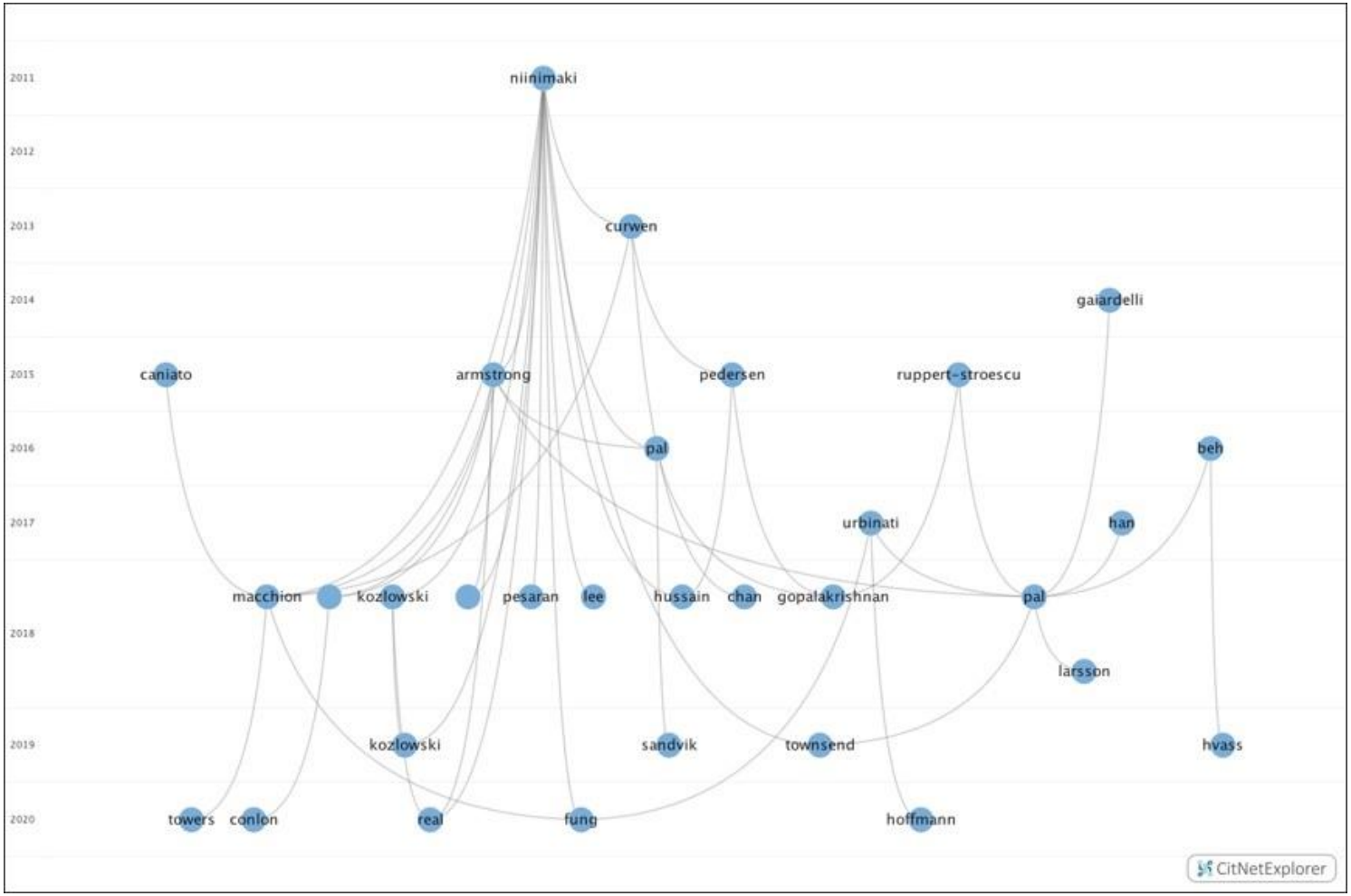


Figure 3.8 Visualization of Cluster 1

Cluster 2: Fashion Design Innovation (FDI) in the Design Domain

The cluster created by CitnetExplorer consists of 29 papers with 39 citation links. Figure 3.9 shows its visualization. The earliest paper was published in 1999. Design has been viewed as a critical strategy in the fashion industry, such as design-driven innovation. Investment in design has a favorable effect on five competitive capabilities: having a holistic view, understanding how people give meaning to things, utilizing new technology, visualizing and materializing, and effectively managing the design process (Landoni et al., 2016). The innovation capabilities also are influenced by both the diversity and density of the supply network (Delbufalo, 2015). Further analysis reveals that two sub-clusters can be derived as follows.

Cluster 2-1: Stylistic Domain and New Product Development (NPD)

Fashion aestheticizes daily life, and symbolizes status and identity, thus fosters a transition from top-down to bottom-up in post-modern society (Aage & Belussi, 2008). Aesthetic changes and symbolic elements of the product are involved in stylistic innovation. A mechanism of introduction and adoption of style is facilitated by the driver of convergence in stylistic innovation (Cappetta et al., 2006). The theoretical framework of stylistic innovation constitutes three elements: “creative sensing (inspiration-based), stylistic orchestrating (coherence-focused), and agile

synchronization (timing-driven)" (Tran, 2010). Fashion designer in small-scale brands tends to imitate the "star" storylines of large brands (Peirson-Smith, 2013). The governance of external resources and trends is expanded to include firm agents in order to design new products (Aage & Belussi, 2008). The relationship between an external source and a recipient is complementary and affects the performance of new products. This emphasizes the importance of design, and design knowledge thus is highlighted (Abecassis-Moedas & Ben Mahmoud-Jouini, 2008). Communities' communication and aesthetics are both tangible and intangible incentives to encourage innovation (Di Maria & Finotto, 2008). The registered community design provides legal protection for aesthetic innovation (Filitz et al., 2015). The fashion industry is characterized as a design-intensive industry that employs a strategy of combining innovation with tradition. This strategy tries to leverage historical knowledge and is measured by two indicators: the depth of design tradition and the intensity of design tradition (Magistretti et al., 2020). The choice of materials for fashion accessories has shifted towards a natural and organic trend, specifically wool fabric (Ribeiro et al., 2015).

Cluster 2-2: Technology

Technology innovation acts as a platform for design innovation (Rubera & Droge, 2013). Design innovation oriented by technology can be approached in two major ways: radical design of novelty or the revival of the old design. Additionally, materials have

a crucial role in technology innovation (Cautela et al., 2018). Technological dominant design experienced a phase of convergence (Cappetta et al., 2006). Distinct performance of technology innovation and design innovation, as well as their interaction, can be moderated by brand strategy. Design innovation plays a significant role in corporate branding but has no impact on noncorporate branding. The influence of design innovation on Tobin's diminished marginally as levels of technology innovation decreased. These decreasing marginal impacts may reflect constraints on expanding corporate brand names, as perceived by investors (Rubera & Droge, 2013). Regarding technology epiphanies, the exploration of underestimated meaning in technology can be managed by utilizing a platform that enables technology, double-sided networks, and new knowledge disciplines (Dell'Era et al., 2017). Digital technology in social media contributes to innovation in flexibility, supported by four factors: structure, behavior, cognition, and knowledge transformation (Scuotto et al., 2020).

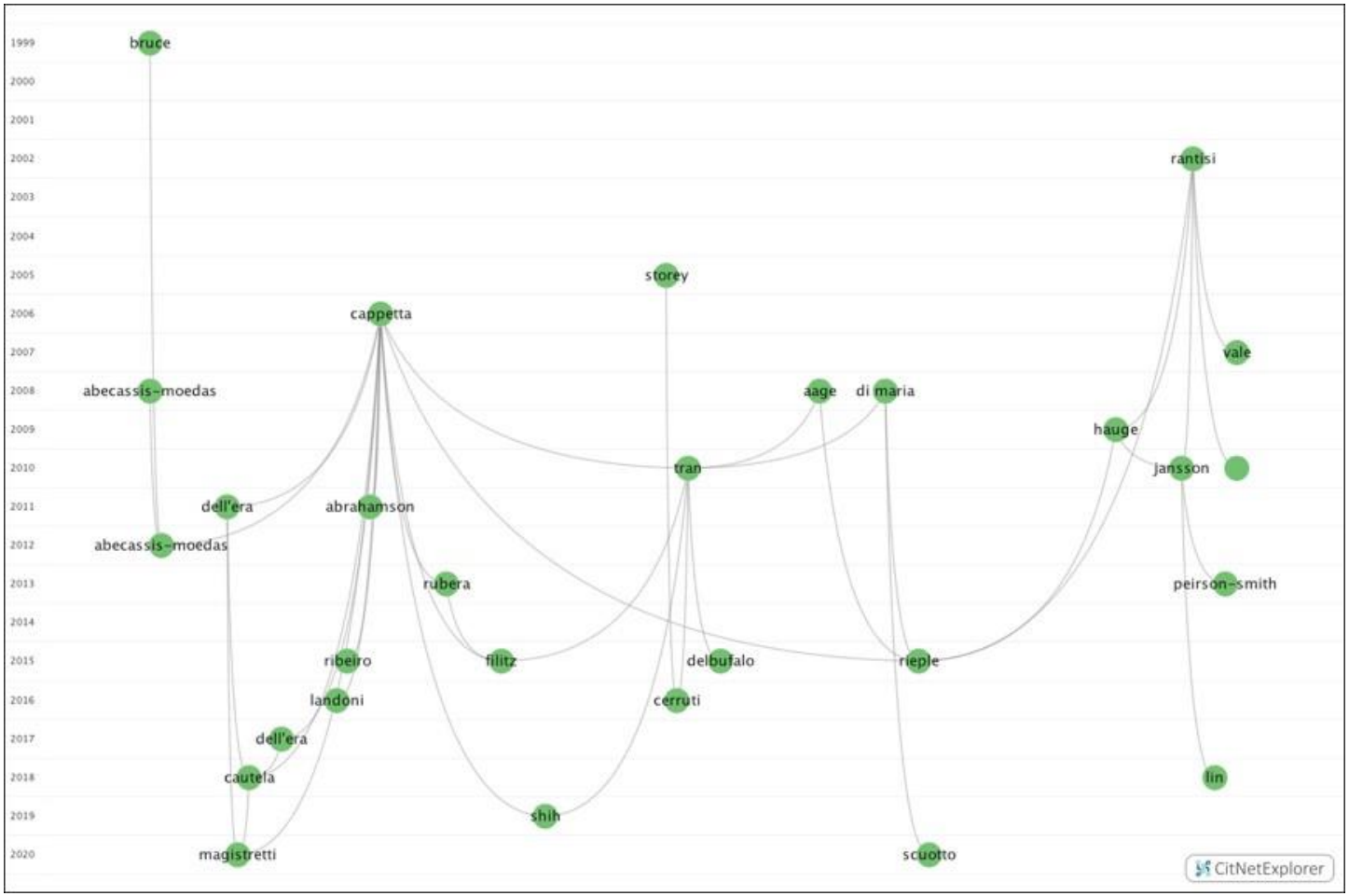


Figure 3.9 Visualization of Cluster 2

3.3.2.2 Subjective-grouping Categories

The majority of papers that were not grouped by CitNetExplorer, were subjectively classified into seven categories: technology, material, product development, tradition & craft and culture & history, region, business, and management, based on the clusters discovered through CitNetExplorer, as shown in Table 3.10.

The first category is technology-driven design innovation with 24 papers. Digital technology contributes new opportunities for design innovation, such as intelligent technology, interactive technology, big data, 3D technology, wearable technology, and smart garment technology. Six papers on IT topics such as mobile phone technology, social media, e-commerce, and mobile shopping are donated to the FDI advancement.

The material is rewarded in the second category with 20 papers that incentivize design innovation. These publications showcase innovative materials, such as cellulose, self-growth fiber, electronic optical fiber, and jacquard.

The product development category demonstrates a critical role in the FDI domain, as indicated by its 15 publications. Nine publications on the framework or mechanism of product development integrate the design and management theory with the fashion sector. Cooperation with users is synonymous with open innovation, a topic that has been examined in 4 papers.

The category with the highest number of publications consists of 15 papers in the tradition and craft subcategory and 29 papers in the culture and history subcategory. This category exerts a considerable influence on FDI since it has historically served as a source of inspiration and design innovation. For example, Fair Island knitwear and Hellenic textile have inspired creativity. Nevertheless, no inter-citation paths have been detected, indicating that the status quo is dispersing.

The regional category has 14 studies in China, Italy, England, Australia, New Zealand, Romania, South Africa, and Uzbekistan, exploring FDI pertinent to the local features. Nevertheless, similar to the prior category, no inter-citation paths have been discovered, suggesting that the geographical inherence of these two categories limited the referencing.

There are two distinct categories: business and management. Business models related to FDI encompass relevantly broad topics, such as consumer and consumption, retailing, and branding. Many researchers have studied the management domain at the company level. The supply chain is included. Sustainability is another valuable field to explore. Two papers linked to IP have been found. Two papers are relevant to the policy topic.

Table 3.10 Subjective-clustering results

Category		Publications
Technology		(Bertola & Teunissen, 2018; Colombi et al., 2018; Jain et al., 2018; Miell et al., 2018; Shin & Westland, 2017)
	Intelligent technology	(Fu & Liu, 2019)
	Interactive technology	(Yu et al., 2021)
	Big data	(Wang et al., 2018),
	3D technology	(Davis et al., 2020; Koncic & Scapec, 2018; Popescu, Niculescu, et al., 2017; Popescu et al., 2019; Sohn et al., 2020)
	Wearable technology	(Barile & Sugiyama, 2020; Mo et al., 2020; Stankeviciute, 2020)
	Smart garment	(Cerqueira et al., 2020; Yang et al., 2017a)
	Smartphone	(Nofal, 2020)
	Social media	(Jin & Ryu, 2019; Rossol & Lapolla, 2020)
	E-commerce	(Moodley, 2003; Torres & Arroyo-Canada, 2017)
	Mobile shopping	(Soni et al., 2019)
Material	Cellulose, self-growth, electronic optical fiber	(Agrawal & Chopra, 2020; Bai et al., 2015; Belforte et al., 2014; Bogdan & Zwolinska, 2012; Elesini et al., 2016; Fjodorova et al., 2015; Glovinsky & Zavrel, 2018; Jakubas & Lada-Tondyra, 2018; Kedzia et al., 2017; Kenkare & May-Plumlee, 2005; Li et al., 2017; Linton, 2020; Matusiak & Fracczak, 2017; Ng & Wang, 2016; Ng & Zhou, 2010; Petrulis & Petrulyte, 2017; Song et al., 2010; Szalek & Mikolajczyk, 2016; Wang et al., 2012; Zemcic & Chinciu, 2011)
Prod		(Monti & Sargentini, 2018; Veselov et al., 2000)

	Framework or mechanism of product development	(Chae, 2017; Choi et al., 2015; Chouprina, 2016; Cianfanelli & Goretti, 2017; de Araujo et al., 1998; DeLong et al., 2017; Diaconu et al., 2008; Popescu, Olaru, et al., 2017; Sokolowski, 2020)
	Cooperation with users	(Baker et al., 2019; Gordon & Guttmann, 2013; Morris & Ashdown, 2018a, 2018b)
Tradition & Craft and Culture & History	Tradition and craft	(Affinito et al., 2017; Bertola et al., 2020; Bian & Li, 2021; Broadley et al., 2017; Creanga, 2020; Linton, 2020; Magistretti et al., 2020; McHattie et al., 2018; Min & Koo, 2017; Perivoliotis, 2005; Reynolds, 2016; Sandhu, 2020; Shin & Westland, 2017; Wanniarachchi et al., 2020; Zhang et al., 2019)
	Culture and history	(Akinwumi & Renne, 2008; Almond, 2020; Arunyanart & Utiswannakul, 2019; Bertola et al., 2016; Chen, 2017; Chouprina & Kuz'menko, 2017; Connor-Crabb et al., 2016; Demartini & Trucco, 2018; Farnan, 2018; Hemmings, 2019; Horsley, 2015; Houze, 2006; Jefferies & Shaw, 2015; H. R. Lee et al., 2020; Lesger, 2018; Majima, 2008; McCreesh et al., 2018; McNeill, 2018; McQuillen, 2012; O'Connell, 2020; Padovani & Whittaker, 2015; Papalas, 2016; Park et al., 2014; Perez, 2019; Pesce, 2016; Rose, 2007; Schmidt & Tay, 2009; Thorogood, 2018; Volonte, 2012)
Region		(Abrudan et al., 2020; Bertola & Colombi, 2014; Ceptureanu et al., 2016; Cirella et al., 2016; Craik, 2015; Iannilli, 2014; Khurana & Ataniyazova, 2020; Moodley, 2003; Proje & Bizjak, 2018; Rose et al., 2007; Sikiaridi & Vogelaar, 2012; Smith & Finn, 2015; Volonte, 2012; Wysokińska, 2015)
Business		(Sun & Chi, 2019)
	Consumer and consumption	(Baker et al., 2019; Kim et al., 2018)
	Retailing	(Colombi et al., 2018)

	Branding	(Bernardes et al., 2018; Choi et al., 2015; Eren-Erdogmus et al., 2018; Tao & Xu, 2018; Torres & Arroyo-Canada, 2017)
Management		(Ceptureanu et al., 2016; Cirella, 2016; Cirella et al., 2016; Eiriz et al., 2017; Heusinkveld et al., 2009; Mwaura, 2016; Negoita et al., 2017; Seram et al., 2019; Smith & Finn, 2015)
	Supply chain	(Lam & Postle, 2006)
	Sustainability	(Hall & Velez-Colby, 2018; James et al., 2019; Mazzarella et al., 2019; McCreesh et al., 2018; Woodside & Fine, 2019).
	IP	(Marinova, 2001; Pouillard, 2017)
	Policy	(Gilsing et al., 2010; Wysokińska, 2015)

3.3.3 Main Path Analysis

3.3.3.1 Main Path 1: Fashion, Design, Innovation, Region

The fashion industry's local innovation system in Manhattan was characterized by its openness, variety, and coherence. The paper identified the design innovation flows and district innovation flows, which specifically focused on designers and inspiration, with retailers, buyers, and textile factories as facilitators. Moreover, design innovation flows adapted particularly for Manhattan have created new design space -- boutiques as a source of inspiration, alongside traditional methods, such as forecasts, trade shows, and media (Rantisi, 2002). Hauge argued that Rantisi's research failed to discover the

mechanism by which intangible value was added to maintain the outsourcing practice in the fashion industry while keeping it localized. He also utilized the fusion of places as a strategy for fashion innovation (Hauge et al., 2009). This tool was mentioned by Jansson and Power to increment the relationship between fashion branding and the location, specifically in the context of branding a city like Milan (Jansson & Power, 2010). Using Taipei as an empirical case, Lin developed a framework for analyzing this spatial proximity of innovation (C. Y. Lin, 2018). There are 4 papers that focus on the fashion industry cluster, knowledge flows, localization, and the function of the site, as shown in Figure 3.10.

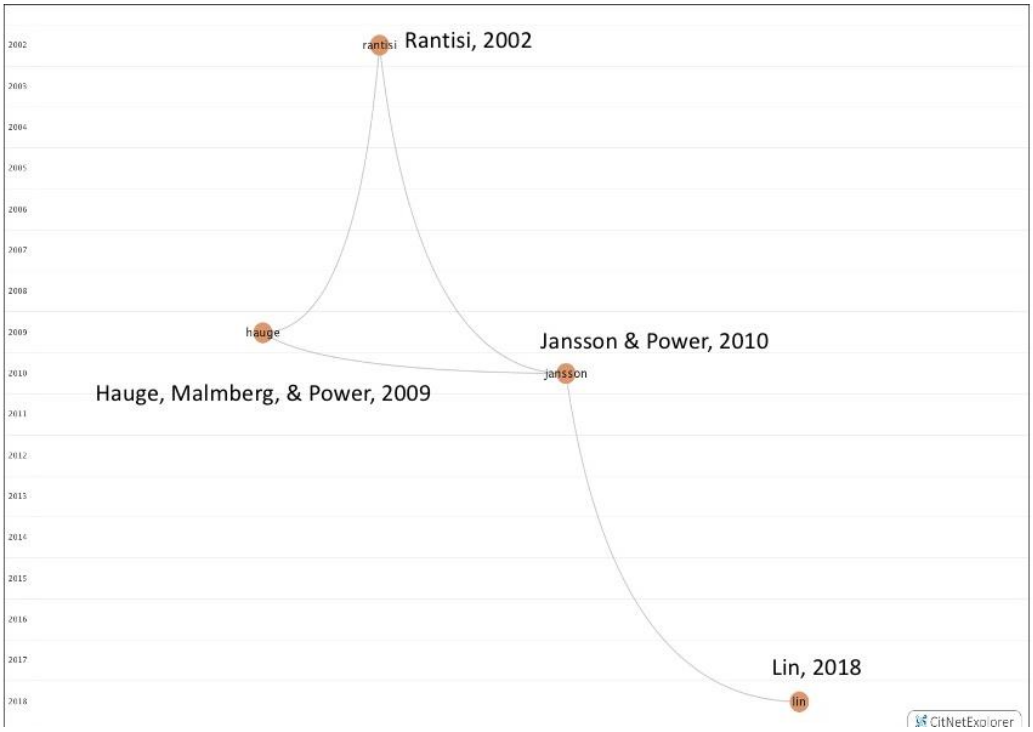


Figure 3.10 Main path 1

3.3.3.2 Main Path 2: Fashion, Design, Innovation, Style

Papers contribute to the design-intensive industry, as shown in Figure 3.11. Cappeta et al. developed a model of style creation and evolution, with an emphasis on convergent design (Cappetta et al., 2006). However, Dell'Era disagreed with the co-styles model in the sense of focalization, arguing that the ferment of new design was most effective during a quiet period. Based on Cappeta's incentives for aesthetics, Cautela et al. followed the product language innovation in Cappetta's and Dell'Era's studies and proposed a new model triggered by technology. Magistretti et al. cited three previous papers to provide the theoretical foundation for the divergence of design, innovation, and competitive advantage. Their focus is on aesthetics rather than function, and they developed Cautela's research about leveraging tradition (Cautela et al., 2018; Dell'Era & Verganti, 2011; Magistretti et al., 2020).

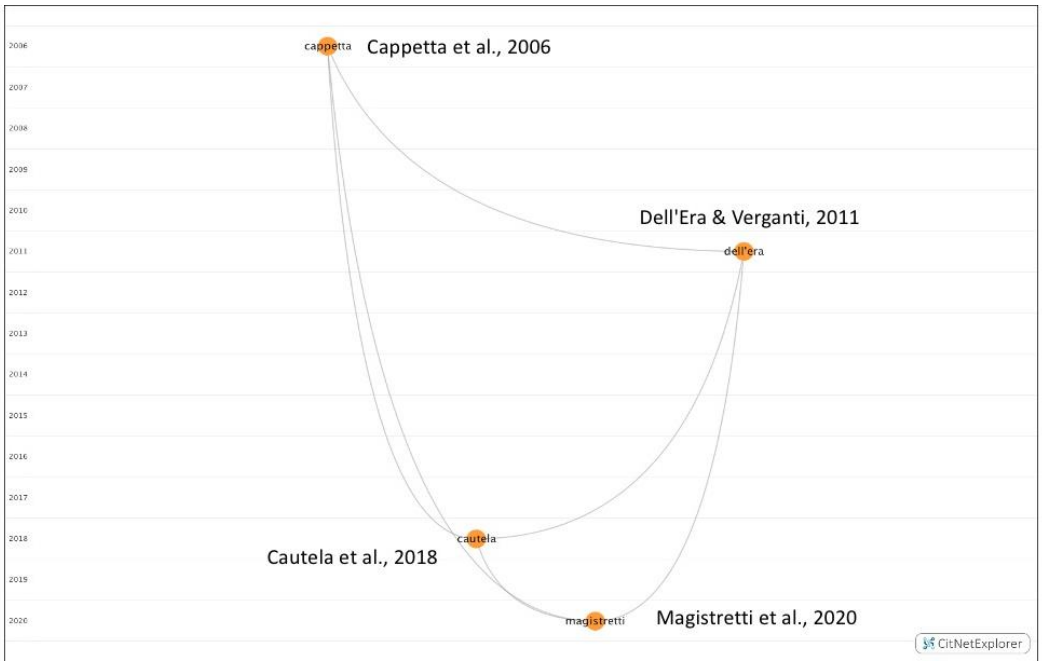


Figure 3.11 Main path 2

3.3.3.3 Main Path 3: Fashion, Design, Innovation, Sustainability, Strategy

Three papers have low citation scores, despite their focus on strategies for the sustainable supply chain, as shown in Figure 3.12. Given the publishing year, it is reasonable that two of them have few citation scores. A practical paradigm that aligned the design sector with the upper supply chain in Peru was proposed and cited to state New Product Development (NPD) without compromising stylistic requirements. Furthermore, Curwen and Park emphasize the stakeholders' cooperation within the supply chain (Curwen et al., 2013). The inclusion of social responsibility is a key component of the strategic approaches, with the identification of incentives and barriers being crucial (Macchion et al., 2018). In order to effectively implement a

sustainable planning strategy framework, it is necessary to build a framework that highlights the importance of supplier partnerships in engaging with the supply chain (Fung et al., 2020). Both Macchino's and Fung's papers examined Nike as a case study. Macchino's work focuses on its absence of corporate social responsibility (CSR), while Fung's paper discusses Nike's efforts to incorporate CSR into its internal action plan.

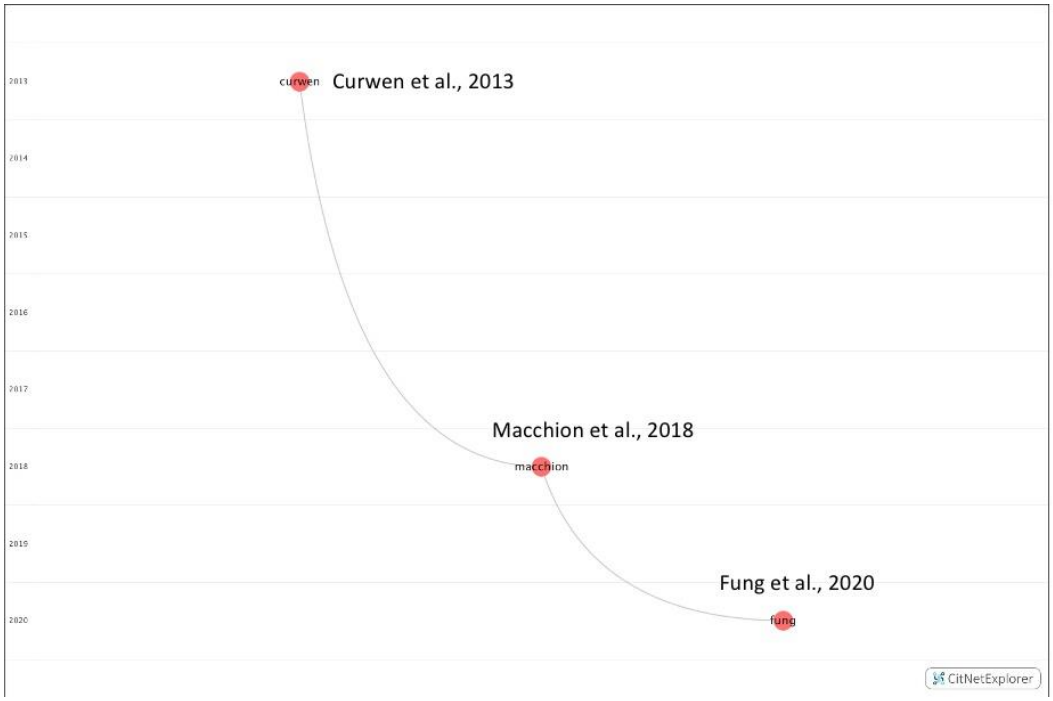


Figure 3.12 Main path 3

3.3.4 Triangulation

Utilizing VOSviewer being an alternate tool, a triangulation of results was undertaken to confirm the findings of CiNetExplorer and the subjective clustering. The analysis of

results in VOSviewer is centered on the field, keyword, and researcher. Figure 3.13 highlights a variety of topics, such as design, innovation, fashion, and sustainability. Furthermore, specific fields were chosen to examine the links between keywords, as shown in Figure 3.14 to Figure 3.17. It can be concluded that FDI has connections with product innovation, such as product development, textile, and quality; with technology innovation, such as technology and knowledge; with organization innovation, such as industry, management, impact, performance, model, strategy, and networks; with consumer innovation, such as behavior and consumption. It also demonstrates that FDI types normally overlap instead of being exclusive. These networks exhibit a positive correlation with the findings of VOSviewer and the manual grouping.

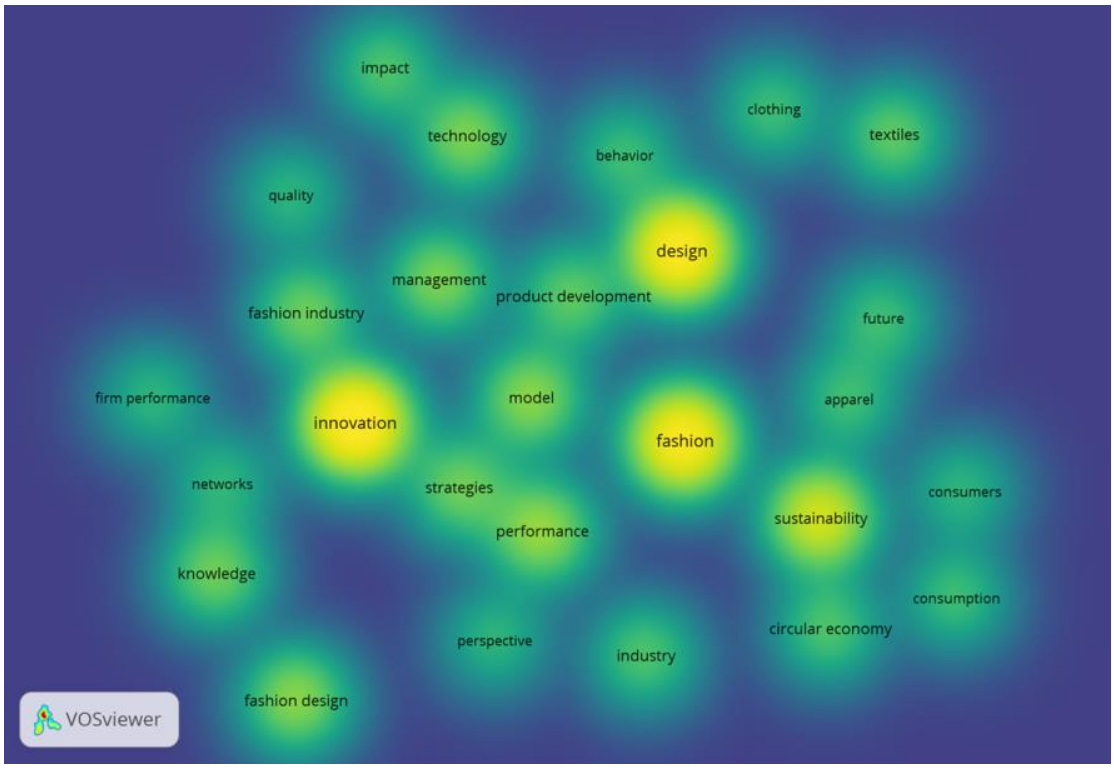


Figure 3.13 Areas of Fashion Design Innovation (FDI) by VOSviewer

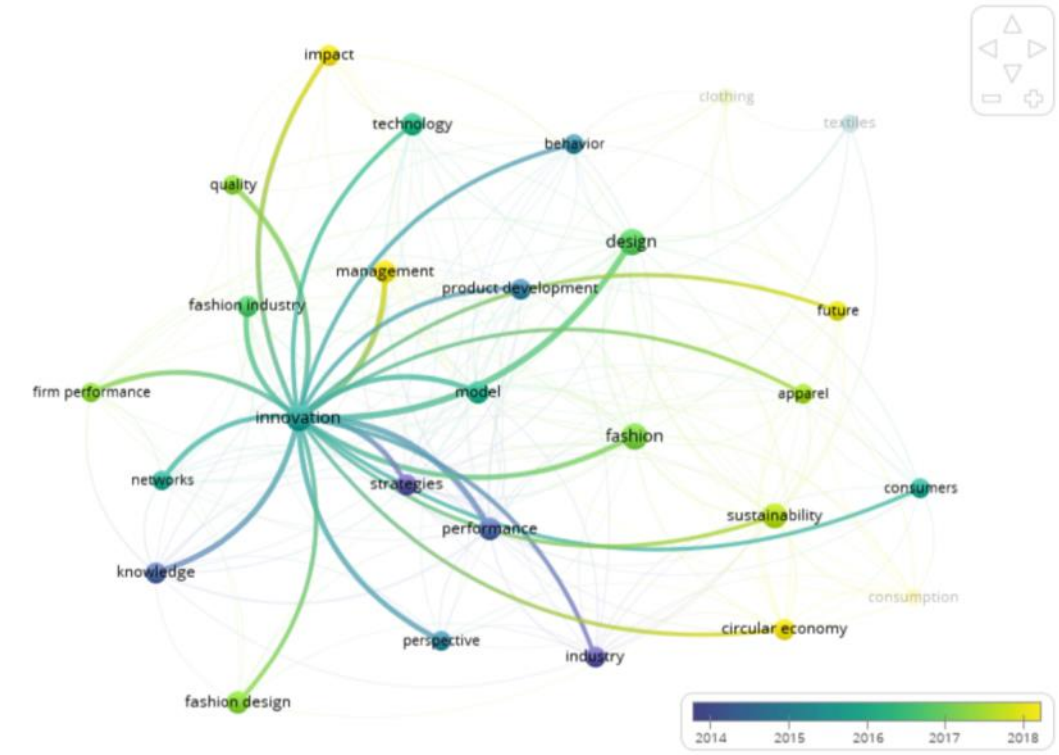


Figure 3.14 The keyword network of “innovation”

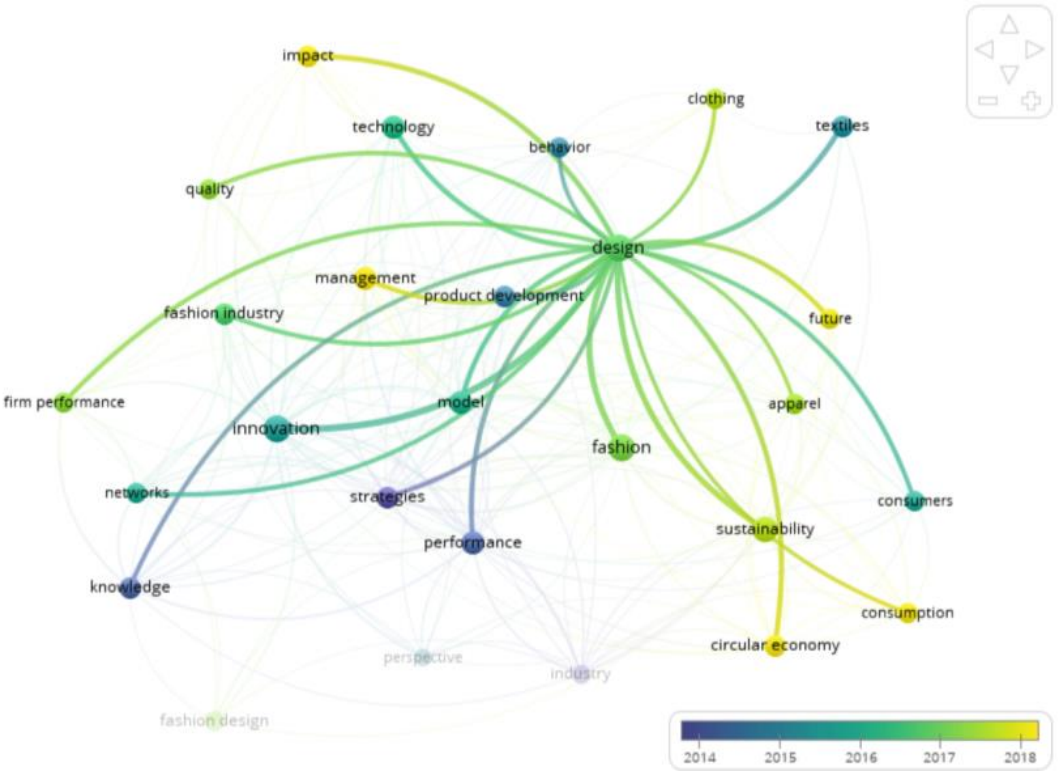


Figure 3.15 The keyword network of “design”

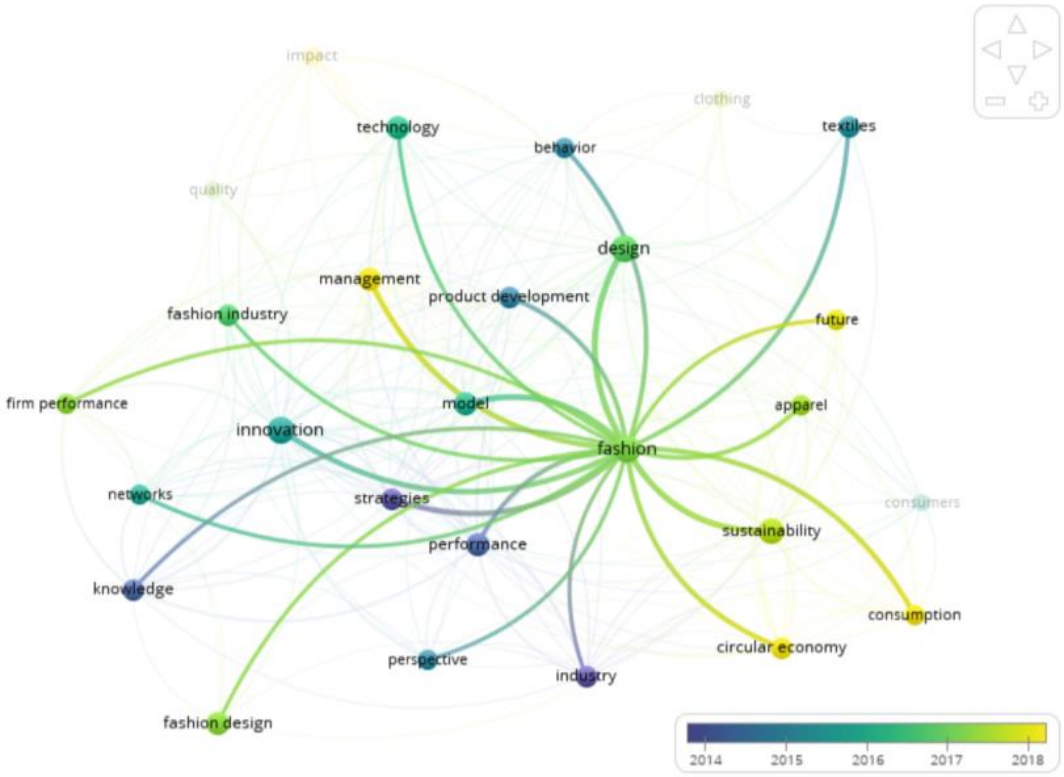


Figure 3.16 The keyword network of “fashion”

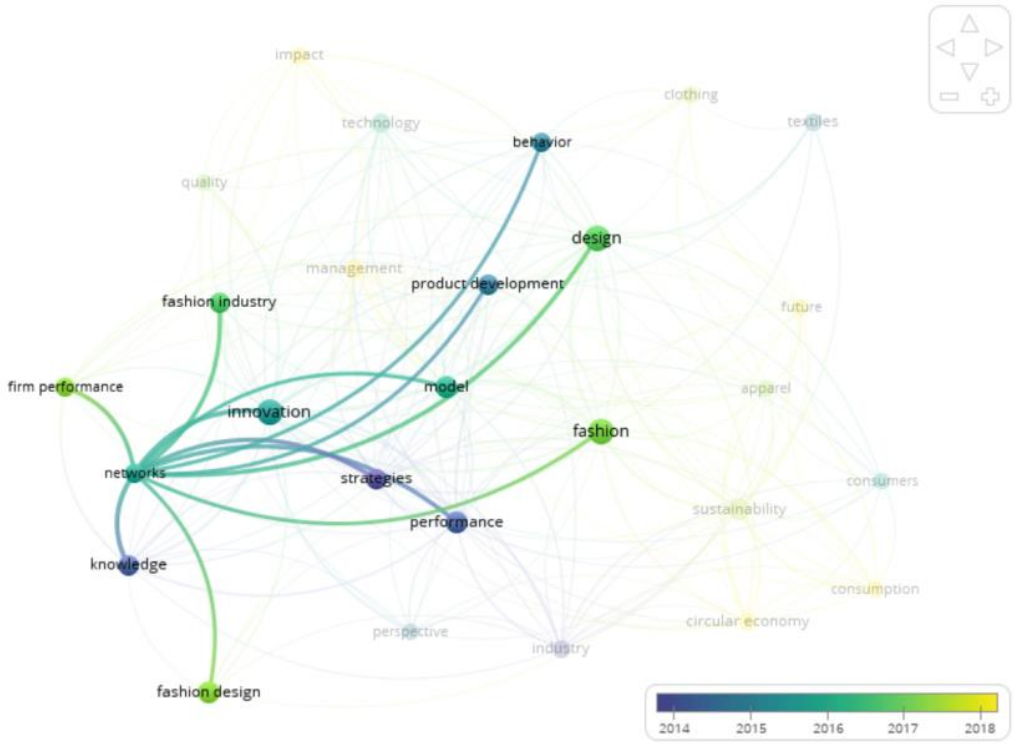


Figure 3.17 The keyword network of “network”

Figure 3.18 depicts prominent researchers who have endeavored in the FDI field. Based on the titles of their publications, certain authors are implicated. Bertola is a Professor at the Design Department at Politecnico di Milano, who has extensively engaged in the cultural dimension of design innovation (Bertola & Colombi, 2014; Bertola et al., 2020; Bertola & Teunissen, 2018; Bertola et al., 2016). As a team, Papesu, Olaru, Niculescu, and Salistean have published four design innovation-related papers in the field of technology, such as 3D design, 3D scanning, and simulation (Popescu, Niculescu, et al., 2017; Popescu, Olaru, et al., 2017; Popescu et al., 2019; Sabina et al., 2020). Park, who is in the same cluster as Morris, has explored social sustainability involving users in the fashion sector (Curwen et al., 2013; Kim et al., 2018; Park et al., 2014). The analysis of the authors emphasizes culture, technology, and sustainability, thereby triangulating research streams in FDI identified by CitNetExplorer and the manual grouping.

3.4 Discussion

Extant studies that claim their research is innovative or has innovative relevance, are abundant and distributed across diverse interdisciplinary fields, as evidenced by the study results. There is still a wealth of publications that are not included due to the

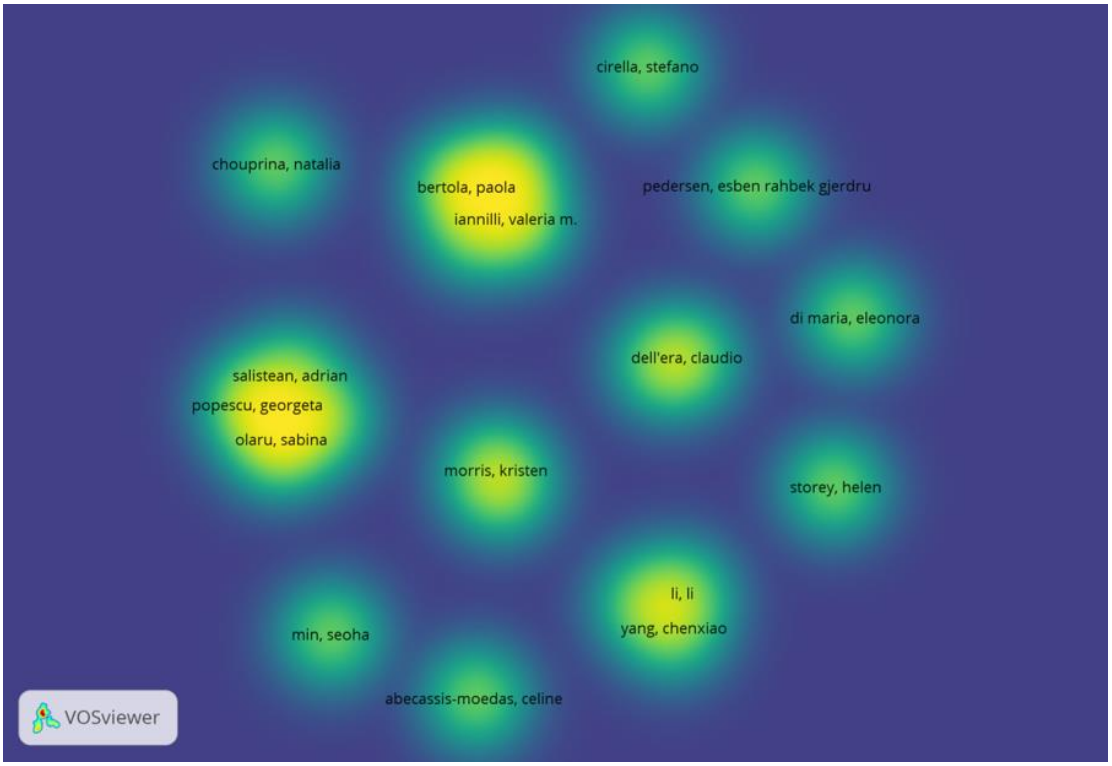


Figure 3.18 Analysis of authors using VOSviewer

search restriction. For instance, scholarly interest has been shown in design outsourcing, design collaboration, and network structure about design innovation (Delbufalo, 2015; Shen et al., 2016; L. Wang et al., 2017). Design discourse such as media played an unrecognized role in fashion innovation (Khaire & Hall, 2016). Innovation sparked by culture and history, as well as those immersed in the management and business domains, are beyond the discussion of this research.

Furthermore, Study 1 finds that few papers have explored and investigated a comprehensive and systematic view of FDI (Hodges & Link, 2018; Sugg, 2022). Only

one paper discusses fashion innovation, such as fashion brokerage as a bridge for FDI diffusion (S. Lin, 2018). Study 1 does not aim at any particular product, technology, or material. This literature review provides an overview to foster categories of FDI, urges that FDI should be conceptualized and measured, and that FDIE should be meticulously built and investigated.

3.5 Chapter Summary

This chapter aims to develop an overview of FDI and clarify the realm of FDI by sorting and analyzing academic literature pertinent to FDI in the core collection of the WOS database, using CitNetExplorer to explore clusters and the main paths. Two clusters are identified: FDI related to sustainability and FDI in the design domain. Three main paths are analyzed: region, style, and strategy. Regarding publications that can not be clustered by CitNetExplorer, a subjective method is employed to categorize them into seven groups. Finally, the results are confirmed by using VOSviewer. This study sheds light on the need for further and more specific research on design innovation in the fashion industry and lays the groundwork for Study 2 on the measurement of FDI.

Chapter 4

Study 2 Measurement of Fashion Design Innovation

4.1 Chapter Introduction

This chapter covers Study 2 the measurement of Fashion Design Innovation (FDI). The literature review examines studies on the scale of design innovation and product innovation. Then, dimensions and items of the measurement are elaborated based on categories of FDI identified from the academic literature in Study 1. The methodology section discusses four sub-studies employed to refine and verify the FDI measurement: Study 2.1 is a professor review, Study 2.2 is a focus group survey, Study 2.3 is an expert interview, and Study 2.4 is a large-scale survey. Results present the outcomes of four sub-studies. Particularly, confirmatory factor analysis (CFA) has been used three times to obtain significant reliability and validity, by eliminating items and the performance dimension. Finally, the FDI measurement is determined.

4.2 Literature Review

4.2.1Measurement of Design Innovation and Product Design

The definition of design innovation presented indicators of design innovation such as performance, function, technology, usage or ease of use, X-factor, i.e., 'wow', appearance, style, quality, cost/price, range, material, and quality (Gemser & Barczak, 2020; Gemser & Leenders, 2001; Roy & Riedel, 1997; Walsh, 1996).

The significance of product design assessment has been demonstrated in the marketing field (Moon et al., 2015). Researchers created a variety of three-dimensional measurements of product performance, such as those having aesthetics, feature, and ergonomics (Moon et al., 2015), or those having aesthetic, functional, and symbolic (Homburg et al., 2015). While some researchers, from a more psychological perspective, proposed a four-factor model including affective, cognitive, ergonomics, and reflective factors (Gilal et al., 2018). Design value captured rational, kinesthetic, and emotional attributes indicating appeal (Noble & Kumar, 2010).

Kim treated design innovation as a construct and measured it with aesthetics, features, and emotion when purchasing augmented products, but there was no holistic scale (Kim et al., 2019). Moon's scale-anchored Innovative Product Design (IPD) aimed at developing IPD measurement. With the definition of IPD as "product design that is

perceived by a customer as innovative, based on the following product attributes: aesthetics, features, and ergonomics", these three dimensions were evaluated. The last two dimensions were incorporated into the performance dimension in this research (Moon et al., 2015). Similar to Homburg's scale of New Product Design (NPD) which was closely related to fashion products, this research takes into account all three factors: aesthetics, functionality, and symbolism. However, there aren't overt indications of innovation (Homburg et al., 2015).

Researchers also dedicated each dimension individually. Visual product aesthetics was composed of personal and social value of design, acumen, level of response, and design determinacy, which provided a symbolic perspective (Bloch et al., 2003). Hedonic and utilitarian dimensions were scaled to reflect customer attitude (Voss et al., 2003). Some researchers investigated design creativity with criteria in which novelty and usefulness had high frequency (Han et al., 2021). Research on design orientation had a distinguished view at the level of the company and identified awareness of the benefits of design, design sensibility, basic skills, specialized skills, innovation skills, involving others, and design organization (Cantó et al., 2021).

Due to the limitations posed by the complexity of aesthetics and the subjective meaning of fashion products, scanty investigations have contributed to measuring FDI. Process and model of stylistic innovation were proposed (Cappetta et al., 2006; Tran, 2010). It

was recommended that in the field of customer behavior, hedonic design elements were parallelly valuable to tangible characteristics such as appearance, shape, form, color, style and configuration, materials, texture, and finish (Bloch, 2011). Research on fashion marketing measured product innovation by asking customer questions with the words ‘unique’, ‘hard to find’, ‘novel’, and ‘special’ (Torres & Arroyo-Canada, 2017). Aesthetic, expressive, and functional perspectives were three dimensions used to verify customer satisfaction with 3D printing fashion (Cui et al., 2022). As for fashion, the assessment of shoe design was more relevant to this research, but it aimed at customer perception with one marketing category similar to the studies mentioned above (Lo, 2021). This category was innovation and development with ten attributes ranging from style, technology, materials, ergonomics, and washable to customization which were basically reorganized and renamed with fashion orientation in this research. Meanwhile, other attributes in other categories, such as function and appearance, were synonymous with those in the innovation category which were unified into different dimensions in this research (Lo, 2021). Overall, further research is needed to explore how to measure FDI that is not based on consumer response but on the innovators’ vision. Chair of Ernesto Gismondi Artemide’s quote, “Market? What market? We do not look at market needs. We make proposals to people.” is a good example of

distinguishing design-driven innovation from customer-centred innovation (Verganti, 2011).

It should be noticed that all measurements were designed from the customer's perception, only Moon's scale and Kim's construct were innovation-related (Kim et al., 2019; Moon et al., 2015). The measurement in this research is innovation-oriented. The dimensions and items of previous scales are revised in terms of fashion discipline and extended three extra dimensions, i.e., material, technology, and sustainability, to stress innovation elements within the fashion context based on Study 1 results.

Design innovation is comprehensive and complicated and can be studied in different dimensions, levels, and perspectives. Fruitful frameworks, models, and structures have been proposed conceptually and verified empirically (Bernardo & Medeiros, 2021; Gemser & Barczak, 2020), such as the design/innovation polar profile map (Walsh, 1996) and the design innovation spectrum (Na et al., 2017). Some frameworks were based on process perspective, such as "the development funnel" (Walker & Roy, 1999), input-moderator-output (IMOI) (Dong, 2015), as well as supply chain and lifecycle (Montagna & Cantamessa, 2019).

The measurement of product design has been investigated using quantitative methodology. The roadmaps of different research were rather similar, from item

generation, refinement, and dimensionality to validity and reliability. Some studies began with conceptualization and ended with empirical tests. Literature review, expert interview, and empirical case were universal methods to explore and testify these measurements. The reliability and validity of the above scales were statistically demonstrated and testified by experts. Little is known explicitly about FDI which this investigation aims to explore.

4.2.2 Dimensions and Items of Fashion Design Innovation (FDI)

The dimensions and items of the measurement were generated based on an extensive literature review of FDI of Study 1 in Chapter 3 and previous studies on product design measurement (Bloch et al., 2003; Gilal et al., 2018; Homburg et al., 2015; Lo, 2021; Moon et al., 2015). An elaboration of the dimensions of FDI as discovered in the publications identified in Study 1 is discussed below.

4.2.2.1 Aesthetics

Aesthetics is the basic principle of product design. The appearance or presentation was created in tangible aspects, such as form, color, materials, and an integrated item - style. Aesthetic innovation was operationalized by measuring spending on design, design-related positions, and their salaries at the firm level (Eisenman, 2013). Similarly, it indicated aesthetic innovation assessment and testified in a fashion footwear company,

but it analyzed indicators of a firm (Alcaide-Marzal & Tortajada-Esparza, 2007). These two measurements did not mention the product which is the unit of analysis in this research. Stylistic innovation was defined as “the change in the aesthetic design and/or symbolic value of products” (Tran, 2010). Bloch’s assessment of visual aesthetics posited in customers (Bloch et al., 2003). Product language innovation and materials were methods to innovate design (Cautela et al., 2018). It was believed that newness in decoration in boys’ clothes exemplified design innovation even in the 19 century (Rose, 2007). It should be no doubt that color and pattern can be viewed as factors for innovation (Zemcic & Chinciu, 2011). For instance, Schiaparelli's pink was a stunning color innovation (Papalas, 2016). Accordingly, items are generated to represent form, color, texture, and decoration, as well as style.

4.2.2.2 Material

Lo measured the innovation of shoes with material item (Lo, 2021). However, the above-mentioned highly-cited papers on product design have no material factor separately. The literature review on FDI indicates that material incentivizes design innovation, ranging from cellulose, self-growth, and electronic optical fiber to jacquard (Agrawal & Chopra, 2020; Elesini et al., 2016; Jakubas & Lada-Tondyra, 2018; Kenkare & May-Plumlee, 2005; Li et al., 2017; Linton, 2020; Matusiak & Fracczak, 2017; Ng & Wang, 2016; Ng & Zhou, 2010; Wang et al., 2012).

4.2.2.3 Performance

The comfort dimension consisted of external, clothing, and human factors (Kamalha et al., 2013). As for fashion itself regard, fit-for-body physically and mentally satisfied the wearer (LaBat & DeLong, 1990). Dart was an influential innovation in pattern making to transfer 2D fabric into a 3D subject that shaped the breast, waist, and buttock. Ease and tolerance were provided by pleat. The effect of thermal attributed on the wearer's sensation was related to moisture vapor resistance and accumulation, particularly of greatly innovative non-woven materials such as leather (Bogdan & Zwolinska, 2012; Glovinsky & Zavrel, 2018; Jintu & Tsang, 2008; Yang et al., 2017a).

4.2.2.4 Symbolism

The fourth dimension is symbolism with social value item and personal value item. Bloch's assessment of visual aesthetics posited in customers could be integrated into the symbolic dimension with personal and social value items (Bloch et al., 2003). When evaluating FDI, hedonic design elements were parallelly valuable to tangible characteristics such as appearance, shape, form, color, style and configuration, materials, texture, and finish (Bloch, 2011). Moreover, stylistic innovation was defined as "the change in the aesthetic design and/or symbolic value of products" (Tran, 2010).

Apparently, it exhibited personal and social value beyond function and visual responses, manifesting both “individuality” and “inclusivity” (Park et al., 2014). Women's self-fashioning was believed to manifest their self-concepts through garments (McNeill, 2018). Nationality was connected to clothing, such as in Australia and the US (Lesger, 2018; Schmidt & Tay, 2009).

4.2.2.5 Technology

The extensive literature review on FDI reveals two prevalent clusters in technology and sustainability, so these two dimensions are included to stress innovation compared with New Product Design (NPD) (Homburg et al., 2015). Moreover, Talke also brought out the necessity of a combination of technology and design newness in product innovativeness (Talke et al., 2009). Although technology is embedded in products either explicitly or implicitly, it contributes to fashion design development. The technology factor consists of five items: manufacturing technology, finishing technology, showing technology, user-centered technology, and IoT. Manufacturing, finishing, and showing technology focused on the product itself, such as 3D technology (Davis et al., 2020; Koncic & Scapec, 2018; Popescu, Niculescu, et al., 2017; Popescu et al., 2019; Sohn et al., 2020).

While user-centered technology refers to wearable technology, interactive technology, sensory technology, and customization technology (Cerqueira et al., 2020; Mo et al., 2020; Yang et al., 2017b; Yu et al., 2021).

IoT technology outbreaks in a digital era, particularly with the emergence of the Metaverse, and fosters virtual collection (Wang et al., 2018). Online shopping and mobile terminal not only prompted customization but also conformed open innovation to fuse a FDI community (Caputo et al., 2016; Kautish & Sharma, 2019; Wang et al., 2018). Phone technology (Nofal, 2020), social media (Jin & Ryu, 2019; Rossol & Lapolla, 2020), e-commerce (Moodley, 2003; Torres & Arroyo-Canada, 2017), and mobile shopping (Soni et al., 2019) donated FDI.

Since the cross-disciplinary feature incubates unexpected technology, more technology indicators are latent to explore in the future.

4.2.2.6 Sustainability

An extensive literature review also highlights research on sustainable innovation in fashion, flourishing from raw material, process, design, and recycling along the process of production, marketing, and usage. Based on the seventeen sustainable development goals (SDGs) of UNESCO, when compared to tangible factors such as form, material,

and observable procedure, this underlying dimension discloses FDI for the environment, well-being, and the community which were identified as three items in the measurement.

Environment originally posits as the heart of Sustainability. Recently, successful factors concluded by the literature review also mainly emphasized the impact on the environment, for instance, low-waste, bio-based, organic, and recycled (Rese et al., 2022). The well-being of the elderly, kids, patients, the disabled, and those in poverty should be taken into consideration (Jakubas & Lada-Tondyra, 2018; Szalek & Mikolajczyk, 2016). Older women improved their lives through the "Mom hand works" Project (Bian & Li, 2021). It was crystal clear that through craft in India, decolonizing design prompted fashioning well-being (Sandhu, 2020). Sportswear promoted a modern lifestyle in California (Farnan, 2018).

A new social landscape and social capital were exemplified with rich cases globally scattered. An excitation case of Sari triggered social innovation in India (Bertola et al., 2020). Craft and culture were eligible to enhance and sustain the local community, such as lace in Nottingham, tie-dye in China, mud dye in Japan, tapa cloths in Pitcairn, and handloom in Sri Lanka (Bian & Li, 2021; Broadley et al., 2017; Linton, 2020; Reynolds, 2016; Wanniarachchi et al., 2020). A regional and collective ecology could thus be built by innovating Fair Island knitwear (McHattie et al., 2018).

Cooperation with users was an anonymous from open innovation and has been examined by many authors (Baker et al., 2019; Gordon & Guttmann, 2013; Morris & Ashdown, 2018a, 2018b).

Because the current arguments present a multi-dimension explication of the construct in various ways in the existing literature, the key construct of FDI lacks a precise and succinct definition. It must be more critical and intellectual to integrate the literature and propose an explicit definition of the construct and a measurement.

4.3 Methodology

The development process of measuring FDI was composed of seven steps based on a well-built research procedure (Johnson & Morgan, 2016; MacKenzie & Podsakoff, 2011). Figure 4.1 presents the flow of the research design consisting of a literature review, measurement development, survey development, refinement by the expert review and the focus group survey, large-scale administration, and reliability and validity, as well as the final measurement. To achieve the goal of each step, four sub-investigations were used. Table 4.1 shows the sample types for each sub-study.

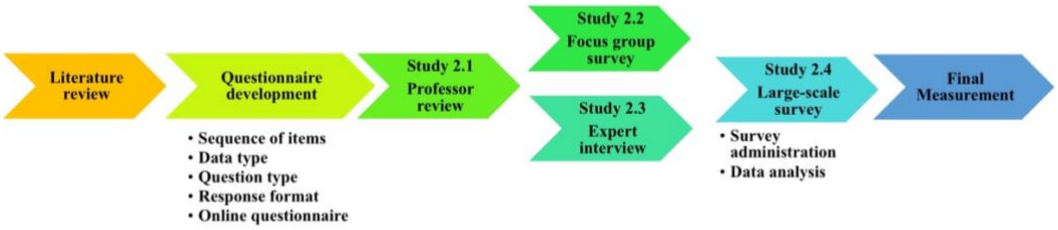


Figure 4.1 Development procedure of FDI measurement

Table 4.1 Sample of each study

Sample group		Sample size				
		Study 2.1 Professor review	Study 2.2 Focus group survey	Study 2.3 Expert Interview	Study 2.4 Large-scale survey	
1	Fashion designers	0	9	4	30	25.9%
2	Industrial professionals	0		5	21	18.1%
3	Academic experts	2		5	9	7.8%
4	Association leaders	0	0	4	0	0
5	Government officials	0	0	2	0	0
6	Fashion students	0	0	0	56	48.2%
Total		2	9	20	116	100%

The extensive literature analysis of FDI was developed in Chapter 3. A content analysis was conducted to examine the literature on the assessment of product design and design innovation as discussed in 4.2.1. Additionally, FDI was elaborated again in 4.2.2 on the foundation of Chapter 3 to determine construct dimensionality within the fashion context.

4.3.1 Questionnaire Development

Since multiple dimensions reflect FDI, a total of six dimensions and 20 items were generated from step 1. It recommended no more than 20 words and 3 commas in one item to achieve brevity (Johnson & Morgan, 2016). The name of items matched the requirement of simplicity and precision by using no more than two common nouns (MacKenzie & Podsakoff, 2011). Table 4.2 provides the explanations of each item, which is reflective intrinsically.

The format of the self-report questionnaire concerned questions, responses, and item sequence (Schwab, 2005). The systematic, consistent, and uniform solution took account of the respondent's understanding ability; thus, the efficiency and correctness of the responses were ensured. The survey was supposed to last 5 minutes. Below is the justification for format development.

Table 4.2 Fashion Design Innovation (FDI) dimensions and items for survey

Dimension	#	Item	Explanation
Aesthetics	A1	Form	Innovation related to silhouette, details of the garment, such as collar, sleeve, shoulder, hem and waist, etc., and proportion
	A2	Color and pattern	Innovation related to color trend, colorway and pattern, etc.
	A3	Surface	Innovation related to the texture and decoration
	A4	Style	Innovation related to the combination of design attributes and fashion items, such as hippie style.
	A5	How to wear*	Innovation related to the ways of dressing
Material	M1	Raw material	Innovation related to raw material
	M2	Fabric	Innovation related to fabric
	M3	Accessories	Innovation related to accessories, such as button
Performance	P1	Comfort	Innovation related to fitness, adjustments and thermal feature, etc.
	P2	Protection	Innovation related to protecting the body, such as waterproof, fireproof, and anti-SUV.
	P3	Maintenance	Innovation related to maintenance, such as durability, easy to wear, and laundry.

Symbolism	S1	Personal value	Innovation dedicated to individual identity and self-esteem.
	S2	Social value	Innovation dedicated to social identity and social image for a person.
Technology	T1	Manufacturing	Innovation related to pattern making, cutting, and sewing, such as 3D body scanning, CAD, automation and AI
	T2	Finishing	Innovation related to garment finishing, such as dyeing and brushing
	T3	Showing	Innovation related to exhibiting fashion and prototype, such as virtual reality
	T4	User center	Innovation related to contacting user, such as wearable technology, interactive technology, sensor technology and customization
	T5	IoT	Innovation related to the internet, such as big data, mobile terminal
Sustainability	ST1	Environment	Innovation related to 3R (reduce, recycle, reuse) and circular economy
	ST2	Wellbeing	Innovation related to the elder, kids, patience and the disabled, etc.
	ST3	Society	Innovation related to the community and heritage, etc.

*: added after Study 2.2 Focus group survey

4.3.1.1 Sequence of Items

A brief phase outlined the aim of the study at the beginning of the survey. Items were ordered by being easy, familiar, and interesting to participants (Schwab, 2005). For example, the aesthetics dimension was located first as the most direct visual factor in FDI, followed by touchable material, wearable performance, abstract symbolism, embedded technology, and finally the public issue of sustainability. Demographic information was achieved by four items, i.e. position, working experience, age, and location, which were collected at the end of the survey. Useful information had been obtained, even though the participant was not willing to provide sensitive personal information.

4.3.1.2 Type of Questions

Easy-to-complete, close-ended questions were appropriate in this study. All items in the study had the same question, asking if the respondents considered the relevance to FDI. Only one question after the introduction could eliminate repetitive phrasing, reduce the reading demand, and maintain brevity and consistency. As for each item, one or two words in nouns with examples in parentheses also maintained simplification and alignment. Only in Study 2.2, one open-ended question was added at the end of

each dimension to check if there were any items missing and to improve content validity. As for personal information, the position acted as an open-ended question.

4.3.1.3 Response Format

The question asked if the participant agreed that the factor could measure FDI. Too many choices cause fatigue, which worsens the task of ranking, thus damaging the quality of the answer thereafter (Brace, 2008). Moreover, great precision was not necessary for this measurement. For instance, “slightly agree” is basically “agree”. So, this measurement adopted a Likert scale with responses from negative to positive, i.e., “strongly disagree”, “disagree”, “agree”, “strongly agree”, and “no opinion”. If the order was reversed, the result shows higher means, which causes positive bias. Starting with a negative response would not result in a lower mean (Johnson & Morgan, 2016). Although responses can be assigned with numbers, such as 1 for “strongly disagree”, 2 for “disagree”, 3 for “agree”, 4 for “strongly agree”, and 5 for “no opinion”,. Alternatively, numerical and verbal are posited parallelly, e.g., “1 strongly disagree” and “2 disagree” etc. The verbal response without a number was employed to achieve a direct and efficient response.

If the participant had no tendency towards the item, the “no opinion” option offered a neutral perspective to reduce the risk of guessing. It also avoided oppression or social

desirability that the participant might suffer without his or her actual knowledge (Fowler, 2014; Johnson & Morgan, 2016). The inclusion of option as the final choice was intended to avoid a neutral position in the middle, since it could induce respondents to select this answer in order to save time or to hinder their personal opinion (Josselin & Le Maux, 2017).

4.3.1.4 Type of Data

Generally, there are four types of data that can be collected using a survey questionnaire: nominal data, ordinal data, interval data, and ratio data (Brace, 2008; Fowler, 2014; Johnson & Morgan, 2016). The Likert scale was appropriate for this survey, as its objective is to decide if factors and items can measure the construct. Both ordinal data and interval data can rate factors in a single category. Interval data enables the calculation of aggregates such as mean and standard deviations (Brace, 2008). This scale had an equal distribution of positive and negative options, resulting in a measurement that is less prone to bias (Josselin & Le Maux, 2017). The same distance between responses allows items' comparison. Integers from 1 to 5 were assigned to responses before the data analysis. In this sense, interval data was desirable.

4.3.1.5 Online Questionnaire

As for online questionnaire generation, Wenjuanxing (问卷星) is a popular survey applet in Mainland China that is embedded in the messaging app WeChat. Considering the majority of the sample in the study is located on mainland China, the research used Wenjuanxing as the online questionnaire platform. Appendices 1 and 2 show the mobile screenshots of the questionnaire from the pretest and the large-scale survey. The layout has choices for whether each item is on a separate page, or a measurement can be rolled forward and backward without breaking down items. After comparison, the latter was adopted to alleviate respondents' fatigue and differentiation (Couper et al., 2001; Tourangeau et al., 2004). A QR code and a linkage were generated by Wenjuanxing, which were shared via WeChat and other websites such as LinkedIn.

4.3.2 Study 2.1 Professor Review

Suggestions from two professors in the fashion discipline confirmed the dimensions, items, and response of the measurement, thus making sure the content validity that was defined as "representativeness" both at the individual level and collective level (MacKenzie & Podsakoff, 2011).

4.3.3 Study 2.2 Focus Group Survey

A pretest needed to evaluate the validity of the measurement. "Other opinion" response was added at the end of each dimension to check if there were some items missing, in

order to improve content validity. Participants were nine experienced professionals from the fashion industry including fashion designers, fashion brand owners, patternmakers, and experts from universities, see Table 4.1. The pilot study was conducted after a vocational training course on October 14, 2022. One more item “How to wear (Innovation related to layering etc.)” was suggested to be added to the aesthetic dimension in the open-ended question “Other opinion”. Such that the number of items reached twenty-one.

4.3.4 Study 2.3 Expert Interview

Study 2.3 took the convenience of the interview on the FDIE which functioned as the first session leading the interviewee to indulge in the interview. The aim of this sub-study is to verify the results of previous studies on the measurement of FDI by interviewing designers, professors, professionals, association leaders, and officials. Twenty interviewees took part in this study either physically or online. Interviewees in Study 2.3 and Study 3 were the same, as shown in Table 4.3. Non-anonymous interviewees were identified directly by name. All participants were recruited through the researcher’s personal connections. The duration ranged from 5 minutes to 30 minutes with either recording or taking notes. Data were collected from October 2021 to February 2023. The interview questions based on research question 1, proposition 1, and Study 1’s result are listed below:

1. Do you have any knowledge or experience about Fashion Design Innovation?

2. Can you give examples of Fashion Design Innovation?

3. How will you measure Fashion Design Innovation?

After data collection and transcription, a hybrid data coding method was employed. This method was based on categories that were developed through the previous literature review. The resulting data was then utilized to verify the findings of previous sub-studies, improve the accuracy of the measurement, and contribute to the content validity.

4.3.5 Study 2.4 Large-scale Survey

4.3.5.1 Survey Administration

A new questionnaire that added a “how to wear” item and deleted the open-ended question in each dimension was used in Study 2.4. The total number of items is 21. The administration of a large-scale survey was more about data collection than of the pilot study. Participants were broadened by adding fashion students as a major part. The sample was recruited mainly by using the researcher’s personal connection. There are no universal rules for the sample size of the survey. Generally, the bigger the sample size, the less variable across the result. Normally, researchers focus on two principles, minimum size and the ratio per item (Johnson & Morgan, 2016). Some studies

recommended an experimental total size of 78 for 20 items (MacCallum et al., 1999). As for the N:p ratio, “Cattell (1978) believed this ratio should be in the range of 3 to 6. Gorsuch (1983) argued for a minimum ratio of 5. Everitt (1975) recommended that the N:p ratio should be at least 10. Clearly, the wide range of these recommendations causes them to be of rather limited value to empirical researchers. ”(MacCallum et al., 1999). Study 2.4 the large-scale survey referred to a moderate solution with a ratio of 5 per item. Thus, the minimum number of the total sample size will be 110. The desirable sample size should meet the requirements of factor analysis. Totally 116 respondents completed the questionnaire, all of whom were valid. Table 4.1 presents the population and its ratio. The large-scale survey was conducted from October 18, 2022, to December 18, 2022, lasting two months.

4.3.5.2 Data Analysis

Using two statistical tools, SPSS and online SPSSAU, descriptive analysis, reliability, validity, and CFA were conducted. Descriptive statistics such as frequencies, central tendency, and variability were analyzed. Also, reliability and validity were investigated by using data collected from the large scale. Reliability concerned the consistency score of the measurement. Validity reflected the extent to which the data supported the interpretation of the measurement. Cronbach’s Alpha dealt with internal consistency based on a single administration. Interval data collected from the 5-point Likert scale

exhibited the rejection of the original assumption (normal distribution of data) by using Kolmogorov-Smirnov test. Thus, Spearman correlation rather than Pearson correlation is appropriate in this case to access the discriminant validity (Gorsuch, 2015; Thompson, 2004).

4.3.6 Final FDI Measurement

After the measurement refinement, as well as the test of reliability and validity, a final version of the measurement of FDI was decided.

Table 4.3 Interviewee and interview information

Sample group	#	Interviewee background			Interview information		
		Name	Company	Position	Date	Duration (min)	Method
Fashion designer	D1	Harry LAI	N/A	Designer, Owner	Dec. 24, 2021	30	T
	D2	Zhidong XU	EEKA Group (listed in HK)	Design Director	Oct. 20, 2022	75	W
	D3	Yang LIU	N/A	Designer, Owner, Vice Chairman of China Fashion Designers Association	Jan. 15, 2023	70	W
	D4	Anonymity	Internet giant company incubator (full-time), fashion brand Art by Physicist (part-time)	Independent designer (part-time)	Feb.16, 2023	60	W
Industrial professionals	I1	Anonymity	Fashion tech accelerator, Shenzhen Fashion Designer Association	Cofounder, Secretary general	Nov. 21, 2022	60	F

			B Business (listed the mainland China)	Former director			
	I2	Anonymity	Moreline Fashion	Associate general manager	Oct. 20, 2022	40	W
	I3	Anonymity	Shenzhen Boke Times Technology Development Co., Ltd.	General manager	Jan. 13, 2023	60	W
	I4	Jiguo QIANG	Shanghai Yiyu Industrial Co., Ltd.	Executive Director, General Manager	Jan. 19, 2023	80	W
	I5	Anonymity	C Business (Menswear)	Director	Feb.9, 2023	100	F
Academic expert	A1	Jiaxin WANG	Fashion School, Guangdong Polytechnic	Dean, Professor	Dec. 24, 2021	30	T
	A2	Fujun FAN	College of Arts, South China Agriculture University	Former Associate Dean, Professor	Oct. 21, 2022	60	W
	A3	Yanlin CHEN	Tsinghua Shenzhen International Graduate School	Associate Professor	Dec. 5, 2022	70	W
	A4	Haiyan WU	China Academy of Art	Professor, Former Dean, Doctoral Supervisor	Jan.15, 2023	70	W

	A5	Anonymity	Fashion China Magazine	Editor in chief	Feb.21, 2023	30	W
Association leader	L1	Yaohua DONG	Shenzhen Original Design Fashion Week	Honorary Cha 6, 2021	Oct. 6, 2021	50	F
	L2	Shikang ZHOU	Shenzhen Fashion Designers Association	President	Oct. 23, 2022	75	F
	L3	Anonymity	The Federation of China (Shenzhen) Wearable Industries	Secretary General, Executive Vice President	Nov. 1, 2022	80	W
	L4	Yan CHEN	Shenzhen Copyright Society	Executive Vice President	Jan.16, 2023	50	F
Officials	O1	Anonymity	Shenzhen Economic Development Bureau	Former Party Secretary	Jan. 9, 2023	80	F
	O2	Anonymity	Department of Natural Resources of Guangdong Province	N/A	Jan.13, 2023	60	W

F: Face to face T: Tencent Meeting W: WeChat

4.4 Results

4.4.1 Study 2.1 Professor Review

According to the expert review, the measurement did not need any additional dimensions or items.

4.4.2 Study 2.2 Focus Group Survey

The pilot study showed positive results for every item, which meant professionals agree with FDI measurement. Appendix 3 displays the result of the focus group survey. “How to wear (Innovation related to layering, etc.)” was suggested to be added to the aesthetic dimension. Such that the number of items reached twenty-one.

4.4.3 Study 2.3 Expert Interview

The interview further credited reliability and validity of the measurement. According to the result of Study 2.3, some interviewees responded to item issues.

4.4.3.1 Aesthetics

A. Form

All interviewees responded to form innovation positively. YANG LIU admitted form was a necessary criterion for fashion design competitions whenever he was assigned to be a judge. Being a design director and the Top 10 Fashion Designers of China in 2016,

ZHIDONG XU pointed out three ways of fashion creativity including material, color, and form. HARRY gave a specific example of a brand focused on innovation and the sale of different parts of a whole garment, such as sleeves, front panel, and hem, which individual customers can connect into a new and distinguished form by using buttons or other ways.

B. Color and pattern

ZHIDONG XU pointed out that "*color innovation is relatively uncommon, and mostly is developed by the trend. Some new colors will lead to part of innovation and provide the customer with a new concept*". He continued to explain the significance of pattern innovation to create brand DNA and archives by taking some luxury brands as examples, such as Louis Vuitton. The brand's classic pattern and logo were inspirations for FDI. "*why? Because their joint design is one type of innovation. All joint-design pieces must be developed based on classic patterns and old patterns... classic design takes a fresh look... this kind of innovation can be kinda like a classic is always accepted by customers, meanwhile, the classic changes with newness and trends*". YANLIN CHEN credited traditional patterns of intangible heritage by innovating deconstruction and reconstruction. YAN CHEN encountered two infringement cases on the pattern and character design. INTERVIEWEE I1 considered lively color innovation from the

patients perspective, which would improve the pleasure of the hospitalization process, and even the rehabilitation.

C. Surface

Issey Miyake pleats were proposed by YANG LIU to emphasize texture innovation, which had special visual and aesthetic effects, as well as a distinguished tactile impression. Because there are so many innovative materials, fashion designers should make breakthroughs to redesign texture based on these materials. A5 showed how the designer innovatively integrated traditional embroidery into suits for a menswear brand.

D. Style

INTERVIEWEE I2 reported that "*as for fashion, style belongs to innovation. Fashion innovation that is relatively niche and that has not been popularized in a short period is quite meaningful if it is done well. In the early stage, there may be some aimless behavior. It will take a long time. If it becomes relatively successful, you can do brand incubation. I actually think it is pretty good*." FUJUN FAN considered style innovation to be due to more mature customers who needed personalization. INTERVIEWEE L3 expressed fashion as a style that even should be an icon in an era, which were "*a very clear value logic hidden behind the physical product*".

E. How to wear

YANG LIU pointed out that “how to wear” was one of his criteria for FDI when he was assigned to be a judge in fashion design competitions and events. He asserted that “*new ‘how to wear’ generates new looks, sometimes even a stunning effect*”. “How to wear” can be innovated by discovering diverse nationalities and cultures and combining them with international trends. HAIYAN WU also mentioned that a new “how to wear” would donate to fashion newness. However, only YANG LIU and HAIYAN WU responded to this item proactively and strongly.

4.4.3.2 Material

Material gained the highest frequency and impact among all measurement items. All interviewees responded to material innovation positively. The material was one criteria when YANG LIU judged work in fashion design competitions. FUJUN FAN stressed the priority of material compared with form and color by saying, “*the human body has such a structure, head, torso, and limbs...cannot be mutated. Clothing is the packaging that wraps the human body, is no longer possible to change the style too much...Among the three elements of clothing, the only one constantly changing and renewing in the long term is material.*” ZHIDONG XU mentioned that “*the deep dimension of innovation belongs to material...When our entire group introduced a new commodity system this year, we found that the dimension of materials was deeper, which could set many barriers to protect our brand. The core technology of the brand exists on the*

fabric. Form is relatively superficial. Because plagiarism in the fashion industry is fierce, being very fast in form and color, but difficult in materials, so when it comes to real innovation, this is a point." JIAXIN WANG admitted that material and technology had greater innovative ability than aesthetics.

A. Raw material

FUJUN FAN stated that "*there were no chemical fibers 300 years ago...Modified chemical fiber, grafting technique, as well as various rectifications, integrations, and additions, are constantly endowed with new functions, and emerge endlessly*". Nylon, polyamide, and graphene are some innovative examples of raw materials mentioned by interviewees. JIGUO QIANG stated that 3M and Toray Japan spends a lot of resources and capital all year round to research new fibers. Some interviewees mentioned vegetarian leather, faux leather with high flame resistance made of protein fiber extraction, and other biomaterial from a sustainable perspective. INTERVIEWEE I1 considered traditional natural fiber could improve the experience through high-tech elements. YANG LIU had a high-tech example: quantum technology was employed to superfine wool yarn to improve human microcirculation. INTERVIEWEE A5 promoted luminous yarn, optical variable yarn, and sensitive yarn, which were combined with Su embroidery. Temperature change color and humidity change color were quite mature technologies within material innovation.

B. Fabric

YANG LIU highlighted the importance of fabric by saying, "*a designer is half successful because of a piece of good fabric*". FUJUN FAN articulated this opinion that form and color are based on fabric, stating that "*intelligently control the color of clothing, and you can get whatever color you want. The same is true for the style. You can adjust which parts you want to expand or shrink at will. What is this all based on? Build on the functionality of the fabric.*" This application of high tech in fabric was experimented with and launched to the market by INTERVIEWEE D4, saying that "*these electronic products can be directly and flexibly used as part of the clothing fabric. For example, flexible circuits can be printed on the fabric, and it can also emit light. In addition, the solar panel is flexible and can be placed directly on the fabric to charge the mobile phone. There is also flexible heating. A heating sheet can be placed directly inside the windbreaker. It is very light and thin, and you can't feel that there is hardware inside*." Furthermore, HAIYAN WU vaguely talked about Coperni 2023 Spring-Summer collection showing spray-on fabric from Fabrican Technology.

C. Accessories

Two interviewees talked about zipper. INTERVIEWEE O2 credited that zipper was a super great invention. INTERVIEWEE O2 also gave an example of the collar button on a shirt. But no more interviews talked about this item.

4.4.3.3 Performance

A. Comfort

JIAXIN WANG mentioned that moisture absorption and breathability were basic properties of human comfort. JIGUO QIANG had an example from the Middle East, saying, "*I have made functional clothing for some special groups. For example, we make some medium-thick vests for the Middle East. If you wear a vest in the summer, you will feel uncomfortable, you should wear a T-shirt instead. But we added some functional things to the courier's vest, absorbing sweat quickly*."

B. Protection

Many interviewees talked about hot protection, cold protection, sun protection, anti-UV, and flame retardant, for instance, winter apparel in the Olympic Games and clothing in the Arctic and South Pole. Coating and metal film were mentioned when dealing with protection items. JIGUO QIANG stated that "*in summer... can maintain body temperature. The surface temperature of the body is around 24 degrees, which can be maintained within a few hours. It will return to the ice as long as the material*

encounters water at room temperature, which may also be a kind of protection for some special groups."

C. Maintenance

Relatively few interviewees talked about innovation in maintenance. JIGUO QIANG reported that some fashions in Europe "*can stand the test of time... after half a year, it is different after washing several times. Very durable*". Two academic experts mentioned washability. INTERVIEWEE O2 acknowledged wash-and-wear as a great invention and complained, "*the material itself will make life more convenient and dignified. Hemp is wrinkled before the banquet, so hemp is purely used for just a moment, it will be wrinkled when sitting*." Actually, the performance dimension was often mingled with material dimension during the interviews, because the function of material innovation often aimed to improve comfort, protection, and maintenance of fashion, although performance innovation could be obtained by other methods such as pattern cutting.

4.4.3.4 Symbolism

Four academic experts strongly promoted the personal and social characteristics of FDI. HAIYAN WU discussed human demand under specific social circumstances from philosophical speculation.

A. Personal value

INTERVIEWEE I1 considered fashion as a lifestyle design, which is relevant not only with substances, but also with invisible functions to symbolize personal and society; different nationalities and districts had different appeals of displays. He stated that "*I think it is reasonable to innovate on this, and there should be such demand*." YANLIN CHEN argued that this item "*meets people's material, emotional, or spiritual needs*", which "provides consumers a reason to buy." INTERVIEWEE A5 introduced brands "*use different angles and ways of thinking to convey the new life rhythm and attitude of young people*." INTERVIEWEE L3 used Thom Brown and Off-White to express a similar opinion. HAIYAN WU identified the person being either a customer or a designer.

B. Social value

Almost all interviewees expressed that as long as society and economy were developed, fashion innovation must reflect the changes of globalization and diversifications at the social level, such as FDI for regional markets, subculture groups, and niche markets instead of the single market. JIAXIN WANG took the Dior New Look as an exemplary innovation to illustrate postwar society. According to INTERVIEWEE O2, LV and Parada have different social responses in the UK, New Zealand, and Italy. Another

symbolic innovation introduced by ZHIDONG XU was Bottega's green, which had been overlooked when launching the market but found a life meaning during the pandemic. HAIYAN WU also mentioned that work-from-home during COVID19 caused the popularity and innovation of homewear or loungewear of higher quality. She also talked about her research on fashion trends since the 1990s, saying that "*after we do it for a long time, political factors lead to social hotspots. The comments, attention, following, and support are immediately reflected in design studies. In design, the first thing to bear the brunt is fashion*." She vividly described that during her flight to Germany, she knew that Chairman Hu Jintao had visited Africa, and wondered if there would be some aesthetics, lifestyle, and folk art of Africa and China would be exhibited in the Frankfurt exhibition. After arriving, to her surprise, her idea was proved to be true that pattern and cloth mimic African batik and wood carving, as well as Chinese paper-cutting and origami. Their comparison was developed into one of the trends at the exhibition. SHIKANG ZHOU and INTERVIEWEE O1 approved that local brands contributed to identity recognition of nationality, such as Guochao. More abstractly, FDI was treated as a thinking tool of society as well as a symbol of lifestyle by YANLIN CHEN.

4.4.3.5 Technology

A. Manufacturing technology

The digitalization of manufacturing technology was proposed by interviewees from designers to officials. INTERVIEWEE I5 showed a digitalized prototype room and accentuated the importance of digitalization by saying, "*the technique is good, the innovation of pattern making is good, but you have to grasp the newest digitalization tool and system*." INTERVIEWEE I3 gave the reason for the increased cost, particularly time cost, when swiftly change from mass production to small batches, lay on pattern making and cutting instead of sewing, due to the unit price. He continued to provide the solution of parametric CAD to shorten the grading time. INTERVIEWEE D4 printed patterns directly on fabric, which did not require the pattern transfer process. The highest frequency of examples was the smart manufacturing of EEKA Fashion Holdings Listed[1].

Flexible manufacturing was discussed by several interviewees. INTERVIEWEE I3 clarified that this technology was based on individual needs, multi-varieties, and small batches. He expanded the discussion to rapid response production since the lead time was shortened. Some interviewees talked about machinery innovation.

As for specific technology, INTERVIEWEE O2 mentioned binding technology replaced sewing technology, while SHIKANG ZHOU mentioned using templates is an innovative technology to speed up sewing. JIGUO QIANG talked about seamless technology in knitwear. Another seamless technology was the use of sprayable coating

technology, which dismissed the cutting and sewing processes mentioned by HAIYAN WU.

Regarding printing, embroidery, and laser cutting, JIGUO QIANG believed that "*they probably the most commonly are used in fashion, which can be made into some patterns on fabric."*

B. Finishing technology

JIGUO QIANG identified the finishing technology by saying that "*Italian fabrics can be printed directly, while Chinese fabrics, if you don't communicate with the fabric mill in advance that it is for printing, cannot be directly used for printing…The dye itself and the materials used for dyeing are good*." However, no more interviewees mentioned this item.

C. Showing technology

This category also refers to conceptualization and presentation technology. YAOHUA DONG considered Metaverse a virtual showing technology of fashion, such as MetaFactory. INTERVIEWEE I3 reported that 3D virtual prototypes and 3D fashion shows have spurred out recently which reduced time, material cost, and labor cost. INTERVIEWEE I1, also talked about Metaverse where fashion shows had immersed feeling and materials had no limitations. INTERVIEWEE I5 introduced glasses-free

3D in the industry park of the company. Considering physical exhibitions, JIGUO QIANG visited ISPO in Germany saying, "*the showing technology at this trade fair in Munich shocks me. Watching the display of those foreign brands, I am so disappointed that we are manufacturing downstream products for other countries, we are too backward. I feel really ashamed. Why? The design, the inspirations, the things made during this fair, the immersive experience. We have no right to speak loudly internationally, we are actually in such a low-tech industry without high-tech chips*."

D. User-centered technology

Based on a basic pattern and parametric CAD, one-person-one-pattern could be achieved, with the INTERVIEWEE I3's words "*We conclude a methodology for customization, using standardization to achieve personalization, which is named modular combination*." Furthermore, a platform that was easier for customers to modify style, color, material, and size could process pattern making and cutting automatically. INTERVIEWEE D4 also pointed out a smart Made-to-Measurement system matched individual demands by using 3D simulation software. INTERVIEWEE D4 launched her own brand with wearable technology in 2016, such as flexible circuit printing on fabric and flexible solar cells.

E. IoT technology

The provincial official was impressed by logistics innovation in the fashion sector, which was built based on big data and resulted in accuracy. INTERVIEWEE I5 argued that "*now everyone is making digital products, and everyone is doing NFT*." YAOHUA DONG talked about crowdfunding and smart contracts of fashion design, complemented after the interview with some examples such as RTFKT, Digital Fashion Operating System (DFOS), and RedFOX. INTERVIEWEE I3 pointed out that "i*n the next few decades, China's population decline will lead to a shortage of skilled workers, which also requires companies to make good use of big data to achieve the continuation of technology*." INTERVIEWEE I1 elaborated on big data, saying "*most people can be analyzed through online big data, because every big platform, no matter if it is a shopping platform or a search platform, has several labels for each consumer. Everyone may have thousands of tags from which a designer team can capture useful information, such as purchase frequency and consumption tendencies, to gain insight into the real needs of consumers. There is a good saying that big data understand consumers better than themselves. I think we should fully learn from the research of big data*."

4.4.3.6 Sustainability

A. Environment

All interviewees responded to this item from material and aesthetics to technology. HARRY and 4 recommended eco-vegetarian leather and biodegradable materials such as mushroom and spider silk. Many interviewees criticized the cutting process, which can be resolved in multiple ways. SHIKANG ZHOU stressed the lifespan of fashion product. INTERVIEWEE I3 pointed out that "*because of fiercer environmental protection, low carbon is the future trend, which requires fashion production to be more efficient and reduce unnecessary waste"*, smart CAD and big data would make contribution. INTERVIEWEE A5 reported that EEKA[1] was included in the list of 2020 Sustainable fashion practitioners and joined WWD Sustainable Fashion Association in 2021 because of its effort to recycle, degradability, reuse, and low energy consumption. A detailed case was provided by YANG LIU that he won Asahi Kasei Chinese Fashion Designer Creation Award to express environmental protection.

B. Wellbeing

JIAXING WANG mentioned sensors and chips were embedded in fashion to monitor body data. YANG LIU gave an example of herbal medicine dyed fashion to improve health. YANLIN CHEN mentioned one graduation fashion design at Tsinghua University aimed at the convenience of the elderly. INTERVIEWEE I1 reported that gowns for patients innovated by changing color might help the psychology of hospitalization.

C. Society

HAIYAN WU mentioned the usage of local resources could benefit the local community, such as bamboo fiber. YANLIN CHEN discussed how pattern innovation of intangible heritage contributed to the survival of tradition and folk art. INTERVIEWEE A5 also mentioned intangible heritage such as Su Embroidery, which was refreshed by combining high-tech fibers and trendy suits. YANG LIU coined this item in a broader lens of nationality and the Orient, to innovate Chinese studies.

It demonstrated that the same dimensions and items as those in Study 2.2 were extracted from the data coding of Study 2.3. Based on the literature review and expert interviews, 6 dimensions and 21 items were identified for the following sub-study 2.4, as shown in Table 4.2.

4.4.4 Study 2.4 Large-scale Survey

4.4.4.1 Descriptive Analysis

The total sample size is 116, without missing data and invalid data. Table 4.4 shows the statistical description of 21 variables, including mean, minimum, maximum, standard deviation, variance, Skewness, and Kurtosis. The skewness measures the deviation from normality, which has values (-1.0, +1.0). As for Kurtosis, a measure of the peakedness of a distribution, only item “form” is larger than 2.0, and the rest of the 20

items lie between ±2. Thus, all are acceptable. Both skewness and kurtosis indicate a suitable data set for further analysis. The frequency and bar chart of each item are shown in Appendices 4 and 5.

Appendix 4 presents the frequency of each variable individually. It can be concluded that the most common choice of all items appears on “agree”, coming after “strongly agree”. All items have the highest frequency and ratio of choice “agree”, from 49.1% of item 3 to 62.11% of item 8. Only one item “surface” is slightly less than 50%, which is 49.1%. But this item has the largest percentage of “strongly agree”, which is 45.7%. “Accessories”, “protection”, “maintenance” and “finishing technology” are more than 60% of “strongly agree”. The lowest percentage is 25.9 belonging to “how to wear”, “social value” and “IoT technology”.

The total percentage of “strongly agree” and “agree” ranges between 78.5 and 96.6. The highest number is item “form”, while the lowest item is “how to wear”, both of which belong to the aesthetics dimension.

As for “no opinion”, the highest percentage is 6, which comes from “personal value” and “wellbeing”. The second largest percentage is 5.2, which comes from “how to wear”, “society value” and “IoT technology”. Two of the top four items belong to the symbolism dimension. The lowest percentage is .9 on items “surface” and “fabric”.

It is noticed that no respondent ranked “surface”, “comfort”, “social value”, “finishing technology”, “well-being”, and “society” as “strongly disagree”. These 6 items count for 28.6% of 21 items, which is nearly one-third. “Strongly disagree” ranges from .9% to 1.8% in the rest of the items except IoT technology which has 3 responses on “strongly disagree” and accounts for 2.6%.

It is reported that only one item “form” has no response on “disagree”, which has 2 responses on “strongly disagree”. The item “how to wear” gains the highest responses 17 (14.7%) on “disagree”. There are two more items: “personal value” and “social value” from the symbolism dimension with a percentage of “disagree” greater than 10. This means one-tenth of respondents have a negative attitude toward the symbolism dimension.

The frequency summing “strongly disagree” and “disagree” ranges from “form” with 2 (1.8%) to “how to wear” with 19 (16.4%). Following are “maintenance” and “IoT technology” with 9.5%. There is a slight difference of frequency: “strongly disagree” and “disagree” on “maintenance” and “IoT” are 1, 10, and 3, 8 respectively. More respondents hold an extremely negative attitude toward “IoT technology” and a relatively mild negative towards “maintenance”.

Table 4.4 Descriptive data analysis

Statistics									
Item		1.Form	2.Color and pattern	3.Surface	4.Style	5.How to wear	6.Raw material	7.Fabric	8.Accessories
N	Valid	116	116	116	116	116	116	116	
	Missing	0	0	0	0	0	0	0	
Mean		3.39	3.42	3.43	3.27	3.18	3.32	3.40	3.25
Median		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mode		3	3	3	3	3	3	3	3
Std. Deviation		.615	.648	.593	.677	.809	.641	.617	.671
Variance		.379	.420	.352	.458	.654	.410	.381	.450
Skewness		-.473	-.291	-.237	-.042	.058	.002	-.501	-.165
Std. Error of Skewness		.225	.225	.225	.225	.225	.225	.225	.225
Kurtosis		2.439	.904	-.521	.731	.296	1.102	.902	1.660

Std. Error of Kurtosis	.446	.446	.446	.446	.446	.446	.446	.446
Minimum	1	1	2	1	1	1	1	1
Maximum	5	5	5	5	5	5	5	5

(to be continued)

Item		9.Comfort	10.Protection	11.Maintenance	12.Personal value	13.Social value	14.Manufacturing technology	15.Finishing technology
N	Valid	116	116	116	116	116	116	116
	Missing	0	0	0	0	0	0	0
Mean		3.37	3.29	3.22	3.31	3.26	3.34	3.38
Median		3.00	3.00	3.00	3.00	3.00	3.00	3.00
Mode		3	3	3	3	3	3	3
Std. Deviation		.653	.698	.674	.774	.712	.620	.599

Variance	.427	.487	.454	.599	.506	.384	.359
Skewness	.017	-.005	.047	.085	.462	-.167	.603
Std. Error of Skewness	.225	.225	.225	.225	.225	.225	.225
Kurtosis	-.182	1.569	.861	.235	.301	1.075	.164
Std. Error of Kurtosis	.446	.446	.446	.446	.446	.446	.446
Minimum	2	1	1	1	2	1	2
Maximum	5	5	5	5	5	5	5

(to be continued)

Item		16.Showing technology	17.User-centered technology	18.IoT technology	19.Environment	20.Wellbeing	21.Society
N	Valid	116	116	116	116	116	116
	Missing	0	0	0	0	0	0
Mean		3.41	3.38	3.24	3.39	3.49	3.34

Median	3.00	3.00	3.00	3.00	3.00	3.00
Mode	3	3	3	3	3	3
Std. Deviation	.698	.706	.765	.615	.653	.634
Variance	.487	.498	.585	.379	.426	.402
Skewness	-.280	-.240	-.086	-.245	.414	.398
Std. Error of Skewness	.225	.225	.225	.225	.225	.225
Kurtosis	1.492	1.369	1.269	1.078	-.168	.189
Std. Error of Kurtosis	.446	.446	.446	.446	.446	.446
Minimum	1	1	1	1	2	2
Maximum	5	5	5	5	5	5

4.4.4.2 Reliability and Validity

Reliability. Table 4.5 shows that the Cronbach α value is 0.915, which is larger than 0.9, thus indicating that the reliability quality of the research data is very high. If any item is deleted, the Cronbach α value will not change significantly, so it suggests that the item should not be deleted. The CITC values of the items are all larger than 0.4, indicating a good correlation between the analysis items and a high level of reliability. In summary, the reliability is of high quality and can be used for further analysis.

Table 4.5 Reliability statistics

Items	Corrected Item-Total Correlation (CITC)	Cronbach α if Item Deleted	Cronbach α
A1	0.509	0.912	0.915
A2	0.652	0.909	
A3	0.623	0.910	
A4	0.503	0.912	
A5	0.563	0.911	
M1	0.593	0.911	
M2	0.661	0.909	
M3	0.465	0.913	
P1	0.512	0.912	
P2	0.549	0.911	
P3	0.596	0.910	
S1	0.494	0.913	

S2	0.614	0.910	
T1	0.573	0.911	
T2	0.483	0.913	
T3	0.517	0.912	
T4	0.520	0.912	
T5	0.522	0.912	
ST1	0.636	0.910	
ST2	0.575	0.911	
ST3	0.599	0.910	
Cronbach α (Standardized): 0.917			

Validity. Items were extracted based on an intensive literature review in Study 1 of Chapter 3. Study 2.1 expert review, Study 2.2 focus group survey, and Study 2.3 expert interview have ensured the content validity.

Table 4.6 reveals that the communalities corresponding to all items are higher than 0.4, indicating that item information can be effectively extracted. In addition, the variance explanation rates of the six factors are 15.095%, 11.809%, 11.807%, 11.558%, 9.273%, and 8.828%, respectively. The cumulative variance after rotation is 68.370%, which is greater than 50%. It means that sufficient information on the items can be collected. The factor loading coefficient also presents that the corresponding relationship between the factor (dimension) and the item is in line with the expectation, with the exception

of items P1, P2, and P3, which require further modifications, such as deletion. The absolute value of all factor loading coefficients is greater than 0.4, and the correlation between the item and the factor exists. Table 4.7 indicates that the KMO value is 0.840, which is greater than 0.8, suggesting the data is very suitable for extracting information and the validity is good.

Table 4.6 Validity analysis

Items	Factor Loadings						Communalities
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Factor 6	
A1	0.113	0.72	0.173	0.084	0.213	0.052	0.617
A2	0.014	0.639	0.197	0.309	0.315	0.308	0.737
A3	0.048	0.504	0.311	0.256	0.159	0.421	0.621
A4	0.217	0.388	-0.047	0.215	-0.047	0.677	0.706
A5	0.223	0.174	0.349	-0.065	0.454	0.476	0.639
M1	0.258	0.264	0.636	0.092	0.167	0.125	0.592
M2	0.379	0.357	0.512	-0.049	0.159	0.359	0.689
M3	0.087	0.073	0.774	0.111	0.089	0.101	0.642
P1	0.075	-0.029	0.438	0.167	0.14	0.696	0.73
P2	0.207	0.383	0.302	0.667	-0.205	-0.002	0.767
P3	0.052	0.222	0.59	0.444	0.12	0.126	0.627
S1	0.073	0.147	0.16	0.197	0.789	0.092	0.722
S2	0.136	0.469	0.121	0.255	0.675	0.039	0.775
T1	0.612	0.461	0.178	0.136	-0.025	0.046	0.64
T2	0.724	0.24	0.005	0.081	-0.043	0.174	0.621

T3	0.765	0.036	0.107	0.155	0.178	0.058	0.658
T4	0.746	0.02	0.416	0.126	0.023	-0.08	0.753
T5	0.752	-0.114	0.03	0.244	0.21	0.229	0.736
ST1	0.19	0.426	0.143	0.554	0.199	0.171	0.614
ST2	0.204	0.106	0.127	0.68	0.411	0.03	0.702
ST3	0.285	0.004	0.027	0.719	0.258	0.324	0.771
Eigenvalues (Initial)	7.942	1.942	1.375	1.103	1.033	0.963	-
% of Variance (Initial)	37.817 %	9.249%	6.546%	5.254%	4.918%	4.586%	-
% of Cum. Variance (Initial)	37.817 %	47.066 %	53.612 %	58.866 %	63.784 %	68.370 %	-
Eigenvalues (Rotated)	3.17	2.48	2.479	2.427	1.947	1.854	-
% of Variance (Rotated)	15.095 %	11.809 %	11.807 %	11.558 %	9.273%	8.828%	-
% of Cum. Variance (Rotated)	15.095 %	26.904 %	38.711 %	50.270 %	59.542 %	68.370 %	-

Table 4.7 KMO and Bartlett's Test

KMO		0.84
Bartlett's Test of Sphericity	Chi-Square	1198.701
	df	210
	p	0

4.4.4.3 Confirmatory Factor Analysis

The histograms in Appendix 5 indicate that all items exhibit a distribution that is essentially normal. Because the sample size was greater than 50, the Kolmogorov-Smirnov test was used to further determine whether there was a significant deviation from the normal distribution (Drezner et al., 2010). Table 4.8 shows that all items were significant ($p<0.05$), leading to the rejection of the original assumption (normal distribution of data). Thus, Spearman correlation rather than Pearson correlation is appropriate in this case to access the discriminant validity (Gorsuch, 2015; Thompson, 2004).

Table 4.8 Kolmogorov-Smirnov test (Normality)

Items	*n*	Mean	Std.	Skewness	kurtosis	Kolmogorov-Smirnov test	
						Statistic *D*	*p*
A1	116	3.388	0.615	-0.473	2.439	0.331	0.000**
A2	116	3.422	0.648	-0.291	0.904	0.294	0.000**
A3	116	3.431	0.593	-0.237	-0.521	0.301	0.000**
A4	116	3.267	0.677	-0.042	0.731	0.317	0.000**
A5	116	3.181	0.809	0.058	0.296	0.278	0.000**
M1	116	3.319	0.641	0.002	1.102	0.337	0.000**
M2	116	3.397	0.617	-0.501	0.902	0.300	0.000**
M3	116	3.250	0.671	-0.165	1.660	0.335	0.000**
P1	116	3.371	0.653	0.017	-0.182	0.301	0.000**

P2	116	3.293	0.698	-0.005	1.569	0.335	0.000**
P3	116	3.224	0.674	0.047	0.861	0.329	0.000**
S1	116	3.310	0.774	0.085	0.235	0.285	0.000**
S2	116	3.259	0.712	0.462	0.301	0.332	0.000**
T1	116	3.345	0.620	-0.167	1.075	0.332	0.000**
T2	116	3.379	0.599	0.603	0.164	0.366	0.000**
T3	116	3.405	0.698	-0.280	1.492	0.297	0.000**
T4	116	3.379	0.706	-0.240	1.369	0.299	0.000**
T5	116	3.241	0.765	-0.086	1.269	0.314	0.000**
ST1	116	3.388	0.615	-0.245	1.078	0.322	0.000**
ST2	116	3.491	0.653	0.414	-0.168	0.317	0.000**
ST3	116	3.345	0.634	0.398	0.189	0.345	0.000**

* $p<0.05$ ** $p<0.01$

Utilizing SPSSAU, an online SPSS tool, CFA was conducted in an iterative way. Dimensions and items of FDI measurement were finalized after three rounds.

First Round. Table 4.9 provides the basic information about the 6 factors and the number of their items. Table 4.10 shows, with the exception of A4, A5, M3, and P1, the standard factor loadings for all other factors and items exceed 0.6, and the p value is statistically significant for all items. Therefore, it can be deduced that there exsit correlations among all factors and items have. According to Table 4.11, the average variance extracted (AVE) values corresponding to 3 factors are less than 0.5 and the

CR value for the performance factor is less than 0.7, suggesting that convergent validity is not satisfied. As shown in Table 4.12, it can be observed that all 6 dimensions have statistical significance, and the correlation coefficients for all dimensions exceed zero, indicating a positive correlation among the dimensions and good discriminant validity. It was considered to remove item P1, which had a lower standard factor loading, and thereafter conduct a re-analysis.

Table 4.9 CFA basic summary (1st Round)

Factor	N
Aesthetics	5
Material	3
Performance	3
Symbolism	2
Technology	5
Sustainability	3
Total	21
n	116

Table 4.10 Factor loading (1st Round)

Factor	Item	Non-standard Load Factor (Coef.)	Std. Error	z (CR Value)	p	Factor Loading (Std. Estimate)
Aesthetics	A1	1.000	-	-	-	0.607
Aesthetics	A2	1.442	0.213	6.758	0.000	0.831
Aesthetics	A3	1.178	0.187	6.289	0.000	0.742
Aesthetics	A4	0.959	0.197	4.865	0.000	0.529
Aesthetics	A5	1.277	0.241	5.309	0.000	0.590
Material	M1	1.000	-	-	-	0.691
Material	M2	1.064	0.150	7.083	0.000	0.764
Material	M3	0.877	0.158	5.556	0.000	0.579
Performance	P1	1.000	-	-	-	0.565
Performance	P2	1.181	0.235	5.028	0.000	0.624
Performance	P3	1.281	0.237	5.404	0.000	0.702
Symbolism	S1	1.000	-	-	-	0.689
Symbolism	S2	1.245	0.185	6.719	0.000	0.933
Technology	T1	1.000	-	-	-	0.660
Technology	T2	0.959	0.160	6.006	0.000	0.655
Technology	T3	1.257	0.190	6.605	0.000	0.738
Technology	T4	1.300	0.194	6.711	0.000	0.754
Technology	T5	1.344	0.207	6.480	0.000	0.720
Sustainability	S1	1.000	-	-	-	0.752
Sustainability	S2	1.032	0.140	7.373	0.000	0.731
Sustainability	S3	1.023	0.136	7.522	0.000	0.747

Table 4.11 AVE and CR (1st Round)

Factor	AVE	CR
Aesthetics	0.448	0.798
Material	0.465	0.721
Performance	0.400	0.665
Symbolism	0.672	0.800
Technology	0.499	0.832
Sustainability	0.553	0.787

Table 4.12 Spearman correlation (1st Round)

	Aesthetics	Material	Performance	Symbolism	Technology	Sustainability
Aesthetics	1					
Material	0.618**	1				
Performance	0.589**	0.604**	1			
Symbolism	0.484**	0.397**	0.402**	1		
Technology	0.338**	0.470**	0.374**	0.332**	1	
Sustainability	0.527**	0.427**	0.561**	0.502**	0.525**	1

* $p<0.05$ ** $p<0.01$

Second Round. Table 4.13 displays the basic information of CFA with 6 dimensions and 20 items after excluding item P1. According to Table 4.14, all other factors and items, with the exception of A4, A5, and M3, have standard factor loadings larger than 0.6. Additionally, the p value is significant for all items. Thus, it can be inferred that all factors and items have correlations. Table 4.15 shows that the AVE values for 2 factors are below 0.5 and the CR value of performance is below 0.7, indicating that the convergent validity still needs improvement. Table 4.16 shows that after the deletion of P1, all 6 dimensions continue to demonstrate statistical significance, and the correlation coefficients for all dimensions surpass 0, indicating a positive correlation among the dimensions and good discriminant validity. All correlations remain the same from the 1st round correlation test, with the exception that performance is most significantly impacted by the sustainability factor rather than the material factor. Given that the performance factor's CR value is less than 0.7, it should be considered to be removed.

Table 4.13 CFA basic summary (2nd Round)

Factor	N
Aesthetics	5
Material	3
Performance	2
Symbolism	2
Technology	5

Sustainability	3
Total	20
n	116

Table 4.14 Factor loading (2nd Round)

Factor	Item	Non-standard Load Factor (Coef.)	Std. Error	*z* (CR value)	*p*	Factor Loading (Std. Estimate)
Aesthetics	A1	1.000	-	-	-	0.610
Aesthetics	A2	1.447	0.212	6.819	0.000	0.838
Aesthetics	A3	1.165	0.185	6.284	0.000	0.737
Aesthetics	A4	0.952	0.196	4.866	0.000	0.528
Aesthetics	A5	1.264	0.239	5.299	0.000	0.586
Material	M1	1.000	-	-	-	0.682
Material	M2	1.104	0.158	7.006	0.000	0.783
Material	M3	0.871	0.162	5.364	0.000	0.567
Performance	P3	1.000	-	-	-	0.735
Performance	P2	1.008	0.161	6.269	0.000	0.715
Symbolism	S1	1.000	-	-	-	0.688
Symbolism	S2	1.249	0.186	6.710	0.000	0.934
Technology	T1	1.000	-	-	-	0.662
Technology	T2	0.960	0.159	6.028	0.000	0.657
Technology	T3	1.252	0.189	6.607	0.000	0.736
Technology	T4	1.300	0.193	6.736	0.000	0.755

Technology	T5	1.337	0.207	6.473	0.000	0.717
Sustainability	S1	1.000	-	-	-	0.761
Sustainability	S2	1.023	0.137	7.468	0.000	0.733
Sustainability	S3	0.995	0.133	7.478	0.000	0.734

Table 4.15 AVE and CR (2nd Round)

Factor	AVE	CR
Aesthetics	0.448	0.798
Material	0.467	0.721
Performance	0.525	0.689
Symbolism	0.673	0.801
Technology	0.499	0.832
Sustainability	0.552	0.787

Table 4.16 Spearman correlation (2nd Round)

	Aesthetics	Material	Performance	Symbolism	Technology	Sustainability
Aesthetics	1					
Material	0.618**	1				
Performance	0.467**	0.484**	1			
Symbolism	0.484**	0.397**	0.385**	1		
Technology	0.338**	0.470**	0.357**	0.332**	1	
Sustainability	0.527**	0.427**	0.532**	0.502**	0.525**	1

* $p<0.05$ ** $p<0.01$

Third Round. Table 4.17 displays the basic information with 5 dimensions and 18 items after removing items P2 and P3. Table 4.18 demonstrates that with the exception of A4, A5, and M3, the standard factor loadings for all other factors and items are largerer than 0.6, and the p value of all items is statistically significant. Thus, it can be inferred that all factors and items have correlations. According to Table 4.19, all 5 factors have CR values above 0.7, and although the AVE values of the 3 factors are still slightly less than 0.5, the convergent validity can be acceptable. Table 4.20 displays that all 5 dimensions exhibit statistical significance, and the correlation coefficients for all dimensions surpass 0, indicating a positive correlation among the dimensions and demonstrating good discriminant validity. It can be concluded that the standard factor loading coefficients, convergent validity, and divergent validity were acceptable after eliminating the performance factor.

Table 4.20 also indicates that all correlations are unchanged as in the previous rounds after the removal of the performance factor, except that sustainability is most impacted by aesthetics instead of performance, which is discussed below. Regarding the aesthetics factor, the material exhibits the strongest correlation coefficient value, followed by sustainability as the second most influential factor. Conversely, the correlation between aesthetics and technology is the weakest. Aesthetics has the highest influence on the material factor, and symbolism has the lowest. Concerning the

symbolism factor, sustainability exhibits the highest influence and technology the lowest. The technology factor is most significantly associated with sustainability, while symbolism is least significant. Sustainability is most impacted by aesthetics and least by material.

The statistical analysis proceed by examing factor covariance and generating the CFA model, as depited in Table 4.21 and Figure 4.2. The significance of the correlation between all factors is demonstrated in Table 4.21 of the factor covariance analysis.

Table 4.17 CFA basic summary (3rd Round)

Factor	N
Aesthetics	5
Material	3
Symbolism	2
Technology	5
Sustainability	3
Total	18
n	116

Table 4.18 Factor loading (3rd Round)

Factor	Item	Non-standard Load Factor (Coef.)	Std. Error	z (CR value)	p	Factor Loading (Std. Estimate)
Aesthetics	A1	1.000	-	-	-	0.605

Aesthetics	A2	1.461	0.217	6.744	0.000	0.839
Aesthetics	A3	1.171	0.189	6.211	0.000	0.735
Aesthetics	A4	0.959	0.199	4.829	0.000	0.527
Aesthetics	A5	1.286	0.243	5.299	0.000	0.592
Material	M1	1.000	-	-	-	0.665
Material	M2	1.180	0.171	6.909	0.000	0.815
Material	M3	0.866	0.169	5.118	0.000	0.550
Symbolism	S1	1.000	-	-	-	0.688
Symbolism	S2	1.250	0.186	6.709	0.000	0.935
Technology	T1	1.000	-	-	-	0.661
Technology	T2	0.956	0.159	6.007	0.000	0.654
Technology	T3	1.256	0.190	6.622	0.000	0.739
Technology	T4	1.298	0.193	6.727	0.000	0.754
Technology	T5	1.339	0.207	6.479	0.000	0.718
Sustainability	S1	1.000	-	-	-	0.753
Sustainability	S2	1.040	0.142	7.328	0.000	0.739
Sustainability	S3	1.009	0.138	7.318	0.000	0.738

Table 4.19 AVE and CR (3rd Round)

Factor	AVE	CR
Aesthetics	0.448	0.797
Material	0.469	0.721
Symbolism	0.673	0.801
Technology	0.499	0.832
Sustainability	0.552	0.787

Table 4.20 Spearman correlation (3rd Round)

	Aesthetics	Material	Symbolism	Technology	Sustainability
Aesthetics	1				
Material	0.618**	1			
Symbolism	0.484**	0.397**	1		
Technology	0.338**	0.470**	0.332**	1	
Sustainability	0.527**	0.427**	0.502**	0.525**	1

* $p<0.05$ ** $p<0.01$

Table 4.21 Factor covariance

Factor	Factor	Non-standard Coefficient	Std. Error	*z*	*p*	Coefficient (Std. Estimate)
Aesthetics	Material	0.127	0.030	4.230	0.000	0.806
Aesthetics	Symbolism	0.140	0.036	3.948	0.000	0.716
Aesthetics	Technology	0.070	0.021	3.277	0.001	0.463
Aesthetics	Sustainability	0.128	0.030	4.340	0.000	0.750
Material	Symbolism	0.112	0.033	3.360	0.001	0.497
Material	Technology	0.118	0.029	4.077	0.000	0.684
Material	Sustainability	0.116	0.030	3.886	0.000	0.593
Symbolism	Technology	0.085	0.029	2.982	0.003	0.394
Symbolism	Sustainability	0.163	0.040	4.095	0.000	0.666
Technology	Sustainability	0.115	0.028	4.043	0.000	0.610

Three rounds of confirmatory factor analysis (CFA) were conducted to attain a satisfactory factor loading coefficient, convergent validity, and discriminant validity, as previously stated. Table 4.22 shows that the deletion of item comfort (P1) has a positive impact on the discriminant validity of the performance dimension, while having no effect on the convergent validity. However, after the elimination of the performance dimension, both convergent validity and discriminant validity were acceptable. Figure 4.2 displays the finalized structure model following the third round of CFA.

Table 4.22 Information for three rounds of CFA

Round	Dimension Numbers	Item Numbers	Deleted dimensions and item	Convergent validity	Discriminant validity
1	6	21		X	X
2	6	20	Item: P1	X	√
3	5	18	Dimension: Performance (Item: P2, P3)	√	√

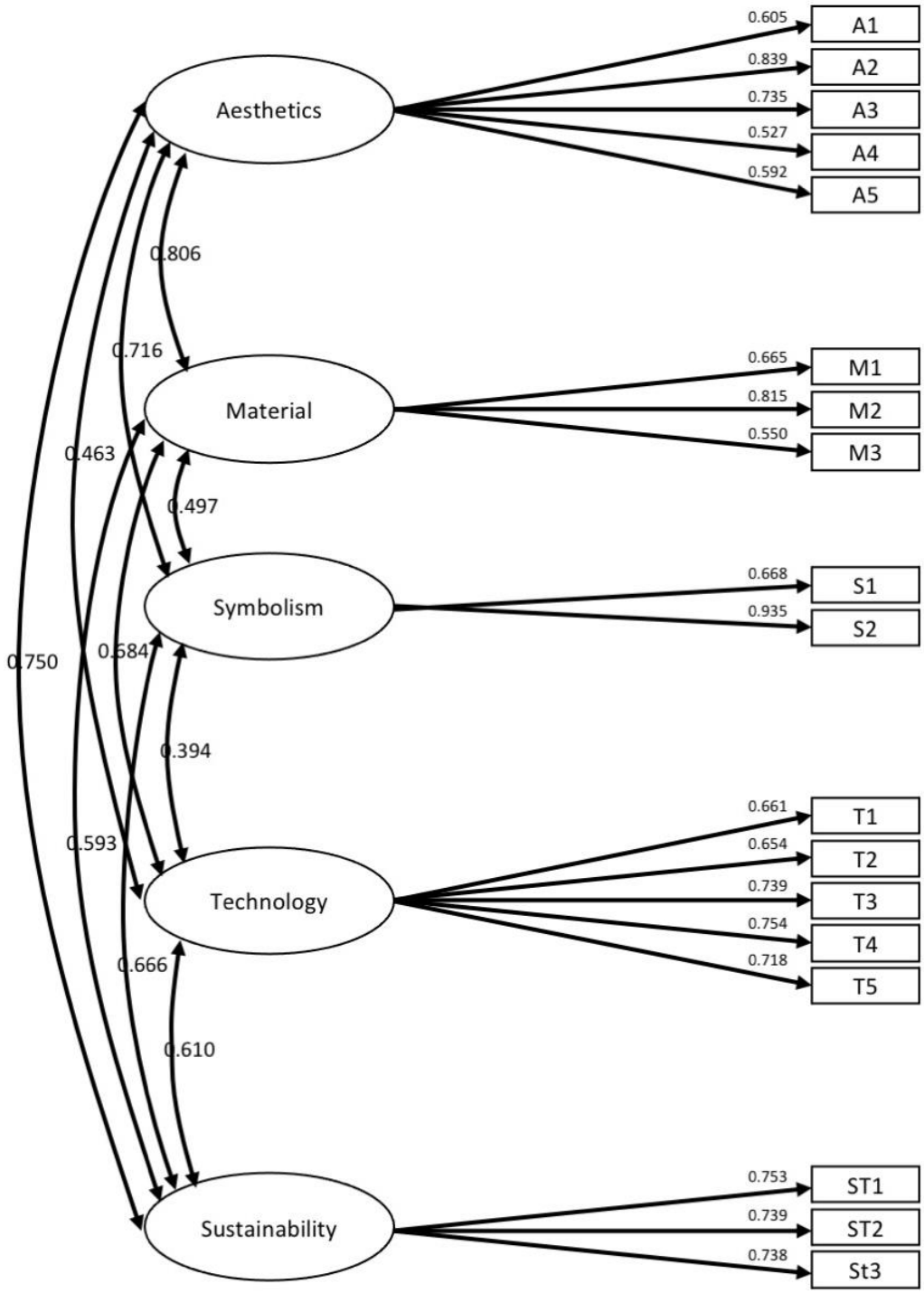


Figure 4.2 FDI measurement model

4.4.4.4 Reliability and Validity after CFA

After conducting CFA, the reliability and validity of 5 dimensions and 18 items were assessed.

Reliability. Table 4.23 shows the reliability statistics. The reliability coefficient value of 0.903 exceeds 0.9, thus indicating a high level of reliability. Regarding the "alpha coefficient of deleted item", it is observed that the reliability coefficient does not exhibit a substantial increase following deleting any item. This suggests that the item should not be subject to deletion. Concerning the "CITC value", it is noteworthy that all of the analysis items show CITC values exceeding 0.4, indicating a good correlation between the items and a good level of reliability.

Table 4.23 Reliability statistics

Items	Corrected Item-Total Correlation (CITC)	Cronbach Alpha if Item Deleted	Cronbach α
A1	0.504	0.899	0.903
A2	0.646	0.895	
A3	0.604	0.897	
A4	0.486	0.900	
A5	0.561	0.898	
M1	0.571	0.897	
M2	0.670	0.895	
M3	0.431	0.902	

S1	0.497	0.900	
S2	0.620	0.896	
T1	0.580	0.897	
T2	0.480	0.900	
T3	0.546	0.898	
T4	0.525	0.899	
T5	0.535	0.899	
ST1	0.624	0.896	
ST2	0.569	0.897	
ST3	0.584	0.897	
Cronbach α (Standardized): 0.905			

Validity. Table 4.24 shows that the communality values associated to all items are greater than 0.4. In addition, the 5 factors have variance (rotated) rates of 16.309%, 14.683%, 14.187%, 13.288%, and 8.850%, respectively. After rotation, the cumulative variance rates are 67.317%, which surpasses 50%. It implies that item information can be effectively extracted. Table 4.25 shows that the KMO value is 0.837, which exceeds 0.8, suggesting the data is very suitable for information extraction.

Table 4.24 Validity analysis

Items	Factor Loadings					Communalities
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	
A1	0.049	0.598	0.268	0.127	0.208	0.492
A2	-0.049	0.651	0.321	0.44	0.191	0.759
A3	0.028	0.625	0.355	0.323	0.09	0.63
A4	0.293	0.722	0.001	0.035	0.126	0.625
A5	0.152	0.268	0.539	0.149	0.306	0.501
M1	0.158	0.175	0.725	0.269	-0.012	0.653
M2	0.29	0.405	0.676	0.112	0.018	0.718
M3	0.112	0.095	0.685	-0.062	0.299	0.584
S1	0.101	0.153	0.17	0.206	0.871	0.864
S2	0.091	0.367	0.21	0.384	0.606	0.701
T1	0.543	0.392	0.28	0.212	-0.136	0.59
T2	0.787	0.351	-0.006	-0.114	0.142	0.776
T3	0.725	0.042	0.223	0.239	0.064	0.639
T4	0.68	-0.082	0.488	0.193	-0.076	0.75
T5	0.777	0.02	0.09	0.254	0.173	0.707
ST1	0.151	0.433	0.2	0.653	0.033	0.677
ST2	0.178	0.078	0.155	0.815	0.212	0.772
ST3	0.345	0.191	0.001	0.685	0.236	0.68
Eigenvalues (Initial)	6.941	1.902	1.307	1.024	0.943	-
% of Variance (Initial)	38.563%	10.569%	7.261%	5.688%	5.238%	-

% of Cum. Variance (Initial)	38.563%	49.131%	56.392%	62.080%	67.317%	-
Eigenvalues (Rotated)	2.936	2.643	2.554	2.392	1.593	-
% of Variance (Rotated)	16.309%	14.683%	14.187%	13.288%	8.850%	-
% of Cum. Variance (Rotated)	16.309%	30.993%	45.180%	58.468%	67.317%	-

Table 4.25 KMO and Bartlett's Test

KMO		0.837
Bartlett's Test of Sphericity	Approx. Chi-Square	982.284
	df	153
	Sig. (p value)	0

4.4.5 Final Fashion Design Innovation (FDI) Measurement

The final FDI measurement consists of 5 dimensions and 18 items, as shown in Table 4.26. The performance dimension with 3 items was deleted after the CFA procedure.

Table 4.26 Final FDI measurement

Dimension	Item	Explanation
Aesthetics	Form	Innovation related to silhouette, details of the garment, such as collar, sleeve, shoulder, hem and waist, etc., and proportion
	Color and pattern	Innovation related to color trend, colorway and pattern, etc.
	Surface	Innovation related to the texture and decoration
	Style	Innovation related to the combination of design attributes and fashion items, such as hippie style.
	How to wear	Innovation related to the ways of dressing
Material	Raw material	Innovation related to raw material
	Fabric	Innovation related to fabric
	Accessories	Innovation related to accessories, such as button
Symbolism	Personal value	Innovation dedicated to individual identity and self-esteem.
	Social value	Innovation dedicated to social identity and social image for a person.
Technology	Manufacturing	Innovation related to pattern making, cutting, and sewing, such as 3D body scanning, CAD, automation and AI
	Finishing	Innovation related to garment finishing, such as dyeing and brushing

	Showing	Innovation related to exhibiting fashion and prototype, such as virtual reality
	User center	Innovation related to contacting user, such as wearable technology, interactive technology, sensor technology and customization
	IoT	Innovation related to the internet, such as big data, mobile terminal
Sustainability	Environment	Innovation related to 3R (reduce, recycle, reuse) and circular economy
	Wellbeing	Innovation related to the elder, kids, patience and the disabled, etc.
	Society	Innovation related to the community and heritage, etc.

Thus, Fashion Design Innovation (FDI) can be defined as both tangible and intangible components that are embedded in fashion, possess changes, newness, and novelty, and dramatically or gradually impact human beings, society, and the environment.

4.5 Chapter Summary

This chapter develops the measurement of FDI based on categories of FDI that are identified from the academic literature in Study 1. Since this research focuses on the level of fashion items, Study 2 concentrates on product innovation rather than firm innovation. Four sub-studies are employed to create and evaluate the measurement.

Study 2.1 is the professor review. Study 2.2 is the focus group test. Study 2.3 is the expert interview. Study 2.4 is the large-scale survey. Reliability and validity are also discussed. Finally, the measurement of FDI is determined with a total of 18 items across 5 dimensions. The results of Study 2 thoroughly determine factors for gauging FDI, allowing for a clearer definition of FDI with accurate dimensions and items of measurement. Moreover, Study 2 strengthens the theoretical foundations for Study 3 the Fashion Design Innovation Ecosystem (FDIE).

Note:

1. EEKA: EEKA Fashion Holdings Limited (EEKA Fashion Group, Hong Kong Main Board Listed Stock Code: 3709.HK) was established in 2007 as a well-known fashion brand group with the multi-brand operation. Group holds NAERSI, NAERSILING, NEXY.CO, Koradior, La Koradior, Koradior elsewhere, CADIDL, FUUNNY FEELLN ----eight self-owned brands. (source: http://www.eekagroup.com/)

Chapter 5

Study 3 Fashion Design Innovation Ecosystem

5.1 Chapter Introduction

This chapter explores a comprehensive and systematic lens, namely the Fashion Design Innovation Ecosystem (FDIE), to foster Fashion Design Innovation (FDI), which is the result of Study 1 FDI and Study 2 the Measurement of FDI. The chapter consists of the methodology and findings. It begins with the methodology session that contains research design, interview guide development, sampling, data collection, data coding, and data analysis. Then, the study result is elaborated, and thirteen stakeholders, nine activities, and four resources within FDIE are identified. Finally, the policy-driven FDI is disclosed with a discussion on policies, followed by the elucidation of associations.

5.2 Methodology

5.2.1 Research Design

Oh et al. (2016) acknowledged Graham's opinion that quantitative indicators such as licensing income were unreliable and invalid as metrics because the innovation ecosystem was a non-linear and co-evolutional model (Oh et al., 2016; Ritala & Almpanopoulou, 2017). Nine highly-cited papers on the innovation ecosystem serve as evidence to employ qualitative investigation, as shown in Table 1.1 (Feng et al., 2021). This research complies with previous studies by using qualitative methodology, aiming at exploring and evaluating FDIE, as shown in Figure 5.1.

Regarding the explorative investigation, it is believed that expert and elite interviews perform more focusedly and effectively than quantitative methods and observation (Aguinis & Solarino, 2019; Bogner et al., 2018; Fossey et al., 2002). Due to little research on FDIE, the semi-structured interview was used to explore insights and probe the topic in-depth with interviewees' extensive responses to both planned and follow-up questions. The semi-structured interview was conducted in a face-to-face manner both online and offline and recorded by the researcher using a mobile phone and online meeting software (Archibald et al., 2019). The interviewees include experts, managers, organization leaders, designers, and officials related to five dimensions of Study 2 the measurement of FDI.

The FDIE and the policy-driven FDI could be evaluated by empirical testimony because "in both quantitative and qualitative approaches, a real-world check of the archetypes

identified can be achieved through stakeholder-based assessments and workshops" (Piemontese et al., 2022). The transcription of recorded data was coded and analyzed to reveal the opinions on the performance of the FIDE and the policy-driven FDI.

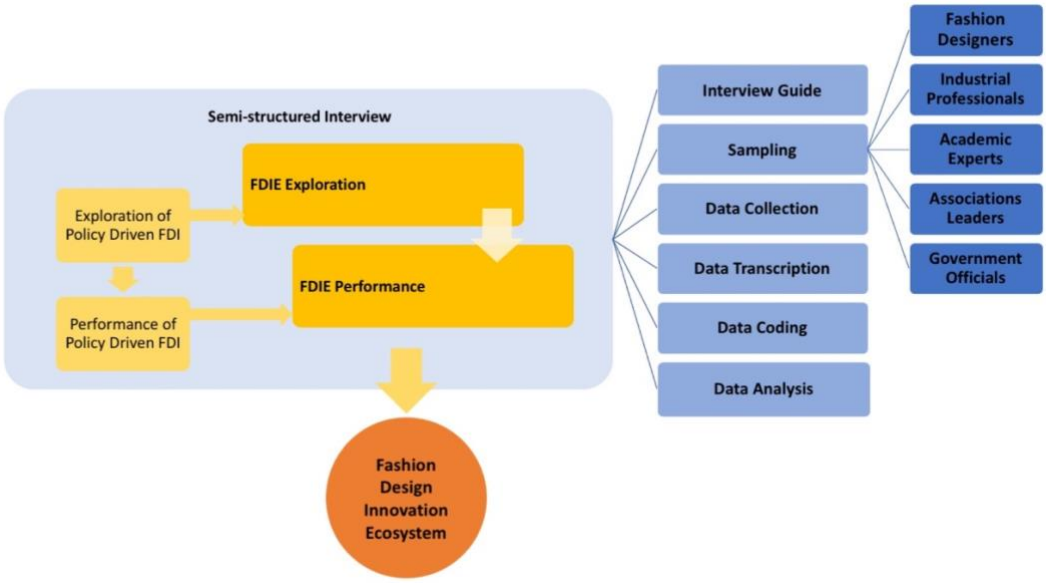


Figure 5.1 Study 3 research design

5.2.2 Interview Guide

The interview guide for Study 3 FDIE was designed and the interview questions were generated based on the study objectives (i.e. FDIE, FDIE, and policy-driven FDI), research questions, and the conceptual framework that had been developed after reviewing the literature. Two experts were invited to review and pretest interview questions during the planning stage.

Five sessions aimed at specific information. The first part briefly introduced the research objectives. The second part dealt with the oral interview agreement to accentuate confidentiality again before answering questions formally, although the written agreement had been signed before the interview. The third part intended to clarify the basic informant's background and his or her entity. Since the research unit was not at the company level, general questions mainly reflected the qualifications of informants.

The fourth part consisted of two main topics. The open-ended questions in line with the research questions and the research framework would be asked in an explorative manner based on the informants' experience. Thus, "how" and "what" were major questions. Examples, as evidence, were asked to support the phenomenon of FDIE (Yin, 2018). Details were encouraged to narrate examples, such as the role of government using "policy-driven" as a manifestation (Crow & Nath, 1992). The driving forces, tangible and intangible resources, and expected outcomes were involved as indispensable dimensions. Minor changes were made based on the feedback from interview questions from two professors. For instance, scoring the extent of policy-driven FDI was removed for more discussion of reasons because interviewees provided details in the pilot study on why they gave the point. Follow-up questions, such as "why" questions, that were slightly adapted based on the answers, illuminated and probed

specific themes (Eisenhardt, 1989). Moreover, interviewees who argued there was no FDIE, would elicit the reason to offer alternative or opposite opinions. The overarching question design with minor variations could capture all kinds of stakeholders' insights. The semi-structured feature of the questions instigated conversation without strict restriction (Kvale, 1996).

The final part presented gratitude to informants with the researcher's contact information following and encouraged interviewees to provide more insights even if the formal interview had been conducted. The interview guide is shown in Appendix 6.

The cover letter in Appendix 7 for the interview was created to invite interviewees, beginning with a brief introduction of the research, as well as the benefits to the academics, the fashion sector, and the government. The time and place depended on the interviewee's availability. Sensitive issues such as anonymity were highlighted to increase the respondent rate. Appreciation words were expressed in advance. Both the cover letter and interview guide were translated into Chinese by the researcher.

5.2.3 Sampling

The sampling strategy was purposive, convenient, and non-random. The researcher's personal connections in the fashion sector assured the sampling method and the response rate. There is no formula to design sample size because the logic of

maximizing information is different from the statistical conclusion formed by a large population of non-qualitative research (Guest et al., 2006; Yin, 2016). Since the research has no relevance to human being issues, there is no need to get approval from the institutional review board.

Interviewees were selected based on a particular predetermined sample frame. The sampling strategy intentionally selects specific participants, activities, processes, and settings, suits the research questions, propositions, and theoretical framework most, and generates relatively appropriate data and productivity for consolidating results (Maxwell, 2013). Research on innovation ecosystem and design innovation has strategic implications for policymakers, practical implications for decision-makers and third parties, and theoretical meanings for researchers. Additionally, designers are stakeholders that substantially exert FDI in fashion itself. As such, the research population was specified into five stakeholder groups including four fashion designers, five industrial professionals, five academic experts, four association leaders, and two officials. Each group was subjected to an equal ratio, except the government official due to its role outside the industry. Totally twenty interviewees were recruited for the exploratory part. Three listed companies including one listed in Hong Kong and two listed in mainland China, contributed to the research credibility. The types of businesses ranged from startups, SMEs to large corporations. Interviewees' businesses produced

womenswear, menswear, and sportswear. All interviewees had extensive working experiences as directors, managers, owners, professors, and leaders, which can be referred back to Table 4.3.

Generalization or external validity of the research urges diversified research sites to approach the target population (Kawamura, 2011). However, constraints of time and cost limited access to all appropriate research sites, interviewees, and other types of data. Regarding geographical rationality, because the researcher is located in China, which was reported as “the current leading apparel exporter of the world” (Park-Poaps et al., 2021; Zhang et al., 2016), rich sampling in China can represent and infer findings about a larger population, which were also both time and money efficient.

5.2.4 Data Collection

The interview began with a brief introduction of the researcher, research, and primary concepts. Interaction and conversation between the researcher and interviewees complied with a fixed routine. Seeing a sheet of question list maintained the formalness of the investigation. Sometimes, the researcher clarified some concepts such as FDI and innovation ecosystem again, confirmed understandings, and probed for deeper insights with follow-up questions. After the interview, respondent validation of the data and

results would enhance credibility (Maxwell, 2013). The procedure ended till answers to research questions and propositions were desirably achieved.

Twenty interviewees took part in this study either physically or online. Numbers were assigned to represent interviewees for coherence and simplicity rather than their names, Because of the pandemic, interviewees preferred online interviews via WeChat and Tencent Meeting, which are popular communication apps in mainland China. Data were collected from October 2021 to February 2023. Each interview was conducted in Mandarin. The sensible duration ranged between 30 minutes and 70 minutes with either recording or taking notes based on the interviewee's agreement.Table 4.3 presents interview information.

5.2.5 Data Coding and Analysis

All interview data has been properly saved and managed. OneDrive exerts movable and backup functions, along with a portable hard disk. Common software is an alternative, such as Excel and Word (Hahn, 2008).

Evaluating the data collected began as soon as the interview finished, such as verification of notes and comparison of data from different interviewees. The simultaneousness provides results of what is going on and what should change for the next step (Maxwell, 2013).

Regarding the transcription process, the speech-to-text software Jiefei was used to automatically convert voice records into text transcripts for further review and analysis. Some habitually repetitive and meaningless spoken words were deleted. Because all interviews were conducted in Chinese, the data had to be translated into English during data coding.

After data transcription, data coding was performed to generate results that would be used to explore and validate FDIE based on the theoretical framework and the findings from Study 2 Measurement of FDI. The data coding procedure was a hybrid approach. The 3rd-order themes were derived directly from three components of the theoretical framework, while the 1st-order themes were directly extracted from the interview data. The 1st-order themes emerged early in the data analysis process with little effort for categorization, therefore the number of themes tended to expand at the beginning stage of the process. The researcher's expertise was used to classify the similarities and differences into more abstract 2nd-order labels, based on the components of the theoretical framework. The distillation of aggregative dimensions into 3rd-order themes led to theoretical saturation (Gioia et al., 2013). The categories were designated based on the previously established propositions. The following session presents the results of the data analysis. Figure 5.1 presents that three 3rd-order themes combine to form the FDIE.

Figure 5.2 3rd-order themes of FDIE

5.3 Fashion Design Innovation Ecosystem (FDIE)

The results of Study 3 reveal three-order themes, as indicated in Table 5.1. Regarding the reduction of bias and generality, each interviewee is assigned a number in his or her group, such as D for the fashion designer group, I for the industrial professional group, A for the academic expert group, L for the association leader group, and O for the official group. Non-anonymous interviewees are presented directly by name.

Table 5.1 Study 3 Themes

1st order theme	2nd order theme	3rd order theme
Fashion Designers	Talents	Stakeholders
Artists		
Scientists		
Artisans		
Influencers		
Managers		
Large Businesses	Fashion Businesses	
SMEs		
Startups		
Material Suppliers	Suppliers	
Manufacturing Suppliers		
Machinery Suppliers		
Online Sellers	Sellers	
Retailers		
Consumers	Consumers	
Consumer Groups		
Investors	Investors	
Incubators	Incubators	
Industrial and Creative Parks		
Digital Product and Service Providers	Smart and Digital Technology Providers	
Internet Service Providers		
Smart Technology Providers		
Third-Parties	Other Stakeholders	

Logistics		
Media	Media	
Universities	Universities	
Associations	Associations	
Government	Government	
Fashion Show and Fashion Week	Show and Fair	Activities
Trade Fair		
Competition	Prize and Award	
Award		
R&D	Value Creation	
Consumer Satisfaction		
Copycats	IP Protection	
IP Protection		
Government Sponsorship	Funding and Investment	
Commercial Investment		
Entrepreneurship	Entrepreneurship	
Information Digitalization	Digitalization	
Platform Construction		
Smart Technology and AI Development		
Environmental Friendliness	Sustainability	
Human Welfare		
Higher Education	Education	
Training		

Famous Fashion Designers	Human Capital	Resources
Independent Fashion Designers and Fresh Graduates		
Other Talents		
Government Subsidies and Funding	Financial Capital	
Commercial Investment		
Rental Spaces	Land Capital	
Industrial and Creative Parks		
Data and Information	Data and Information	
Trends and Archives		

5.3.1 Theme 1: Stakeholders

Freeman defined stakeholder as “any group or individual who can affect or is affected by the achievement of the firm‘s objectives” (Freeman, 2010). Study 3 explores FDIE and identifies stakeholder categories, including talents, fashion businesses, suppliers, sellers, consumers, investors, digital service providers, incubators, media, associations, universities, and government, as well as other stakeholders such as logistics and third parties.

Some interviewees acknowledged the significance of stakeholders from a holistic point of view. As an influential professor and a top designer, HAIYAN WU herself had been approached by a variety of resources, including fabric suppliers, live broadcast

platforms, and exhibitions, either directly or indirectly. She collaborated with local resources, expos, universities, and businesses. INTERVIEWEE A5 highlighted A Business in which the upstream and downstream of the industrial chain collaborate to build a sustainable fashion system with multiple sessions such as design, production, stores, and management systems. YANLIN CHEN stated that stakeholders comprised all parties such as the government, enterprises, entrepreneurs, consumers, and those providing technical services and involved in every phase of the industrial chain such as design, production, fabrics, and sales. They were intertwined, such as in the partnership between industry, universities, and research. YAN CHEN claimed that after establishing an IP workstation in a fashion district, he had identified stakeholders including design, sales, buyers, live e-commerce broadcasts, wholesale, pattern making, and retail in the industrial park. Overall, the interviewees' extensive experiences provided insight into the role of stakeholders on the whole from the perspective of industrial chain, sustainability, and IP activities. Fashion designers were most frequently mentioned among the other 1st-order stakeholders. A detailed identification of stakeholder categories is addressed in the following section.

5.3.1.1 Talents

Both companies and the government are attentive to talent. SHIKANG ZHOU underlined the necessity of talent for innovation, saying, *"from the perspective of*

innovation, we must grasp the source. What source? The first source is talent. Are there talents, design talents, and skilled talents with international vision and international design and innovation capabilities? If there are no such elites, it is impossible to talk about innovation". He further promoted the "*talent chain*" similar to the industry supply chain, as well as balance and segments of education that require distinct talents, such as innovation, skill, and marketing. HAIYAN WU as a member of the government's talent panel, emphasized that the government recruited talent to maintain innovation in the region. INTERVIEWEE A5 stated that in the 1990s, the China Fashion Designer Association's famous brand strategy called for the "*Famous Designer Project*" and the "*Talent and Brand Project*".

Fashion Designers. Undoubtedly, interviewees gave tribute to fashion designers, including well-known designers, independent designers, and designers for specific fashion types.

YANG LIU elaborated on the historical role of fashion designers and criticized the relationship between fashion designers as decorations and innovation two decades ago, saying, "*design is essential; the slogan of a designer's soul is excellent, but in reality, companies did not know how to use designers because they assumed that if you innovated, there would be no market for them*". Famous fashion designers collaborated with companies purely for the modest advertising impact generated by several shows.

Today, however, the situation has changed, both small and large firms are keen to hire designers to achieve innovation. As a case, INTERVIEWEE A5 cited the Shanshan[2] Group, which in 1996 issued a recruitment campaign titled "*One million annual salary hired famous designer*" to develop a world-famous brand by teaming up with well-known designers. This roadmap encouraged famous Chinese brands to expand globally. According to SHIKANG ZHOU, it was a transitional strategy for certain listed companies in China to hire renowned designers around the world. These designers were second- and third-tier employees who had worked for some famous brands but could not be said to have mastered those brands' essence.

The original designers were outlined as the new impetus for innovative design. Two interviewees gave two cases of brand-sponsored prizes to encourage the viability of original designers, which may solve the challenge for fashion innovative design to create a fashion kingdom with a greater diversity of styles. According to YANLIN CHEN, we must make a long-term plan for the transition to a highly personalized market; therefore, Ying'er's competition was to cultivate more original designers for potential cooperation, such as incorporating them into the Group and forming more diverse brands to sustain future revenue. She stated, "*Ying'er's future layout resembles chess pieces. If you are a chess piece, I will lay it out and place it here first*." HAIYAN WU mentioned that in 2022, Youngor[3] held a "100 Designers Make One Shirt"

competition to acquire fresh blood for the brand's design, innovation, and long-term development.

Regarding fashion designers for a specific fashion type, JIGUO QIANG complained that his brand had trouble locating qualified fashion designers who were knowledgeable about the material and style of sportswear, sport, and ergonomics.

Interviewees occasionally identified complementary talent types that can boost FDI in addition to fashion designers, such as artists, artisans, scientists, influencers, and managers.

Artists. ZHIDONG XU talked about joint brands and joint design collections with artists who were renowned for painting and patterns, in order to innovate logos and classic patterns of luxury brands. INTERVIEWEE L3 mentioned artists as contributors to the upgrade of the brand. In reality, fashion designers always walk side by side with artists.

Scientists. The interviewee integrated scientists as stakeholders to facilitate FDI from an interdisciplinary standpoint. INTERVIEWEE D4, a physicist artist and a part-time fashion designer, exemplified the success of fashion projects such as flexible solar cells and printed circulars. HAIYAN WU introduced scientists to collaborate in the fashion sector, particularly in the material field, using examples in Central Saint Martins.

JIAXIN WANG mentioned that scientific research organizations provided chips and fabrics that were easier to replace and wash.

Artisans. According to ZHIDONG XU, if FDI involved traditional Chinese crafts such as special products and capsule collections inspired by certain design elements of crafts, FDIE might include craftsmen such as embroiderers. HAIYAN WU had some government-funded projects that incorporated craftsmen and innovated national tangible and intangible heritages, such as indigo dying and printing. INTERVIEWEE A5 also provided examples of young fashion designers innovating traditional crafts like embroidery. YANLIN CHEN delved further into the topic that artisans were the innovators of fashion design rather than fashion designers' complements.

Influencers. HARRY observed that social media platforms or some head media, such as KOC and KOL, had a great impact on fashion innovation diffusion. HAIYAN WU credited influencers in live broadcasts; when she noticed there were few valuable influencers, she even held a live broadcast contest to unearth talents. INTERVIEWEE I5 mentioned their industrial park offered training programs and courses for influencers. INTERVIEWEE I1 acknowledged that judgments on FDI could be made based on VIP's feedback and insights.

Managers. INTERVIEWEE L3 showed the example of the former CEO at Hermes, Angela Ahrendts, who joined Apple as Senior Vice President of Sales. Some listed companies in China hire international managers. According to SHIKANG ZHOU, it was a transitional strategy, these individuals were second and third-tier employees who had only worked for some famous brands and could not be claimed to have mastered the brand's essence.

Even though SHIKANG ZHOU stressed the importance of workers within the FDIE, it should be noted that this stakeholder was not referenced by other interviewees and was therefore not listed in the 1st-order theme.

5.3.1.2 Fashion Businesses

As 1st order theme of fashion businesses, start-ups, SMEs, and large companies are captured as the focal FDI stakeholders.

Large Businesses. Both INTERVIEWEEs I2 and I5 were directors of large fashion enterprises and discussed the advantages of large firms for FDI, claiming that only large companies could act as the chain owners driving an industrial chain that encompasses small and micro businesses. The chain owner economy was initiated by the government to promote industry growth. INTERVIEWEE I5 introduced her company as the only one in the whole area to be awarded the title of National Industrial Design Enterprise

and the prestigious Famous Trademark. Only if it was large enough could her company acquire FDI by establishing an industrial park aiming at the direction of high-end technology and digital technology, creative diversification, brand internationalization, and product intelligence. This were achieved through the collaboration of cloud design, online-and-offline-integrated supply chain, flexible manufacturing, intelligent sales, and high-end custom integration. INTERVIEWEE O1 illuminated the responsibility of innovation for large businesses to benefit the market and the public.

SMEs. SMEs have a two-sided-coin effect. JIGUO QIANG, being a SME owner of a sportswear brand, stated that many Chinese fashion firms had been conducting extensive R&D and struggled to benefit FDIE. Given the low-tech and consumer-oriented characteristics of the fashion industry, INTERVIEWEE O1 acknowledged the economic and social contributions made by SMEs, which cumulated the foundation for FDI. The small business did not have to handle the entire process; rather, they could specialize in a particular field, such as design, production, and pattern making, as he stated, "*the sophistication of the fashion sector reinforced the competence*". YANG LIU criticized that SMEs' overemphasis on revenue, even to the point of producing copycats, hindered FDI that needed time to recoup the cost, by saying, "*no matter how attractive and creative fashion is, it cannot compare to a true order*".

Startups. The objectives for launching a brand, especially independent fashion brand, are distinguished greatly, and startups operate in various ways. The fashion industry is perpetually innovated by vivacious newcomers. INTERVIEWEE D4 talked about her brand ART BY ARTIST functioned as an experimental fashion lab for cross-disciplinary innovation, such as the application of cutting-edge technologies to fashion design and production. HARRY launched his brand to demonstrate his innovative capability, and as a result, he earned design contracts that further benefited his own brand.

5.3.1.3 Suppliers

Interviewees concentrated on suppliers for materials, accessories, fabrics, production, and equipment. INTERVIEWEE D4 spent most of the time discussing different types of stakeholders in the supply chain.

Material Suppliers. Material suppliers appeared to have contributed greatly to FDI in a variety of ways, as noted by interviewees. INTERVIEWEE D4 complained it was difficult to source innovative fabrics, such as biodegradable material, mushroom, and spider silk. She cited SPUN FLOWERS and SWATCHON as examples of global printing suppliers to explain ordering prototypes online. JIGUO QIANG talked intensively about distinctions in material suppliers for sportswear between Italy,

Taiwan, and Mainland China. Each of them respectively presented top, middle, and low-end level. As chemical material suppliers, both 3M and Japan Toray focused on innovative fibers. INTERVIEWEE O1 acknowledged "*zipper is one of the most remarkable inventions in human history*". YANG LIU won the first prize in a competition held by Japan Asahi Kasei in an effort to encourage the use of innovative and sustainable materials. As opposed to internationalization, both HAIYAN WU and INTERVIEWEE D4 suggested material localization for sustainability innovation.

Manufacturing Suppliers. Many interviewees talked about the FDI technology dimension of manufacturers, including digitalization manufacturing, advanced manufacturing and flexible manufacturing for sustainability, small batches, and made-to-measurement. Several interviewees, including INTERVIEWEE O1, INTERVIEWEE I5, INTERVIEWEE I3, and YANLIN CHEN praised A Business's industry-leading smart innovation in fashion manufacturing. INTERVIEWEE D4 complained that factories must update their equipment, processes, production, and factory layouts to keep up with innovation. For example, she asserted that in the future, some small manufacturers would leverage cutting-edge technologies to transform data obtained from the front-end software into products. Furthermore, she specified some terms, such as 3D body scan, high automation, and robot hand, and cited BE STITCHER as an example of a body simulation provider. JIGUO QIANG stated that

printing, embroidery, and laser cutting were important innovative fashion manufacturers. Regardless of whether it was related to design or R&D, he concluded that manufacturing was still necessary, and it was the factory that ultimately generated value.

Machinery Suppliers. According to INTERVIEWEE O1, the history of fashion innovation was the history of materials and equipment. SHIKANG ZHOU discussed A Business whose innovation focused on intelligent equipment, such as a hanging system. As a fashion designer, INTERVIEWEE D4 attended many machinery conferences and acknowledged innovation in the field. However, she asserted that neither branders nor manufacturers were willing to update equipment, and that innovative machine suppliers needed advertising. JIGUO QIANG concurred that it was challenging for small manufacturers to cover the cost of the replacement of innovative equipment. Additionally, although Chinese equipment was inexpensive but easily damaged, European and Japanese equipment were of great quality but more expensive. It deserved to innovate through equipment.

5.3.1.4 Sellers

Retailers and online merchants are determined to be two 1st-order themes. JIAXIN WANG strongly viewed sales units as FDIE stakeholders. The majority of interviewees focused on internet vendors.

Online Sellers. Several cases were referenced, like SHEIN and Douyin to shed light on online vendors within FDIE. According to INTERVIEWEE D4, fast fashion brands like SHEIN had mastered front-end data, so they were aware of how, what, and where to produce in small batches, which would dramatically facilitate FDI. However, INTERVIEWEE I1 persisted in using SHEIN as a case to raise concerns about fast fashion and its influence on classics and innovation.

INTERVIEWEE I5 and HAIYAN WU both cited live commerce and e-commerce as new sales methods in the digital age. Dalang Digital Technology, for instance, is an e-commerce service provider for the fashion industry, utilizing the Douyin platform and providing services like full-link marketing solutions, short video production, live shopping, internet celebrity training, as well as the enhancement of investment flow and agent operation capabilities. It implied that online vendors might be innovative stakeholders with the ability to incorporate extra FDIE functions.

YANLIN CHEN said that ELLASSAY set up a technology firm to build a retail platform for SMEs using smart and digital technology. She also suggested that the

government should establish a free platform to offer services to SMEs and independent designers.

INTERVIEWEE D4 also added another FDI function, which should be a straightforward way, like computer visions, to assist customers directly obtaining and providing their body data and instantly connecting that data to design and pattern making.

Retailers. INTERVIEWEE D4 said, "*the retailers were the front-end to easily obtain customers' data for FDI*". INTERVIEWEE I1 argued that the interaction with the real scene and the real demands were the toughest challenge for FDI in the digital era. ZHIDONG XU and INTERVIEWEE I1 emphasized that VIP management, such as experiences and feedback in brick-and-mortar stores, should not be ignored within FDIE.

5.3.1.5 Consumers

Consumers. Users were the biggest stakeholder, as stated by JIAXIN WANG. Continually evolving technology such as intelligent technology and IoT, as well as aesthetics, were integrated into fashion performance and function, such as the protection and support of the human body. INTERVIEWEE I1 stressed the importance of customers, saying "*consumers are the ultimate beneficiaries by consuming fashion*

and achieving spiritual pleasure or a sense of material hedonic" and "*user should be the beginning point, rather than designers considering what the consumer needs*". ZHIDONG XU agreed that customers were the driving force for brands and FDI. INTERVIEWEE I1 continued that consumers experiencing the real scenes were challenging for FDI with the popularity of e-commerce.

Consumer Groups. INTERVIEWEE I1 stated whether FDI was intended for the general public, a certain age group, or a particular vocation. He predicted that in the future it would become increasingly diverse and distinctive. Different groups, such as ethnic groups, subcultural groups, and Z-generation gamers of King of Glory, have complicated and multilevel needs that must be taken into consideration. JIGUO QIANG talked about how today's youth, the next generation, had a different vision, had gradually ceased following aimlessly, and cared more about brands, individualism, quality, and novelty.

INTERVIEWEE D4 mentioned customer education towards sustainability innovation, such as traceability and transparency. SHIKANG ZHOU disagreed with customer cultivation and believed that guiding customers originated from understanding them.

5.3.1.6 Investors

Although few interviewees discussed investment and none elaborated on investor types or the details of investment activities, they were attentive to funding and money. The interviewees did not explicitly specify the types of investors, such as foreign investors, local investors, state-owned investors, joint investors, and private investors, due to their limited involvement in investment activities. Two interviewees had been approached by investors due to their prestigious FDI. HAIYAN WU lamented that investors had unrealistic expectations, like a quick revenue cycle, by saying that "*China's financial system is still evolving, Chinese investors lack experiences, and Chinese investors tend to pursue instant gains rather than the long-term gains enjoyed by their American counterparts*". INTERVIEWEE D4 claimed that startups needed different types of investors. More investors might be discovered, such as those who made long-term investments and those who received government subsidies. However, INTERVIEWEE A5 talked about how Shanshan Group[2] launched the "Youth Fashion Designer Venture Fund" with ten million RMB in 2002 and collaborated with the China Fashion Designers Association to co-host the annual "Newcomer Award". Winners were eligible to receive between three and eight million RMB in entrepreneurial funding for brand operations. INTERVIEWEE I5 mentioned that C Company provided three million RMB in startup funds to entrepreneurs or independent designers.

YANLIN CHEN admitted that the financial system was a FDIE component and financial organizations played a significant role in the brand firm's capital-related games. The ecological chain could not function properly without money, YANLIN CHEN noted that the emergence of capital coincided with the emergence of fashion, and capital was bloodthirsty. She underlined that a listed fashion company had to be accountable to the board and shareholders, and the money had to be invested in the areas that would add value, such as the establishment of a technology company to empower SMEs.

JIGUO QIANG pointed out that "*a path to FDI may involve the acquisitions of some global brands and reintegration*". Acquiring other brands would increase one's economic strength and size, which might eventually lead to the creation of a new brand and the growth of a world-class brand. For instance, Anta purchased Fila, which had greater repute than Anta.

5.3.1.7 Incubators

Incubators by far are one of the most inventive forces within the FDIE. Some incubators are initiated by large firms to encourage FDI. Interviewees also implied that fashion incubators were located in industrial parks and creative parks.

Incubators. INTERVIEWEE I5's company managed a fashion incubator in C Company's Digital Fashion Industrial Park, which had labs and entrepreneurship tutors, in addition to six service organizations for industry and commerce, taxation, legal affairs, and investment and financing. These physical space included shared and independent offices, a fabric supermarket and library, a small digital prototype space, a show area, an interactive live broadcast room on the terminal e-commerce platform, and a show space for final products and door-to-door orders. The incubator enabled the integration of some of C Company's own resources, empowering design, prototype, and final marketing. Moreover, the incubator was located in an open industrial park with apartments, an art neighborhood, and convenient transportation. Different solutions are targeted at original teams as well as individuals, such as independent designers and young graduates. A start-up fund of three million RMB was available to entrepreneurs and independent designers. INTERVIEWEE D4 stated that the Muse fabric incubator by Li & Fung in Hong Kong had contacted her for her scientific FDI.

Industrial Parks and Creative Parks. INTERVIEWEE I5 stated that C Company's incubator was located in the industrial park built by the same company. HAIYAN WU mentioned that governments in China subsidized industrial parks with amenities such as low rent for startups and independent designers.

5.3.1.8 Smart and Digital Technology Providers

Digital and internet product and service companies were well identified by most interviewees. Some participants even discussed AI in the fashion sector.

Digital Product and Service Providers. INTERVIEWEE D4 admitted that all aspects of the design could be digitized and required to be connected with the physical world. YANLIN CHEN stated that "*big companies essentially allocate a portion of their funds to the innovative digital construction, especially for the front end and retail end, including VIP and customer statistics as well as the digitalization of inventories and sales*". INTERVIEWEE D4 urges the digitalization of all data along the chain in order to increase transparency and traceability of sustainability in the fashion sector. YAN CHEN mentioned that the digitalization of IP protection dramatically reduced the cost and time, had a great impact on attracting more designers and brands to use IP as a tool to protect their creations, and led to encouraging FDI.

Big data was another interviewee's concern. For example, INTERVIEWEEs D4, I1, and I3 stressed the significance of front-end data, which definitely contributed to FDI, with INTERVIEWEE I1's saying that "big data knows you better than yourself". INTERVIEWEE I3 said that his company operated a data cloud for fashion businesses and fashion manufacturers and that sharing data would be a must in the future.

HARRY pointed out that various APPs or networking allowed for connections between the supply chain, designers, companies, and individuals. INTERVIEWEE D4 and I3 indicated that 3D simulation software might directly support made-to-measurement and on-demand production.

Internet Service Providers. INTERVIEWEE I5 discussed that e-commerce boosted sales. For example, the government of Longhua District in Shenzhen employed livestreaming e-commerce in the fashion sector. YANLIN CHEN mentioned that ELLASSAY[4] founded a technology firm to facilitate the digital empowerment of retail for SMEs. INTERVIEWEE D4 introduced an additional function of online sales, namely computer visions that aided clients in directly obtaining and supplying their body data and instantaneously connecting it to design and pattern making through the internet.

Smart Technology Providers. ZHIDONG XU, YANLIN CHEN, and INTERVIEWEE A5 stated A Business was ahead of the curve in its utilization of smart technologies to enhance the efficiency of fashion manufacturing. YAOHUA DONG frequently brought up blockchain and NFT (Non-Fungible Tokens). A digital ecosystem with features such as traceability, crowdfunding, and smart contracts was proposed. He cited examples such as The Fabricant, MetaFactory, RTFKT, Digital Fashion Operating System (DFOS,) and RedFOX. According to INTERVIEWEE I1,

the incredibly popular notion of metaverse demonstrated that the combination of FDI and high technology was very strong nowadays. He said that "*in the context of Metaverse, there should be certain fundamental software programs, such as templates for fashion designers to grab various elements, to add their own designs, and to create a catwalk-like form. Fashion will be shown in a visual and immersive sense, which was impossible previously. FDI should be considered with this change. Because in the normal physical world, FDI must be constrained by materials, but in the Metaverse, there are no limitations, and designers could think freely*."

5.3.1.9 Other Stakeholders

Third Parties. SHIKANG ZHOU encouraged third parties to cover some government services, such as policy advocacy, and charge a fee within a certain range. INTERVIEWEE O1 also suggested that there should be some industry-serving organizations that certain functions, like the annual audit, ought to be delegated to.

Logistics. The importance of logistics within FDIE, as noted by INTERVIEWEE O2, may pave the way for FDI. Last year, JIGUO QIANG placed some orders in Wuhan, China. He observed that a steady migration of downstream manufacturers to the Midwest was occurring as the relatively extensive high-speed rail network made transportation more convenient. Thus, FDI could be obtained more readily.

Even though several stakeholders from other sectors, such as the jewelry and tourism industries, appeared infrequently during interviews and therefore were not included in the FDIE model, they merit being acknowledged here. YANG LIU talked about Panyu, Guangzhou, a key location for the global jewelry industry. The local government was also seeking interaction between jewelry and fashion. HAIYAN WU described three places where she held fashion shows: an abandoned instructor factory, a ruin in Hangzhou, and the Fahai Temple, all of which subsequently became popular tourist destinations.

5.3.1.10 Media

This stakeholder was discussed in new media, its content, its diffusion, and its impact on FDI. HAIYAN WU emphasized the necessity of MCN (Multi-Channel Network) company, as the live broadcast company lacked products and she lacked a quality live broadcast. Thus, she "*hosted a live broadcast competition for Chinese designers in 2019 for the first time in China with the cooperation of many websites, which attracted up to 100 million viewers*". In 2016, she held a fashion show in the Fahai Temple in Beijing. The People's Daily Online and Xinhua Net received an unexpected 1.8 million hits that night. The annual number of tickets to the temple was one million, but this figure increased to approximately four million within six months. HAIYAN WU attributed the success to the media's power. INTERVIEWEE A5, an editor-in-chief,

explained that Fashion Designer Magazine shifted its readership from fashion designers to academic professionals due to the popularity of self-media in comparison to traditional paper media. ZHIDONG XU asserted that there was a publisher of the top fashion trend, such as big brands and one or two influential organizations that could actually steer or strengthen the fashion trend.

In the realm of new media in the digital age, Yanlin Chen emphasized the significance of Douyin and Little Red Book, where the innovation of online channels such as short videos has disrupted traditional retail and fashion channels with the expansion of diversity. INTERVIEWEE I5 provided an example of how Dalang Digital Technology, the company's e-commerce platform, uses Douyin as a tool to solve retail challenges faced by designers. Especially, the epidemic has brought attention to the online driving force. Jiguo Qian further asserted that "since the rise in popularity of short videos on platforms like Douyin, today's younger generation has different visions from us. They gradually stop mindlessly following some brands' effects. Perhaps even more, Douyin has a lot of personality, it's extremely distinctive, the youth like its craftsman spirit". The communication function of short videos contributes to a shift in consumers' preferences from the brand effect to the individual's personality.

5.3.1.11 Universities

All five academic experts demonstrated the value of education. YANG LIU believed that universities were creative talent pools and competition was a major way to explore potential talents. HARRY referred to the annual recruitment of fresh graduates from the university to boost brand creativity. JIGUO QIANG and SHIKANG ZHOU stressed, "*it was the responsibility of universities to cultivate creative students in accordance with the industry development, from the curriculum to the project*". JIGUO QIANG urged that universities should offer courses or even programs in sportswear and shoe design; otherwise, relevant FDI would be hindered. INTERVIEWEE I3 complained that the absence of digitalization fashion education, such as VR, was a cause of the shortage of managers and technicians with expertise in the digitalization of FDI.

YANLIN CHEN stated that the industry-university-research collaboration could promote FDI. INTERVIEWEE I5 mentioned the responsibility of companies to cooperate with universities in terms of research and internships. INTERVIEWEE A5 gave the 1992 establishment of a "teaching scholarship" by Shanshan Group[2] at Ningbo Teachers College as an example.

5.3.1.12 Associations

The significant role of association inside FDIE was explored by interviewees. Further elaboration will be offered in the section on the policy-driven FDI path.

INTERVIEWEE O1 stated that industrial associations within FDIE served as a link between the government and business, between firms, and between the domestic market and the foreign market. To facilitate FDI, the association's bridge function was necessary. HARRY, YANG LIU, INTERVIEWEE I2 and I5, and SHIKANG ZHOU all mentioned that industrial associations hosted FDI events like fashion week and trade fairs.

INTERVIEWEE L3 insisted that it should be professional associations that facilitate FDI rather than industrial associations from the knowledge agent perspective. SHIKANG ZHOU expressed the comparable opinion that professional associations would support FDI by utilizing their expertise.

5.3.1.13 Government

All interviewees discussed the government's role, which will be covered in the subsequent session on the policy-driven FDI model.

According to the structural perspective of the innovation ecosystem, thirteen 2nd-order themes are integrated into a 3rd-order topic, termed stakeholder.

5.3.2 Theme 2: Activities

The ultimate goal of activities within FDIE was to strengthen the fashion industry's sustainable development, according to FUJUN FAN. Nine distinctive activities as 2nd-

order themes are derived from the interview. 1st-order themes are elaborated in each 2nd-order topic. A total of 9 activities is identified.

5.3.2.1 Show and Fair

Fashion week, fashion shows, trade fairs, and exhibitions emerging during interviews frequently are included in the 2nd-order theme of Show and Fair.

Fashion Show and Fashion Week. YANG LIU remembered that well-known fashion designers cooperated with companies purely for the modest advertising impact generated by several shows. INTERVIEWEE A5 discussed Shanshan[2]'s 1998 launch of a large activity for brand culture, which consisted of 23 fashion shows staged in 16 cities and had a significant impact on the entire country. The activity considerably outweighed its 20 million costs and served to develop Shanshan[2]'s brand reputation.

HARRY discussed that "*Fashion Week, which provided a supply chain and a trading opportunity for brands, creative individuals, and designers, make the entire industry more interactive and close-knit, and synchronizes the newest local trends and information*". SHIKANG ZHOU stated that the annual non-profit fashion festival hosted by the Shenzhen Fashion Designer Association acted as a platform for designer dialogue. However, INTERVIEWEE L3 pointed out that Shenzhen Fashion Week was supported by the Shenzhen Government, which lacked iconic impressions.

According to ZHIDONG XU, INTERVIEWEE I2 and I5, the government subsidized local brands for international catwalks. However, ZHIDONG XU also noted that the so-called famous fashion designers whose fashion collection was shown abroad actually had neither a fashion brand nor a physical contribution. While some designers with genuine talent lacked popularity.

Trade Fair. HARRY mentioned that the majority of attendees at various OEM exhibitions or trade fairs of fashion materials and accessories were brand companies or those with a strong business system. Their purposes were to determine whether the factories had independent R&D capabilities and whether they could compete more effectively with diverse fashion brands in the current industrial chain. JIGUO QIANG had a positive and stunning impression of the Germany ISPO and considered that the international expos were fantastic ways to market the brand, establish industry authority, and learn about innovations from around the world, saying that "*trade fairs and expo feature FDI in addition to Fashion Week*".

5.3.2.2 Prize and Award

The interviewees discussed broadly various competitions, contests, prizes, and awards that discover talents and creative design works.

Competition. YANG LIU believed that "*competition was an important way to explore potential talents*". Projects like China International College Fashion Week and 10+3 Showroom organized by the China Fashion Designers Association, according to INTERVIEWEE A5, aided the young designers' growth. The "Newcomer Award" at College Fashion Week was another annual competition sponsored by fashion companies to select fresh graduates who were nominated by colleges. University Fashion Week and Governor's Cup were hosted by the Guangdong government, according to YANG LIU. INTERVIEWEE I1 argued that student competition was a valuable supplement to the system of commercial competition because it did not rely solely on sales to determine winners. The more competition for young designers, the better.

According to YANLIN CHEN, the future market is changing to be highly personalized, and a long-term plan for the transformation must be established in advance. Therefore, Ying'er organized a grand prize every year, but not all participants were students, as long as it was a small original studio. A ready-to-wear clothing collection was required by the competition. The company might cooperate with winners who could provide designs and products by offering platforms and sales channels. Alternatively, the company might include winners in the group in order to create more diverse brands to sustain the future. A comparable case was mentioned by HAIYAN WU. In September

2022, Youngor[3] held the “100 Designers Make One Shirt” competition in an old building in Shanghai to recruit fresh blood for the sustainable development of the brand, design, and innovation.

The competition also was utilized to market the sponsoring company with its innovative material. YANG LIU recounted his victory in a contest held by Japan Asahi Kasei to encourage the usage of novel fabrics. Regarding commercial competition, INTERVIEWEE I1 elaborated that a tour competition might present multiple final works to a large audience and create relatively fast first-hand feedback.

Award. YANG LIU was occasionally granted by various levels of government for his contribution to the fashion industry. ZHIDONG XU pointed out that the government provided rewards to the Top Ten China Fashion Designers. Some cities had policy support, while others did not; some had greater policy support than others. INTERVIEWEE I2 and INTERVIEWEE I5 also discussed the governmental talent reward scheme that encouraged FDI. However, ZHIDONG XU argued that many winners belonged to the elder generation, who occupied the so-called famous status and resources. In fact, their contribution to the industry was negligible, and their overall impact and influence on the industry were insufficient. Moreover, he continued by stating that if the award was the most prestigious, it was worth fighting for; but if the

award became widespread and the so-called evaluation could be obtained easily, it would be equivalent to not having it.

5.3.2.3 Value Creation

The interviewees discussed R&D in material, fashion, machinery, and production, which could be coded as value creation considering the advantages of FDIE. SHIKANG ZHOU said that the core of FDIE was the value, and all activities must contribute to high value with numerous details such as scene applications. YANG LIU asserted that "*value was created through R&D, production, products and services, and user satisfaction*".

R&D. ZHIDONG XU discussed the joint R&D between fashion designers and artists, as well as the innovation of logos and classic patterns. YAN CHEN elaborated on two examples of pattern R&D. One pattern appeared to be a color block, but some symbols might be concealed in the shading of the color block. The other pattern utilized a minority language SHUI SHU. INTERVIEWEE D4 and JIGUO QIANG mentioned the global fiber and fabric R&D, such as for sportswear and sustainability.

It appeared that several interviewees discussed value creation by culture and heritage. YANG LIU discussed his own experience by saying that "*aesthetics must be established on the premise of internationalization, and then incorporate some of the*

essences of the nation". HAIYAN WU also talked about her own brand and research employing an oriental aesthetic style. ZHIDONG XU mentioned that traditional crafts from remote regions created a classic brand impression. YAN CHEN mentioned value creation using SHUI SHU, a minority language to innovate patterns whose meanings might not be known by those copied patterns.

Consumer Satisfaction. Many interviewees insisted that value was created by meeting customers' requirements. INTERVIEWEES D4, I3, and O2 stressed the importance of customer data to value generation. INTERVIEWEE I1 talked about value creation by obtaining first-hand feedback from a large audience during commercial competitions.

5.3.2.4 IP Protection

Fashion copycats could be coded in the 2nd order of IP protection activity within FDIE.

Copycats. YANG LIU criticized the fact that decades ago, a new brand could be established as long as the original trademark label was removed. Numerous designers traveled abroad to take photos, copied all kinds of fashion, disassembled them, and then reproduced them, which generated benefits for the company. YANG LIU said, "*you can't survive without plagiarism, this is the law of their survival*". However, he also questioned whether IP prevented FDI to some extent, so the definition of plagiarism design mattered. According to YAN CHEN, the simple procedure of copycats consisted

of buying a garment sample, then deconstructing it into parts, and resembling them into a garment. It was challenging to determine which part of the rights had been violated. INTERVIEWEE I3 stated that fashion software might be sold for hundreds of thousands of dollars, but only thousands for illegal versions. It required several years of R&D investment, but within a month of the software's release, there were pirated copies.

IP Protection. YAN CHEN mentioned, according to copyright law, the fashion work should be classified as artwork. Actually, fashion could only be considered as a design work or a design drawing, which would receive far less protection. This was why some big-name designers attempted to create some unique and original designs. For example, some symbols might be concealed in the shading of the color block. Another possibility was that, if the fashion sector was considered as a creative industry, the type of design was either protected by an appearance patent or a work of art. An appearance patent should be used if the style design was more unique, but the lengthy review time -- at least six months – was its main drawback. A yearly patent maintenance fee was also required. Given that fashion was a fast-moving consumer commodity, it was obvious that the expense of this IP method was excessive.

INTERVIEWEE I3 expressed similar concern about the disparity between the high cost of right protection and the low cost of infringement. It was troublesome to report the

case, go to court, and present evidence, so people eventually forget about it in mainland China. However, filing a lawsuit abroad was quite simple, and a few thousand dollars were enough.

YANG LIU believed that in the future of digitalization, the cost of infringement might increase while the cost of rights protection might decrease. Blockchain with lawyers would be the solution. INTERVIEWEE I5 outlined two strategies for preventing copyright infringement in incubators: the separation of physical space and the establishment of an IP work coordination room by a third party.

5.3.2.5 Funding and Investment

Government Sponsorship. All interviewees discussed the financial support from the government. It will be discussed in the policy-driven FDI model session.

Commercial Investment. JIGUO QIANG pointed out that acquiring other brands would increase the company's economic strength and size. Acquisitions and re-integration might be ways for FDI. For instance, Anta purchased Fila, whose global reputation was greater than Anta's. Two interviewees including YANLIN CHEN and INTERVIEWEE A5 mentioned that fashion companies sponsored competitions and Shanshan Group[2] established the "Youth Fashion Designer Venture Fund" with 10 million yuan in 2002.

5.3.2.6 Entrepreneurship

Interviewees talked about incubators and funding for startups. INTERVIEWEE A5 mentioned that Shanshan Group[2] established the "Youth Fashion Designer Venture Fund" with 10 million yuan in 2002. YANLIN CHEN discussed Ying'er held an annual competition and included winners in order to diversify its brand portfolio for the future. According to INTERVIEWEE I5, the company's incubator was located in its own industrial park. Six major sections empowered entrepreneurs with training, tutoring, business, marketing, capital, and production. Laboratories, research offices, and research institutes may be established for long-term development. INTERVIEWEE I2 claimed that in the initial stage, there must be sufficient time and space; in the later stage, innovators could either work with the company to determine how to convert innovation and check whether the government could support the establishment of a new line or a new brand. She stressed that it might take at least half a year, if not longer. The China Fashion Designer Association strongly advocated young designers' new brands via events such as the 10+3 Showroom, according to INTERVIEWEE A5.

HAIYAN WU took a serious opinion on brand registration, which was not sustainable without restrictions. The fact that anyone could register a fashion brand that would vanish quickly, would lead to resource waste.

5.3.2.7 Digitalization

Due to the digital era and the governmental initiatives, interviewees emphasized the significance of digitalization, including the use of advanced digitalized tools and methods, the digitalization of customer and supplier data, and the development of platforms, as stated in the session on digital service providers.

Information Digitalization. INTERVIEWEE I1 highlighted that because offline research was too time-consuming, labor-intensive, and potentially unreliable, today's information-exploding society must rely on digitalization. INTERVIEWEE D4 admitted all aspects of the design could be digitized and must be connected with the supply chain and physical materials. Additionally, she emphasized the requirement of digitalization to facilitate online accessibility rather than personnel connection. INTERVIEWEE D4 introduced an additional function of online sales, namely computer visions that aided clients in directly obtaining and supplying their body data and instantaneously connecting it to design and pattern making through the internet. INTERVIEWEE I1 also elaborated on the necessity to digitalize consumer data, from which could extract valuable information, such as purchase frequency, consumption patterns, and search keywords, to gain insight into consumers' true intentions. YAN CHEN mentioned that the digitalization of IP protection dramatically reduced the cost

and time, had a great impact on attracting more designers and brands to use IP as a tool to protect their creations, and led to encouraging FDI.

Platform Construction. HAIYAN WU acknowledged that given the freedom brought about by the Internet. Everyone was familiar with and knew each other, so cooperation may be more effective now than in the past. INTERVIEWEE I5 discussed how e-commerce boosted sales. For example, the government of Longhua District in Shenzhen employed live-streaming e-commerce in the fashion sector. YANLIN CHEN mentioned that ELLASSAY[4] founded a technology firm to facilitate the digital empowerment of retail for SMEs. ZHIDONG XU pointed out that in the future, a certain platform would integrate all commodities, persons, and capabilities across multiple dimensions. Future construction of a basic Metaverse space carrier platform was anticipated by YAOHUA DONG.

Smart Technology and AI Development. INTERVIEWEE I1 underlined that FDI must consider the future. It should evaluate the potential of the Metaverse and the Internet of Everything, take proactive steps, and experiment in advance. YANG LIU mentioned that the administration of Guangzhou Panyu had specially deployed IoT and developed blockchains to connect fashion companies for interaction.

5.3.2.8 Sustainability

Several interviewees unintentionally broached sustainability, and only INTERVIEWEE D4 elucidated the sustainability-related behavior.

Environmental Friendliness. HARRY, HAIYAN WU, and INTERVIEWEE D4 offered different innovative materials to promote environmental sustainability, such as spider silk, mushroom material, and degradable fabric. YANG LIU won a competition held by Japan Asahi Kasei in an effort to encourage the use of innovative and sustainable textiles. INTERVIEWEE D4 urged that there should be regulations to facilitate the transparency and traceability of supply chain data.

Human Welfare. INTERVIEWEE O1 stated that the FDI with intangible heritage such as handicrafts could alleviate rural poverty. ZHIDONG XU mentioned that traditional handicrafts from remote regions created a classic mark on the brand. In this regard, he believed it to be more akin to public welfare. YANLIN CHEN took the graduate work as an example, to express that wearable FDI benefited the elderly people. INTERVIEWEE D4 mentioned customer education towards sustainability innovation.

5.3.2.9 Education

Education was discussed by many interviewees, which can be coded as activity in FDIE, including higher education, vocational training, internships, and research.

Higher Education. SHIKANG ZHOU strongly stressed the significance of talent cultivation and vocational training in relation to FDI and suggested that the education system should be modified for FDI. YANG LIU participated in a Sino-foreign cooperative education project to cultivate designers. JIGUO QIANG was invited to give a speech at a university due to his extensive professional expertise, and he was seeking opportunities to collaborate with universities on programs like shoe or sportswear design.

Training. INTERVIEWEE I5 talked about how the company ran an internship program with several universities for many years, and the enterprise's intervention encompassed a training base and research cooperation. SHIKANG ZHOU stressed the need for vocational training after normal study in colleges and universities.

5.3.3 Theme 3: Resources

ZHIDONG XU mentioned that resource matching was the main issue. From the standpoint of the needs of the brand, it would seek resources rather than cooperation driven by such resources. Interview data can be categorized into four main resources in FDIE.

5.3.3.1 Human Capital

Human beings as a resource within FDIE could be referred back to the discussion of talent among stakeholders. It might be simply categorized into famous fashion designers, independent fashion designers, recent graduates, and other talents such as managers, artisans, artists, scientists, and influencers.

HAIYAN WU who served as a panel judge for the government talent introduction, stressed that whether it was government or companies, human capital "*is to make this region more innovative, because with this group of talents, there will be more innovations, more things will appear, and this region will never be defeated and will always have the factor of innovation*" and "*sustainability of talents, sustainability of fresh blood, are the same for a brand*". SHIKANG ZHOU also emphasized that "*from the perspective of innovation, we must grasp the source. What source? The first source is talent, design talents, and skilled talents with international vision and international design and innovation capabilities. If there is no such high-end talent, how to talk about it, we can't do it*". He continued that although techniques and equipment were well-armed, they could not conduct FDI without human capital. Human capital was highlighted in a cooperative way between associations and companies regarding many interviewees' talks.

Famous Fashion Designers. INTERVIEWEE A5 discussed that in 1996, Shanshan Group[2] produced a recruitment list headlined "*One million annual salary hired famous*

designer" in an endeavor to create a globally renowned brand by collaborating with renowned fashion designers. This plan encouraged famous Chinese brands to grow internationally. YANG LIU stressed the role of senior fashion designers in FDIE, who had once partnered with companies solely for the minor advertising impact that several shows generated. Today, however, the situation has changed, both small and large companies are eager to hire designers for innovation purposes.

Independent Fashion Designers and Fresh Graduates. According to YANLIN CHEN, Yinger's competition was to cultivate more original designers for cooperation, to incorporate them into the group, and then to form more diverse brands to sustain the turnover of the future, saying, "*Ying'er's future layout resembles chess pieces. If you are a chess piece, I will lay it out and place it here first*". A similar case of Youngor[3]'s "100 Designers Make One Shirt" was cited by HAIYAN WU. INTERVIEWEE A5 discussed the China Fashion Designer Association, which strongly advocated talents through many events, such as the 10+3 Showroom. EEKA[1] and Shanshan Group[2] have sponsored the "New Talent Award" for over ten years. ZHIDONG XU credited that young talents would contribute more to FDI than seniors.

Other Talents. Some complementary talents are listed below. JIGUO QIANG and INTERVIEWEE I5 stated that students' internships benefited both universities and companies. ZHIDONG XU pointed out that the embroiders located at the front end of

the supply chain would benefit some specific brands, and could be used to innovate capsule collections. He also talked about how to cooperate artists to jointly-innovate fashion products. INTERVIEWEE D4 and HAIYAN WU suggested scientists contributed FDI in the material field and wearable technology field. HAIYAN WU even organized a live broadcast competition for Chinese designers in an effort to seek potential live-streaming influencers, because the previous ones were unqualified and unable to satisfy her. SHIKANG ZHOU and YAN CHEN mentioned the recruitment of international managers for innovation strategies.

5.3.3.2 Financial Capital

The interviewees mentioned obtaining financial capital from the government, corporations, and professional investment organizations because as ZHIDONG XU argued "*if a brand wants to grow bigger, it will cost a lot, including tax and personnel expenses*".

Government Subsidies and Funding. INTERVIEWEE I1 and I2 emphasized that government funding should support R&D expenses even if there is no instant market demand but there is potential for future demand. INTERVIEWEE I2 pointed out that the local government offered a variety of subsidies for large-scale enterprises, new studios, and designers.

INTERVIEWEE I5 discussed the importance of government refunds being a finance resource, taking the Golden Tax Phase IV Policy as an example. The other financial resource from the local government was for high-level talents: "*high-level talents are divided into three levels, ABC type, with the highest level funding 2.1 million RMB and the lowest level C funding 640,000 RMB*". HAIYAN WU also cited a designer for the Asia Olympic Games who was rewarded between two and three million RMB. SHIKANG ZHOU provided some figures on the Top Ten Designer Prize, saying, "*as reserve talents with a city reward of 1.6 million RMB, and half of the district reward is 800,000 RMB, which exceeds 2 million RMB*".

The governmental subsidy for overseas fashion shows was mentioned by several interviewees. However, INTERVIEWEE I2 and I5 pointed out the presence of a selection mechanism and a temporal lag. The same situation occurred in terms of trade fairs, according to JIGUO QIANG.

Commercial Investments. Another financial resource for FDI was provided by companies. JIGUO QIANG described Anta as saying, "*Anta has indeed done very well through acquisitions in recent years… Through acquisitions, we can purchase a few international brands, re-integrate ourselves, and move forward gradually. This path may lead to innovation*". HAIYAN WU claimed that investors had approached her with

excessive expectations, like "*Investors put 2 million RMB in you today with the assumption that you will generate 50 million in the following year*."

INTERVIEWEE I5 stated that the 3 million RMB deposited into the exclusive incubator account functioned as seed money for entrepreneurs and independent designers. Companies also held competitions to fund innovative designers, such as HAIYAN WU's "Youngor 100 Designers Make One Shirt" and YANLIN CHEN's "Ying'er New Talent Prize". INTERVIEWEE A5 mentioned that Shanshan Group[2] established the "Youth Fashion Designer Venture Fund" with 10 million RMB in 2002. Another Shanshan[2]'s financial strategy included high salaries for famous fashion designers and scholarships for teachers and students.

5.3.3.3 Land Capital

INTERVIEWEE O2 was an officer in the Natural Resources Department; he addressed the necessity of land resources within FDIE, citing several policies and initiatives. JIGUO QIANG revealed that land resources were related to economic outcomes and taxation. This occurrence was strengthened by INTERVIEWEE O2's use of the jargon "area output".

Rental Spaces. HARRY, YANG LIU, and HAIYAN WU noted that the government provided fashion designers and entrepreneurs with excellent workspaces at below-

market rents. JIGUO QIANG discussed the rental rate that prompted fashion manufacturers to relocate from the east to the middle of China. FUJUN FAN indicated another transfer of the Zhongda Fabric Market[5] from downtown Guangzhou to Qingyuan, 100 km distant, due to Guangzhou's limited land resources, despite the fact it was a mature and renowned cluster.

Industrial and Creative Parks. INTERVIEWEE I2 and I5 discussed the Fashion Town, which was initiated by the local government as an advantageous land resource for FDI. Whereas INTERVIEWEE I1 argued that the government should not intervene in the development of an industry cluster. INTERVIEWEE I5 provided a comprehensive case of her company's industrial park, which she believed was critical for encouraging designers to foster FDI. The park had apartments, an art neighborhood, and convenient transportation. HAIYAN WU elucidated the impact by saying, "*because of the creative park, more brands can be created, and these brands will greatly contribute to social and economic development."* YANG LIU was the ambassador for two creative parks and witnessed the beneficial growth of FDIE within a specific region.

HAIYAN WU noted that land capital was also an essential resource for fashion shows. For instance, her two fashion shows were held in some special locations, including an old instrument factory, a ruin near the city, and the Fahai temple.

5.3.3.4 Data and Information

The results of the information theme encompass diverse facets, including references to inspiration, fashion trends, big data and supply chain data, policy information, and global information. The necessity of information for FDI was stressed by HAIYAN WU, "*when we debuted, the information was very occluded. It turned out that we had plagiarized all of our designs for the market".* INTERVIEWEE I5 mentioned that information services functioned for entrepreneurs in their industry park, such as sharing online data with Huawei and IDG Asia.

Data and Information. INTERVIEWEE I1 discussed how today's information-exploding society must rely on the capture of big data by saying "*Big data understands consumers better than themselves*" to state that most people could now be analyzed using online big data, even though some information was useful but also misleading. A team of designers might extract valuable information from these tags, such as purchase frequency, consumption patterns, and search keywords, to gain insight into consumers' true intentions.

INTERVIEWEE D4 complained about the lack of supply-side information, such as material and printing suppliers, and harassed the prototype of her innovative fashion product. The transfer of FDI into products would be aided by front-end data. She also

envisioned that information such as body measurement and manufacturing data could be shared with greater accessibility and transparency in a digital era. INTERVIEWEE I1 agreed that big data was an emerging resource for FDI. INTERVIEWEE I3 concurred that supply chain data was valuable for FDI, and his company was running a cloud for further analysis and application.

YANG LIU pointed out that international vision was critical for FDI, which could be obtained by absorbing global information. INTERVIEWEE I5 discussed that there was also some sharing of information on the online platform, such as promotional activities, violation of store regulations, and running with merchants. INTERVIEWEE I2 and I5, and SHIKANG ZHOU asserted that information about policy should be delivered directly to businesses and individuals. Meanwhile, INTERVIEWEE O1 stressed that "*big entrepreneurs must become activists, let the market understand, let everyone understand (FDI)*". From the IP standpoint, all FDI were data and information worthy of protection, according to YAN CHEN, which would contribute to the flourishing and healthy development of FDIE.

Trends and Archives. Several interviewees discussed the importance of trends in fashion design. HARRY mentioned that fashion trends and information could be achieved during fashion week. HAIYAN WU underlined the leading impact of fashion trends as information to influence FDI because she had undertaken national-level

research on fashion trends and presented a vivid story of a Chinese leader's visit to Africa that resulted in fashion trends combining Chinese and African elements. YANG LIU elaborated on the fact that Chinese designers traveled overseas to take photos and observed fashion trends. JIGUO QIANG obtained professional trends like outdoor wear and sportswear by attending some trade fairs.

Meanwhile, archives, heritage, and traditions were some interviewees' topics. ZHIDONG XU considered brand logo, legacy, archive, and DNA as knowledge for FDI, such as pattern innovation. INTERVIEWEE L3 took Hermes and LV as examples of brand archive innovation. HAIYAN WU informed that tangible and intangible heritage, such as indigo dying and embroidery, must be innovated in the context of contemporary society. She also launched a brand "Orient Silk Country" and advocated Orient style.

5.4 Policy-driven Fashion Design Innovation (FDI)

It has been discussed policy-driven innovation in Chapter 2 Literature Review. In the context of FDIE, it can be identified that the government, a stakeholder not in the supply chain, also has a significant impact on FDI by using policies as measures. Below is the

result elaboration of the government as an initiator, associations as a mediator, and interactions between the government, associations, and fashion businesses.

5.4.1 Government

Regarding the government as a stakeholder, all interviewees admitted the role of the government in the FDIE. Some interviewees strongly confirmed the positive governmental intervention in the fashion style and future directions such as Metaverse.

INTERVIEWEE O1, a retired officer, had a profound view of government. He said "*Who is in charge of the economy? Two, one government, one market*". He believed that Shenzhen's fashion industry was heavily influenced by government initiatives. For instance, during the early stage of China's Reform and Open Policy, a number of intelligent people designed or at the very least imitated the equipment and fundamental production process. He continued proposing a roadmap by saying, "*Africa must follow China's example by starting three imports and compensation rather than nurturing design first, and then gradually becomes more independent. Irrespective of whether the materials can be sourced locally or not, it is prudent to start by producing buttons before the government slowly supports the industry. This is the government's responsibility: path-making*". Another obligation of the government was how to play chess across the country. The cost will be reduced if there is a regional support system,

as long as it can achieve a certain production scale and economical batch size. Consequently, the government had a directing role in a variety of aspects. The third duty of the government was to consistently encourage fashion designers to participate in culture and art, such as photography exhibitions, in order to raise their level of cultural literacy and artistic ability. Meanwhile the government assisted designers in comprehending society and giving back to society.

JIAXIN WANG confirmed the governmental effect on fashion styles from the fashion history perspective. He mentioned due to the influence of the Soviet Union, the Chinese had begun to wear Bragi dresses and Lenin suits after 1949, and blue and military uniforms during the Cultural Revolution.

YANLIN CHEN verified the governmental impact using a practical phenomenon. She cited Dalang Fashion Town as an example of the government's influence on clusters, stating that "*government-initiated clusters need the government to organize, coordinate, and guarantee in order to enable a region to develop rapidly and rank at the top*". Meanwhile, she agreed that an industry cluster could naturally form and create an ecology in a small region. For instance, Nanyou in Shenzhen was the organic gathering of the enterprises. "*It may begin with a violent escalation. But it (the government) could not allow it to grow viciously on its own. Management and control must be carried out at a specific time, to allow more standardized and institutionalized operations.*"

However, a few interviewees argued that the government had limitations. HAIYAN WU provided her own brand “WHY Design” as a case. She had expected to receive substantial support from the government and investors for almost two decades. Unfortunately, the situation has remained in its infancy since the Reform and Open in China.

INTERVIEWEE I2 complained that it would be tough for a single business to sustain innovation or to be truly willing to do so for an extended period. Therefore, it was reasonable to explore how the business could enhance competitiveness based on a region, city, or organization. She anticipated that the government would establish a platform and a mechanism to improve long-term competitiveness as opposed to short-term profitability. As long as innovation was the goal, any topic was acceptable, including graphene, technology wearables, and other novel things, since persistence might also had an impact.

5.4.2 Policies

YAOHUA DONG considered that policy, as a moderator, indirectly affected fashion design. YANLIN CHEN believed that technological innovation, service innovation, channel conversion or scientific research conversion, talent development, and resource balance, in turn, promoted the improvement or adjustment of government policies.

Although interviewees expounded on how the government supported FDI from various perspectives, it can be coded into several categories of policy, including industry policy, talent policy, finance policy, land policy, IP protection policy, and other policies, reflecting activities and resources in 3rd-order themes of the results of FDIE.

5.4.2.1 Fashion Industry Policy

Interviewees recognized policies specified for the fashion industry and general policies involved in the fashion industry. SHIKANG ZHOU noted there were "*fashion-specific policies in Shenzhen, such as the 20+8 Industries Policy, which acknowledged the modern fashion industry as an industry for the first time*". As such, it would support and pioneer fashion with its own attitude and style, rather than imitating the Western in its entirety.

INTERVIEWEE O1 stated that during the upgrade transformation of traditional industries, there were three types of policies: support, restriction, and cancellation. For instance, the environmental impact was caused by the country's policies in the fashion sector's development. But he also pointed out that it was the cluster of fashion businesses that received the government's actual counsel. INTERVIEWEE O2 mentioned, "*it depended on the planning of regional governments. Policies tended to encourage pillar industries*".

One specific activity captured in the 2nd-order themes and supported by the aforementioned industrial policies was Fashion Show and Fair. According to INTERVIEWEE I2, "*some industrial events are supported and sponsored, including the twice-yearly Shenzhen Fashion Week and fashion exhibitions, as well as four international fashion weeks*". The government mostly selected a few existing activities that were relatively large and significantly beneficial, and it provided some governmental support. She stressed that it was two-way and not government-mandated, but brands that wanted to participate voluntarily and conformed to the policy could apply. HARRY remarked that the government promoted each city's local fashion week and supported the platforms. Many interviewees talked about how the government sponsored local brands to attend overseas fashion shows by covering half of the cost. HAIYAN WU recalled the first show of her brand Eastern Silk Country, backed by the local government and the university, which lighted the West Lake for the first time in 2001. YANG LIU said that the Guangdong government offered platforms for the University Fashion Week and the Governor's Cup.

INTERVIEWEE O1 also mentioned that the Bureau supported the first exhibitions of the Shenzhen Fashion Industry Association in Beijing. HARRY stated that some ODM exhibitions were sponsored by the municipal government in an effort to encourage the factory's independent R&D.

The activity of digitalization of the industry has been strongly encouraged by policies. Regarding the digitalization of the fashion industry, policies were tailored specially for live broadcast e-commerce, such as the vigorous encouragement of the development of live broadcast bases, the introduction of live broadcast companies, and the training and creation of anchors. YANG LIU mentioned that the government of Guangzhou Panyu had specially deployed IoT and created blockchains to connect fashion companies for interaction.

The government maintained a steady relationship with the industry. YANG LIU and INTERVIEWEE I5 discussed the chain owner policy for the benefit of an upstream-downstream chain from design, production, sales to service. YANG LIU also stated that the government had specially created chain owners and industrial chains to facilitate the reciprocity between fashion businesses. Moreover, Panyu in Guangzhou was a key hub for the global jewelry industry. The government was also looking for interaction between jewelry and fashion.

Some other policies were aimed at environmental and technological development. HAIYAN WU stated that as long as the government identified that the company was a high-tech, innovative enterprise, it would provide financial support. INTERVIEWEE I2 pointed out the government's current emphasis on carbon-neural and low-carbon in the fashion sector.

5.4.2.2 Fashion Talent Policy

In addition to mentioning a number of honors, prizes, and education, as 2nd-oder themes of activities, interviewees also provided some policies surrounding this component, albeit in a nebulous fashion. It can be observed that talent policy is closely tied to human resources, financial resources, and land resources.

INTERVIEWEE I5 highlighted that talents were well-funded in both the city and the district due to the high-level talent identification policy specializing in subsidies issued by the Human Resources and Social Security Bureau of Shenzhen Municipality. The talent categories of this policy divided high-level talents into four levels: Extraordinary Abilities and ABC type, with "*the highest level - Extraordinary Abilities level receiving 3 million RMB and the lowest level C receiving 1.6 million RMB*". However, it was "*qualified to people in the fashion design field who received honors like the China Top Ten Fashion Designer, the Jinpeng Award[6], and the Golden Summit Award[7], as well as masters and PhDs*". The prerequisite was settling the social security relationship at a company with a relatively high turnover rate or above the scale, which would be easier to apply. The Longhua Human Resources Bureau provided a living allowance to fresh Ph.D. and masters from the world's top 100 universities. In addition, SHIKANG ZHOU gave the same precise figures for the talent policy, saying that "*reserve talents who won the China Top Ten Fashion Designers or the Golden Summit Award7[2] are eligible for*

rewards totaling more than 2 million RMB: 1.6 million RMB from Shenzhen city and 0.8 million RMB from the district". ZHIDONG XU, one of the Top Ten Fashion Designers, stated that the government gave some benefits, and that different cities had varying policy support; some cities had it, while others didn't; some were higher, some were lower.

HAIYAN WU remembered having a conversation with the Party Secretary in 2003 to propose a China's first-class competition. Each of the first six winners received 400k RMB from the Hangzhou Government to study abroad for one year. Those who ranked after sixth place were offered a year-long study at the China Academy of Art. She stressed that this was the power of the government and a series of support actions for youth.

YANG LIU was granted the title of Master of Haizhu District in Guangzhou, a prominent position in the fashion industry, coupled with numerous subsidies, such as subsidies for enterprises and masters and annual expert medical examinations. There were also policy preferences. Regarding young designers, the park offered housing subsidies. A staff from HAIYAN WU's university who designed the Asian Olympic Games received two or three million RMB, as opposed to the normal hundreds of thousands. However, the demands were extremely stringent, requiring the achievement

of economic indicators, status indicators, and company expectations within two to three years.

SHIKANG ZHOU reported that there were comparatively few government-sponsored industrial training and courses given by organizations. Regarding fashion students, the government cooperated with firms in terms of research and internships, according to INTERVIEWEE I5, whose company had college students as interns from across the country. However, they did not disclose any specifics.

5.4.2.3 Fashion Financial Policy

Interviewees discussed taxation, funding, and subsidies from the government by occasionally mentioning policies, including the Golden Tax Phase IV policy and the chain owner policy, through activities such as show and fair, prize and award, and digitalization which were identified in 2nd-order themes. Since the talent policy has elaborated on the financial support for talents, this session will instead focus on additional finance-related policies.

It was believed the government was attentive to the interaction and reciprocity of all stakeholders within FDIE. INTERVIEWEE I5 stressed that the chain owner policy benefited multiple stakeholders connected to a large focus firm. For example, the majority of businesses with a revenue of more than 5 million RMB were small and

micro enterprises, and the tax rate was particularly low. When it reached 500 million RMB, it became a new accounting base. However, there was a contradiction, as the tax burden would ultimately be proportional to the company's performance. To overcome this dilemma, the chain owner economy was launched with corresponding industrial policies. She stated, "*the chain owner founds a company with 5 million RMB. Small and microenterprises participates in the industrial chain led by the focal company. They all belong to the chain owner in terms of output value, but the tax is paid on the basis of small and micro enterprises. Then the chain owner will receive rewards from the government, which will be allocated to those small and micro enterprises. It is equivalent to multiple policies because it includes both rewards and tax reduction*", as Figure 5.3 shows.

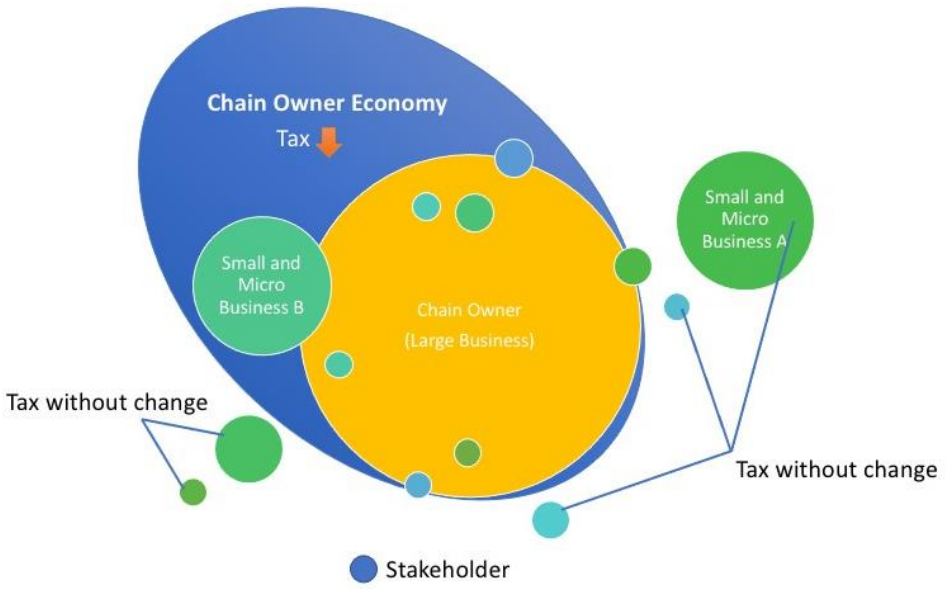


Figure 5.3 Chain owner economy in FDIE

Government policies such as the Golden Tax Phase IV, aided the digitalization of the industry. YANLIN CHEN stated that in recent years, the Economic and Trade Commission has provided numerous subsidies to boost brand efficiency and marketing through digitalization. However, the vast majority of subsidies went to large companies, while only a tiny number of grants went to small and micro companies and original designers. INTERVIEWEE I5 mentioned that Longhua District in Shenzhen employed live streaming e-commerce to implement the digitalization of fashion by saying that "the *Golden Tax Phase IV is designed to retain 75% tax in order to support and stimulate the digitalization of the fashion industry*".

Regarding the financial policy governing the activities of fashion shows and trade fairs, INTERVIEWEE I5 provided a thorough response. It could be divided into two lines: one was brand promotion to improve brand influence; the other was that if the show had a substantial impact on the industry, "*the brand can apply for a major project with a large investment of 5 million RMB. Another innovation funding can reach 3 million RMB*". The company's size was a factor. Regarding the timing, SHIKANG ZHOU added that the brand covered the initial expense. In addition, the current cycle was also exceptionally long, and the subsidies were normally not granted until the fowling year after the participation. Therefore, the brand or the individual was initially accountable

for all the early expenses. YANG LIU also noted that the government sponsored local brands to attend overseas fashion shows by covering half of the expense.

Several policies related to the specific business type were mentioned. HAIYAN WU stated that as long as the government identified that the company was a high-tech or innovative enterprise, it would provide financial support. The highest funding for the cultural and creative industries was 5 million RMB. Loans for small and medium-sized enterprises were interest-free or exempt for several years, according to INTERVIEWEE O1. In addition, the businesses relocating to INTERVIEWEE I5's industrial park might enjoy a 70% refund of district-level policy tax.

Policies and operating procedures rarely underwent dramatic changes, whereas auditing principles did. For instance, the initiative "Brand Cultivation" originally covered the expenditure of production, design, and promotion; labor and materials were excluded. However, the specific rules were subject to annual revision. There were restrictions, such as the deletion of items in the audit policy. If the reimbursement was more than one RMB above the budget, the project would be suspended. Additionally, a number of bureaus agreed that audit firms should communicate with enterprises so that they could receive direct feedback and comments.

5.4.2.4 Fashion Land Policy

According to the interview, the Fashion Town, the Fabric Market, industrial parks, creative and design parks, and rental were mentioned to support FDI. In a generic manner, INTERVIEWEE O2 introduced a provincial land policy, the Eleventh Point of the 2011 Land Policy of Guangdong Province, to support the agglomeration and development of small, medium, and micro enterprises whose own resources might not be sufficient at the development stage.

When INTERVIEWEE O1 was the director of the Economy and Development Bureau, he supported the Shenzhen Fashion Industry Association with a plot of land to build a "*fashion city, because small fashion businesses lack land, the rental is very expensive, and the industry support is very problematic. A small regional hub can make significant contributions*". INTERVIEWEE I5 gave the example of the Dalang Fashion Town in Shenzhen, which consisted of 22 industrial lots and attracted many large companies and top domestic fashion designers. The Dalang Fashion Town was honored with titles including the National Independent Innovation Demonstration Zone, the National Fashion Industry Famous Brand Pilot Area, and the National Benchmark Industry Cluster.

FUJUN FAN stated that the Zhongda Fabric Market[5] in Guangzhou would relocate to Qingyuan, where a textile city had been built. This was a government initiative, because Zhongda Fabric Market[5] spanned such a vast area and had considerable effects on

transportation and other issues, yet the industry needed growth. At the same time, Qingyuan also required government support in order to rapidly become a comparably important city in the Guangdong-Hong Kong-Macao Greater Bay Area. This motion enhanced balance and coordination in general.

HARRY observed that in Shanghai and Shenzhen, some fashion industrial parks and creative parks have emerged for a long time. For some innovators and designers, the entrepreneurial park provided a high-quality office environment at a lower price than the market and was a great resource for innovators and entrepreneurs. YANG LIU served as an ambassador for two creative parks: the Guangzhou TIT Fashion Park and the Weipin Park of Haizhu District. Because the government desired and supported the development of the creative industry, "*the old is replaced with the new, or the original basis is renovated to create a good environment and a platform for designers and enterprises*". HAIYAN WU stated that the government would encourage qualified talents and companies, by establishing entrepreneurial industrial parks and creative parks that offered rent-free space for three years. This was the initial phase of support. Better parks continued to attract visitors from across the nation, growing in popularity and influence. "*Only the government can do it; individuals cannot*". She found that there was a beneficial relationship between talent, brands, creative parks, and the economy. SHIKANG ZHOU remarked that every district had its own rent policy. In

the case of independent designer studios, the rental support was generally separated into a three-year period. The annual sponsored amount decreased, and the subsidy might not be available in the later period. According to JIGUO QIANG, there were few fashion factories with more than one or two hundred employees in Shanghai and its surrounding areas. Because the tax payment and the output were relatively low, the governments of Eastern China were no longer willing to fund this type of fashion industrial park.

5.4.2.5 IP Policy

Despite the fact that the majority of interviewees discussed the IP of FDI, few of them acknowledged IP policy, and even fewer provided specifics, with the exception of YAN CHEN, who is the general secretary of an IP association. YAN CHEN mentioned that the fashion industry had been considered a labor-intensive manufacturing sector, especially traditional manufacturing, which did not create high value and was, therefore, a severely disadvantaged group in terms of lawmaking. When the national copyright law was updated recently, the category of works of applied art was deleted, leaving only works of art. Consequently, the characteristics of works of art were very crucial from a legal perspective. Alternatively, if the fashion sector was categorized as a creative industry, an appearance patent should be used if the style design was more original, nevertheless, the review period -- at least six months was too long, and the annual maintenance fee was too expensive.

He discussed an alternative method. The government's substantial assistance prompted fashion practitioners to form industrial self-regulatory. When signing a rental contract, all parties were required to abide by a clause. If a violation occurred, the deposit might be deducted. If repeated IP infringement harmed the sponsor's reputation, the leased site might be terminated. It was because in every investigation the government conducted, the entire building would be affected, and other renters had not gained monetarily from IP infringement. This encouraged a greater number of owners to take action.

A few interviewees also noted certain policies and initiatives, such as those regarding intangible heritage and rural poverty alleviation. INTERVIEWEE O1 discussed Yunnan and Guizhou, where handicrafts played a crucial role in rural poverty alleviation.

5.4.3 Associations

Several interviewees considered associations as intermediaries between the government and businesses. As a former officer, INTERVIEWEE O1 identified that the association was a component of social structure and served as the extension of the government, the cohesion of enterprises, and a big hub. Associations played an enacting, enriching, and

effective role in the allocation of resources and the support of the industry, "*in a sense, the association, not necessarily the government, is directly tied to the development of an industry", "the government supports associations, not specific enterprises... such as events and trade shows*", and "*the government should continue to support either industrial or social organizations to serve as a bridge*". YANG LIU acknowledged that "*the government cannot accomplish everything, besides supports and policies. However, associations must take the lead in bringing together enterprises, designers, and industrial chains in order to carry out numerous corresponding developments, win-win scenarios, and so on*". According to INTERVIEWEE I2, the government simply offered some financial aid and did not make supplementary recruitment of personnel and organizations. Industrial associations served as bridges or impetus in the middle, having knowledge and willingness to implement policies. JIGUO QIANG emphasized the crucial role of associations, given that the government might be overburdened with issues in all areas and confined by laws and regulations. Associations might have more flexible means, could obtain more information, such as some changes at the government or industry level, and integrate enterprises to carry out some activities. HARRY noted that cooperation between the fashion industrial associations and governments in the first-tier cities could promote the local fashion industry, regardless of economic or policy support.

INTERVIEWEE O1 recommended the "*statutory function*" of associations, which should be strengthened as a fundamental structure, a node, and essential support of "*small government, big society*". Regarding how to strike a balance between the functions of associations and those of the government, he suggested that experts develop rules. YAN CHEN admitted this statutory function by outlining two primary responsibilities of the Shenzhen Copyright Association. The first was to assist provincial Copyright Bureaus and the National Copyright Bureau in reviewing the registration of works and issuing copyright registration certificates. Second, because the association served as a grass-roots workstation of the Guangdong Provincial Copyright Bureau, it also engaged in copyright protection.

5.4.3.1 Functions

Associations took the responsibility of mediators and performed activities such as show and fair, competition and award, IP protection, and education, as identified in the 2nd-order theme, in addition to policy-related work and certification work.

Nearly all fashion designer interviewees talked about Fashion Week, along with some trade fairs and competitions organized by industrial associations. These events were sponsored by the government, as reported in the aforementioned session of show and fair. According to INTERVIEWEE A5, the China Fashion Designers Association

supported young designers with resources and opportunities for participation in exhibitions and shows such as the China International College Fashion Week and the 10+3 Showroom in order to complete the ecological chain of fashion design, which was "*challenging for a business to accomplish*". JIGUO QIANG mentioned that associations offered platforms that showcased regional business in addition to Fashion Week.

INTERVIEWEE I3 advocated for industry associations to take on duties, including IP protection. YAN CHEN introduced three digital IP tools, including a software system that issued digital work certificates quickly for the design of fast-moving consumer goods; a monitoring and identification system of the sales online platform that identified infringing and unauthorized products, as well as their circulation and sales status; and an electronic evidence curing system designed to collect evidence for e-commerce or Internet-distributed works. Additionally, a copyright dispute mediation committee specifically mediated copyright issues that had not yet entered judicial or administrative processes.

Associations also set up training centers, exhibition centers, and technology development centers, according to INTERVIEWEE O1. SHIKANG ZHOU mentioned the industry-association-university-government relationship that contributed to

industry, research, and education. Other functions included the publication of industry reports and white papers, as performed by the Hong Kong Toy Association.

YANG LIU, SHIKANG ZHOU, and INTERVIEWEE O1 mentioned that the evaluation of job titles was a major function of associations that would attract and gather talent. "*Designers have a home now,*" said YANG LIU, "*I became the first senior title holder in Guangdong*". INTERVIEWEE A5 stated that in the 1990s, the famous brand strategy of the China Fashion Designer Association advocated for the Famous Designer Project.

During the policy-making process, according to INTERVIEWEE O1, the government promoted policy direction, and associations helped to formulate detailed rules. Alternatively, the government might hold a symposium at which associations shared opinions and possibly invited some pillar enterprises. In addition, associations from other sectors could be invited. INTERVIEWEE O1 also referred to associations as transshipment and distribution hubs that disseminated policies to enterprises, "*if you don't understand, we will explain it for you*". Moreover, during the policy implementation phase, some policies might not be comprehensive and require revision, and associations might provide comments and feedback.

Besides the above-mentioned formal functions, JIGUO QIANG argued that informal interactions like dinners and annual meetings, which could be referred to as “Guanxi”, constituted an additional and necessary activity.

5.5 Chapter Summary

This chapter discusses the semi-structured interview, data collection, and data analysis of Study 3 FDIE. The study’s findings reveal the identification of FDIE components. The categories of stakeholders include talents, businesses, suppliers, customers, investors, digital service providers, universities, the government, associations, incubators, media, and third parties. The categories of activity comprise show and fair, competition and award, IP protection, value creation, digitization, funding and investment, entrepreneurship, education, and sustainability. The categories of resources include human capital, monetary capital, land, and information. Meanwhile, the policy-driven FDI is captured by identifying policies including industry policy, talent policy, land policy, finance policy, and IP policy, as well as the involvement of associations as intermediaries.

Note:

1. EEKA: EEKA Fashion Holdings Limited (EEKA Fashion Group, Hong Kong Main Board Listed Stock Code: 3709.HK) was established in 2007 as a well-known fashion brand group with the multi-brand operation. Group holds NAERSI, NAERSILING, NEXY.CO, Koradior, La Koradior, Koradior elsewhere, CADIDL, FUUNNY FEELLN ----eight self-owned brands. (source: http://www.eekagroup.com/)

2. SHANSHAN: Ningbo Shanshan Co., Ltd. (“Shanshan”, stock code: 600884) was established in 1992. Shanshan became the first listed apparel company in China in 1997. Shanshan launched a strategic transformation toward the new energy industry in 1999. (source: http://www.ssgf.net/index/en/about.html)

3. Youngor Group: The Group was founded in 1979 in Ningbo, Zhejiang Province. Its subsidiary Youngor Group Co., Ltd. was listed on the Shanghai Stock Exchange in 1998, stock code: 600177. The main brand "Youngor" has continued to maintain its leading brand status in the domestic men's wear, creating a national brand representing "Chinese quality". A three-dimensional brand system with extensions of MAYOR, HART MARX, HANP, UNDEFEATED, and HELLY HANSEN has been formed. (source: http://www.youngor.com/about/1.html)

4. ELLASSAY: a multi-fashion group was founded in 1996 and listed on Shanghai Stock Exchange in 2015, with stock code SH.603808. The group has gathered Chinese

premium fashion label ELLASSAY, German's premium women's wear Laurel, American street fashion brand Ed Hardy, French designer brand IRO Paris, British contemporary fashion brand Self-portrait, and Canadian premium outerwear brand Nobis. (source: https://www.ellassay.com/)

5. Zhongda Fabric Market: The Guangzhou Zhongda Fabric Market is the largest wholesale fabric market in China, covering an area of over 50,000 square meters with over 5,000 shops and showrooms. This market is divided into 9 floors where the first 3 floors are trading centers consisting of 2000+ shops.

(source: https://www.stitchingbusiness.com/blog/largest-wholesale-fabric-market-in-china/)

6. Jinpeng Award is established by Shenzhen Fashion Designers Association and has become a highly credible and influential professional selection project in Shenzhen's fashion design industry (source: https://www.sohu.com/a/621121482_121010226)

7. "Golden Summit Award" is awarded to the Top Ten Chinese Fashion Designers. The Chairman Meeting of the China Fashion Designers Association nominates candidates according to the selection outcomes of the Fashion Art Committee. All directors of the China Fashion Designers Association vote for the annual Award based on the

candidate's professional achievements and fashion release works. (source: https://baike.baidu.com/item/中国服装设计“金顶奖”/1069212)

Chapter 6

Discussion

6.1 Chapter Introduction

In this chapter, three findings are discussed by referring to extant literature from the results of Study 1 and Study 2 in order to resolve two research questions and rationalize five research propositions. Meanwhile, the findings of three studies mutually justify. Table 6.1 displays two research questions and five propositions with three studies. The Fashion Design Innovation Ecosystem (FDIE) model is developed with a discussion of the logic of the model. The performance of the FDIE model is verified by using interview data, and the application of FDIE strengthened its validation. Finally, the policy-driven Fashion Design Innovation (FDI) model is designed and validated.

Table 6.1 Research Questions and Propositions

RQs	What Fashion Design Innovation (FDI) is?	How to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?	Justified Proposition
Study	Study 1 FDI Literature Review Study 2 The Measurement of FDI	Study 3 FDIE	
Proposition	P1: FDI can be evaluated at the product level using factors including style, color, material, function, technology, and meaning.		P1: FDI can be evaluated at the product level using factors including aesthetics, material, symbolism, technology, and sustainability.
		P2: Components of FDIE consist of stakeholders, activities, and resources.	P2: FDIE components consist of stakeholders, activities, and resources.
		P2.1: FDIE includes stakeholders, such as industrial companies, suppliers, users, the government, and universities.	P2.1: FDIE includes stakeholders, such as talents, fashion businesses, suppliers, sellers, consumers, investors, incubators, smart and digital technology providers, media, government, associations, universities, and other stakeholders.
		P3: FDIE is diverse, interactive, and expansion-capable.	P3: FDIE is characterized as diversity, dynamic, openness, reciprocity, and coevolution.
		P4: The government positively drives FDI.	P4: The government positively drives FDI, either directly or indirectly through associations as intermediaries.

6.2 Findings

6.2.1 Findings I: Fashion Design Innovation (FDI)

6.2.1.1 Proposition 1

Based on the results of Study 1, automatically- generated key clusters link to design discipline and sustainability, while manually-grouped clusters focus on technology, material, product development, craftsmanship and history, region, business, and management. Both product and business serve as the investigation objective. Since this research focuses on the fashion goods level, Study 2 concentrates on product innovation as opposed to firm reform. It is concluded that five dimensions and eighteen items can be used to evaluate FDI, including aesthetics, material, symbolism, technology, and sustainability, after the removal of the performance dimension due to the validity of CFA, as shown in Table 4.25. The aesthetics dimension is constituted by five items: form, color and pattern, surface, style, and how to wear. The material dimension involves three items: raw material, fabric, and accessories. The symbolism dimension is made up of two items: personal value and social value. The technology dimension consists of five items: manufacturing, finishing, showing, user-centered, and IoT. The sustainability dimension contains three items: environment, well-being, and society. As a result, FDI can be assessed through these items that FDIE targets to foster. Various

stakeholders aim to innovate these dimensions and items through activities by using resources. It is demonstrated that Proposition 1, “FDI can be evaluated at the product level using factors including style, color, material, function, technology, and meaning”, has a broader scope, more specific factors, and more precise objective; hence, it can be justified as “FDI can be evaluated at the product level using factors including aesthetics, material, symbolism, technology, and sustainability”.

The findings of Study 1 and Study 2 provide responses to the research question “What Fashion Design Innovation (FDI) is?” Thus, both studies coin the concept of Fashion Design Innovation (FDI), which encompasses both tangible and intangible components that are embedded in fashion, possess changes, newness, and novelty, and dramatically or gradually impact the human being, society, and environment.

6.2.2 Finding II: Fashion Design Innovation Ecosystem (FDIE)

Regarding the research question “How to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?”. Proposition 2 employs a structural perspective that is strengthened by stakeholder-focused Proposition 2.1. They are justified by references to the literature in Studies 1 and 2. Hence, the publications cited in the subsequent discussion were derived from these two studies. It aids in constructing FDIE on a

consolidated foundation of extensive academic research on FDI and practical interviews.

P2: Components of FDIE consist of stakeholders, activities, and resources.

P2.1: FDIE includes stakeholders, such as industrial companies, suppliers, users, the government, associations, and universities.

P3: FDIE is diverse, interactive, and expansion-capable.

6.2.2.1 Proposition 2

The findings of Study 3 shed structural light on the research question "How to facilitate Fashion Design Innovation (FDI) through an ecosystem lens". It concentrates on thirteen stakeholders, nine activities, and four resources within FDIE and supports Proposition 2 "Components of FDIE consist of stakeholders, activities, and resources". Recently, the reconciliation of stakeholder theory and resource-based theory has been examined, and both theories have been refined (Freeman et al., 2021). FDIE allows for the concurrent and divergent development of two theories.

Stakeholders

According to Freeman's concept of stakeholder, a stakeholder is "any group or individual who can affect or is affected by the achievement of the firm's objectives"

(Freeman, 2010). “Who are stakeholders?” is the starting point from a rational level. It should be inclusive enough not to exclude groups and individuals who may interfere with FDI, although in an illegitimate way (Freeman, 2010). Thus, one step further should be taken to capture specific stakeholders in the context of the fashion sector and through a new lens of the innovation ecosystem. Proposition 2.1 “FDIE includes stakeholders such as industrial company, supplier, user, government, and university” which refers to stakeholders who instigate and support FDI, apparently confirmed by the results of Study 3. Additionally, more types of stakeholders are identified, such as designers, scientists, artists, artisans, internet celebrities, smart technology and digital service providers, incubators, investors, and associations.

Independent fashion designers have been considered key stakeholders in the entrepreneurship ecosystem (Brydges & Pugh, 2021). As human capital, artists were highlighted by adding value to innovation in cultural products (Wijnberg & Gemser, 2000) and collaborating with designers and manufacturers for design innovation (Hooper, 2017; Lavanga, 2018; McRobbie, 2016; Verganti, 2006). One interview exactly asserted the similar joint-design function of artists. Craftsmen also contributed to FDI with their expertise, such as for the innovation of intangible heritage, which was the sustainability dimension of FDI (Pagan et al., 2020), and for the craft-based fabric innovation of footwear, which indicated the material dimension of FDI (Evans &

Chisholm, 2016). As one sort of artisan, embroiderers were cited by some interviewees in relation to FDI's aesthetic dimension and sustainability dimension including social and human well-being aspects. In a sense, the definition of the fashion designer as the artist-craftsman validated the findings of the talent category (Crane, 1997). Considering the sustainability dimension of FDI, fashion designers were encouraged to engage in interdisciplinary study with material scientists (Whicher et al., 2018). Several interviewees enriched the insight by describing an immersive and concrete cooperation between FDI and scientists. For instance, one interviewee, who is a full-time scientist and a part-time fashion designer, launched her own fashion brand using scientific inspiration and knowledge. Internet influencers might be substituted with vloggers, media influencers, digital influencers KOL, etc., and were approached to gain opinions and co-production within the ecosystem (Gomes et al., 2021; Y. W. Lee et al., 2020).

Suppliers were key participants in the fashion supply chain (Karadayi-Usta, 2022), in various forms of ecosystems (Whicher et al., 2018), and were associated with design innovation (Slater et al., 2014; Verganti, 2008). The FDIE research distinguishes digital service providers from those along the traditional supply chain such as material and fabric suppliers, manufacturers, and machinery suppliers, in light of the rapidly accelerating digitalization, such as AI (Garzoni et al., 2020; Verganti et al., 2020; Wamba-Taguimdje et al., 2020). The third parties served as intermediaries and

provided services like design consultancy, brokerage, logistics, and copyright services (S. Lin, 2018; Pal, 2016; Paras et al., 2018; Sunley et al., 2010). For example, reverse logistics will improve the sustainability dimension of FDI. These stakeholders could easily contribute to the technology and material dimensions of FDI.

End-users, markets, and sellers are strongly correlated with cognitive response and open innovation. Innovation could be inspired and motivated by customers (Chesbrough, 2017; Cui et al., 2022), which was referred to as user-oriented and user-driven design innovation (Veryzer & Borja de Mozota, 2005). These stakeholders substantially adhere to the product visual form of FDI aesthetic dimension and the symbolism dimension of FDI in order to pursue individual meaning or social value.

Investors comprise private investors, institutional investors, and the government (Aspara, 2009; Wessner, 2007). Innovation strategy favored by direct investors of international groups (Vila & Kuster, 2007). Institutional investors reportedly had a good impact on R&D (Wu & Huarng, 2015). In the digital era, online crowd fundraising counted (Dalla Chiesa et al., 2022; Jiao et al., 2021).

Several interviewees mentioned incubators about industrial or creative parks where free or low-cost housing may be offered. Incubators are essential for sustaining continuous innovation. In the context of Canada and New Zealand, the entrepreneurship ecosystem

in the fashion industry was examined to be effective (Brydges & Pugh, 2021; Lewis et al., 2008). The involvement of incubators and accelerators was crucial for the sustainability dimension of FDI (Kozlowski et al., 2018). Incubation programs can be efficiently processed by the science-park-based incubator (De Jager et al., 2017). The equivalent element in FDIE would be an industrial park and a creative park (Lin, 2017).

Universities also undertook incubation, which partly led to entrepreneurship education (De Jager et al., 2017). Universities usually form partnerships with businesses and governments, and contribute to all dimensions of FDI in terms of research and education (Thorogood, 2018).

Regarding the cooperation between universities, governments, and businesses, the Triple Helix was a classic model of the innovation system that has been maintained in FDIE (Etzkowitz & Leydesdorff, 2000). Researchers have examined the fashion sector in countries where the government plays a role, including the entrepreneurship ecosystem in Canada, political projects in New Zealand, and fashion challenges in Australia (Brydges & Pugh, 2021; Craik, 2015; Lewis et al., 2008). As bridges and intermediators between businesses and governments, associations gather firms, monitor trade fairs, and host fashion week. Associations acted as color forecasters, linked fashion magazines to facilitate style innovation, and operated as central agencies for innovation diffusion (Cassidy, 2019; Rantisi, 2002; Swan et al., 1999).

It is evident that the media is an essential stakeholder in innovation generation and diffusion. The media-based polar was treated as the fourth helix in "Mode 3", i.e., the "Quadruple Helix", which contributed to knowledge and innovation (Carayannis & Campbell, 2009). Fashion magazines, as a form of conventional media, enriched Indian fashion discourse (Khaire & Hall, 2016). The media group overlaps the talent group, which includes internet celebrities and key opinion leaders (KOL) with the ability to impact public opinion and communication functions such as e-commerce broadcasts. All of these relevant stakeholders mingle together to make fashion become a conspiracy.

Despite debates on different kinds of ecosystem, sectors, and their evolution, the structurally essential components do not shift greatly (Scaringella & Radziwon, 2018). The supply chain, services, and those originating from the Quadruple Helix are covered by thirteen categories of stakeholders. Among them, fashion designers are the very initial human power, while artists, craftspeople, scientists, and influencers present FDI opportunities as joint players. Investors from the public and private sectors solidify their status by offering money to launch and operate FDI. Companies of intelligence technology and digital services enssure that FDI follows the digital era. Overall, the identification of stakeholders within FDIE is the critical conclusion of Study 3 in terms of answering "who and what really counts" based on the stakeholder theory (Donaldson & Preston, 1995; Mitchell et al., 1997; Smudde & Courtright, 2011). The expansion of

stakeholders to include individuals, sellers, investors, incubators, associations, and media, the elimination of competitors due to the FDIE's industry-level focus, and the division of suppliers into digital service and smart technology providers and supply chain suppliers, are sufficient justification for the Proposition 2.1 on stakeholder type in FDIE. Proposition 2.1 can be justified as "FDIE includes stakeholders, such as talents, fashion businesses, suppliers, sellers, consumers, investors, incubators, smart and digital technology providers, media, government, associations, universities, and other stakeholders."

Activities

Regarding the stakeholder theory, processes were organized implicitly or explicitly to accommodate stakeholders' interests, strategic programming slots between the strategic directions of FDI, and resource allocation (Freeman, 2010). It was believed that "nascent Entrepreneurship Ecosystems can engage in activities to increase their abilities to acquire and create resources" (Roundy & Bayer, 2019). The same conclusion can be applied to FDIE. However, not all activities are equally capable of identification in the context of FDIE. The findings of Study 3 display the most significant activities, including fashion shows and trade fairs, competition and awards, intellectual protection, value creation, investment, entrepreneurship, digitalization, sustainability, and education.

Fashion week and fashion shows were frequently discussed by interviewees to convey FDI. They were unquestionably an indispensable part of the fashion sector and were exclusive to the fashion industry as opposed to other industries (Lewis et al., 2008). The function of trade fairs has evolved beyond commerce to encompass trend development and brand visibility. Pitti Uomo in Italy was a prominent case of a trade fair's role as an intermediary and a temporary cluster in the fashion sector (Lavanga, 2018). London Fashion Week was viewed as a materialized way for fashion (Entwistle & Rocamora, 2006; Majima, 2008). Through fashion shows, brands and designers communicated FDI and gained spotlights (Sandhu, 2020).

The number of prizes was considered a performance indicator of design innovation (Landoni et al., 2016). It was stated that winning awards would lead to reputation-building and trend-configuration (Halbert, 2018; Lin, 2017; Sandhu, 2020). The achievement of constant value transfer across stakeholders was highlighted by winning a prize (Bertola et al., 2020). The winning designers received mentoring, undertook business trips overseas, and disseminated their designs through government and firm sponsorship (Damoah, 2018; S. Lin, 2018; Peirson-Smith, 2013). In the context of open innovation, not only professional designers but also customers participated in competitions (Di Maria & Finotto, 2008).

A significant aspect of FDIE is its substantial capacity for value-related activities, such as value creation, value transfer, and value proposition. The reason for this was that more stakeholders and resources were included, and their interaction and configuration triggered value chain operations (Abecassis-Moedas, 2006). Numerous studies have investigated these activities in the management field, such as the marketing system, supply chain, cultural ecosystem, production value chain, and global value chain (Abecassis-Moedas & Benghozi, 2012; Beh et al., 2016; Burlina & Di Maria, 2020; Dameri & Demartini, 2020; Frow & Payne, 2011). Regarding the symbolism dimension of FDI, stakeholder collaboration would develop meaning innovation from cultural production, social movement, local authenticity, and tradition value (Altuna et al., 2017; Lin, 2017; Wanniarachchi et al., 2020). It also contributes to the sustainability dimension of FDI such as from co-creation and DIY (Hirscher et al., 2018; Hvass & Pedersen, 2019; Niinimaki & Hassi, 2011). The transfer of knowledge between designers and craftsmen resulted in FDI in terms of knitwear in Scotland and Sari in India (Bertola et al., 2020; Halbert, 2018). By using digital data provided by customers and partners, values were co-created to address these providers' needs (Amit & Han, 2017). The preceding discussion contains the results of Study 3, which identifies value creation as R&D and consumer satisfaction, and expands its scope to explore value

proposition and value transfer, which should also be distinct and significant FDIE functions.

In a knowledge-based society, FDI as an asset should be viewed as the intellectual property that is the output of knowledge and skill and must be protected (Dameri & Demartini, 2020). One interviewee stressed the disparity in IP between mainland China and Hong Kong as an obstacle to cooperation within FDIE. Legal norms of IP have been substantially consolidated across countries in the EU and the US (Belfanti & Merlo, 2016; Marinova, 2001; Wysokińska, 2015). It should also be noticed that spinoffs' and independent designers' IP was vulnerable, making their exposure and commercialization risky (Gilsing et al., 2010). The protection of FDI has been widely acknowledged from a historical or regional view (Marinova, 2001; Pouillard, 2017). Considering customers' attitudes to counterfeit, it would be advantageous to design innovative fashion from the manufacturer's and retailer's side (Moon et al., 2018). A multitude of innovation protection methods were investigated, such as registered communityies (Filitz et al., 2015). However, it was paradoxical because imitations of fashion were inevitable and difficult to trace and identify when launching the market commercially (Aspers & Godart, 2013). Challenges would increase if IP protection is legislated in a manner that is excessively stringent.

Monetary investment was an indispensable activity in FDIEt (Hvass & Pedersen, 2019; Wysokińska, 2015). Investment intrudes FDI in all aspects, such as product category renewal, traditional crafts such as mud-dyeing, and trade shows, supported by the World Bank, local governments, and companies (Bruce & Moger, 1999; Damoah, 2018; Dell'Era et al., 2017; Landoni et al., 2016; Linton, 2020; Wanniarachchi et al., 2020).

Entrepreneurial designers enhanced their analytical and intuitive abilities in order to facilitate creativity effectively (Abrudan et al., 2020). Lead users became "lifestyle" entrepreneurs who contributed to the outdoorswear innovation to satisfy their personal needs (Rose et al., 2007). Female self-entrepreneurship formed micro-production networks and stimulated Sari FDI in India (Bertola et al., 2020). Another women-centered case was the revival of knitting as a viable entrepreneurial activity in Scotland (Halbert, 2018). Startups can manage and decide the symbolism dimension of FDI of fashion products that could meet consumers' requirements (Tran, 2010). Outward-looking entrepreneurship expanded local innovation practices in order to evolve the local sector and provide feedback to design networks (C. Y. Lin, 2018). Regarding location decisions, entrepreneurial designers favored amenities above agglomeration (Wenting et al., 2011).

The potential for digitalization encourages all breakthrough technologies to pursue FDI by forging closer linkage with "the entire ecosystem". Fashion 4.0 was a strategy for

harnessing digital transformation to revolutionize the fashion sector (Bertola & Teunissen, 2018). Awareness, investigation, collaboration, and transformation of digitalization were four phases of engagement for businesses (Garzoni et al., 2020). For instance, designer online platforms demonstrated an essential innovation for keeping up with international design trends (C. Y. Lin, 2018).

Sustainability is identified as one dimension of FDI in Study 2, alongside environment and human welfare. Its practices have been mixed with all FDIE activities. The context of sustainability activities varied widely, for instance, from an urban neighborhood in Helsinki, Finland, to a textile community in the UK and Philippines, to the handloom industry in Sri Lanka, and the leather industry in a developing country like Pakistan (Gurova & Morozova, 2018; Ouano & Mazzarella, 2021; Wahga et al., 2018; Wanniarachchi et al., 2020). ReDesign Canvas was developed to address the complex and excessively conceptual problems of existing design tools (Kozlowski et al., 2018).

It was believed that education had the priority of cultivating and harnessing the younger generation for innovation and served as an aggregator of intelligence for innovation research. Entrepreneurial universities imparted knowledge and skills on how to launch and operate startups, such as by employing a knowledge translation approach (Dameri & Demartini, 2020). Fashion design higher education has emerged with sustainability by renewing pedagogy and implementing projects (Agarwal, 2018; Curwen et al., 2013;

DeLong et al., 2017; Hall & Velez-Colby, 2018; Mohajer va Pesaran, 2018). The E-learning course has been experienced successfully with innovation management and entrepreneurship education (Negoita et al., 2017). Digital-minded labor acquired from universities benefited the digitalization activity and technology dimension of FDI (Conlon, 2020). Training such as on-the-job training contributes greatly to FDI because of the disparity between the individual creativity promoted by school education and the industrial practice in the actual world (Volonte, 2012).

Consequently, nine FDIE activities related to FDI are validated by the results of Study 1 and Study 2. Since activities vary by industry, the nine activities are logically classified as fashion-specific, industry-common, service-related, and socially and environmentally obligated. Stakeholders could not achieve the FDI target without participation in these activities; hence, activities, as a part of Proposition 2, a component of FDIE, are justified.

Resources

The stakeholder theory stresses the normality, ethics, and sharing issues that are considered to lack competitive advantage and which may be dealt with by fusing resource-based theory (Barney et al., 2021; Freeman et al., 2021). The findings of Study 3 are consistent with the resource-based theory (Barney & Clark, 2007). A resource-

based view might help to understand this component of FDIE, regardless of whether the resource is provided by suppliers, intermediaries, or the government, and regardless of whether the resources are local or global (Chen & Chen, 2013; Hillman et al., 2009; Rieple et al., 2015; Vale & Caldeira, 2007). Human capital, information, monetary resources, and land are the primary types of resources recognized. The resources are allocated with various configurations of stakeholders and activities. The stakeholder theory also advocated at the transaction level that "what resources are allocated to interacted with which groups" (Freeman, 2010).

Human capital is crucial for knowledge transfer and innovation (Abrudan et al., 2020; Park-Poaps et al., 2021). The labor market stimulated innovative creativity regardless of whether jobs followed people or people followed jobs (Copercini, 2016). Universities were pools of young talents (Majima, 2008). Associations as conduits for practicing designers served as a second source (Rantisi, 2014). Immigration brought in foreign human capital with specialized skills (Moodley, 2003).

Innovation in design necessitated monetary investment (Hvass & Pedersen, 2019; Wysokińska, 2015). A lack of investment impeded design innovation in traditional crafts due to the industrial structure or the national environment (Bruce & Moger, 1999; Wanniarachchi et al., 2020). Most value-seekers were giant businesses with extensive investment experiences and long-term return targets (Macchion et al., 2018). The World

Bank has committed funds for trade shows in Ghana (Damoah, 2018). The government also provides direct financial support for mud-dyeing design innovation (Linton, 2020). Although investment in design did not correlate directly with competitive performance, it did contribute to other competitive outcomes, such as product category renewal (Dell'Era et al., 2017; Landoni et al., 2016). During recessions, SMEs' investment in R&D and advertising would be beneficial (Cucculelli et al., 2014).

The investigation of the role of land resources in Swedish fashion revealed a multifaceted relationship with fashion (Hauge et al., 2009). Regarding the material dimension of FDI, such as mud dye and cellulose, the land was an indispensable resource to incorporate (Chan et al., 2018; Linton, 2020). Industrial parks and districts should be developed to foster innovation by offering sites and services for businesses and their interactions, such as the sharing of information and materials (C. Y. Lin, 2018; Mishra et al., 2020; Rantisi, 2002; Vale & Caldeira, 2007). Additionally, designers desired a space separated from salespeople for idea development (Tran, 2010). Multiple locations, such as cafes and bars, could facilitate individuals to meet and exchange tacit knowledge (Rieple et al., 2015). Small brands with limited budgets staged fashion shows at public venues like parking lots and metro stations (Majima, 2008).

The range of information as a resource is vast and diversified. Archival information served as inspiration for FDI, such as traditional and historical costumes and brand

legacy (Sammour et al., 2020). Digital data is becoming increasingly vital to innovation (Amit & Han, 2017; Scuotto et al., 2020). Subjective knowledge may be the primary investment for startups in the cultural industry (Banks et al., 2000). Few interviewees, however, particularly address knowledge and skills. This study would incorporate knowledge and skills into human capital and information resources according to different situations.

So far, the findings of Study 3 substantially support Proposition 2 based on the testimony of each component including stakeholders, activities, and resources. Proposition 2 is justified as "FDIE components consist of stakeholders, activities, and resources".

6.2.2.2 Proposition 3

Study 3 results also imply that diversity, dynamic, openness, reciprocity, and coevolution are FDIE performances that responds to Proposition 3 **"**Fashion Design Innovation Ecosystem (FDIE) is diverse, interactive, and expansion-capable" which claims the non-physical qualities of FDIE.

As a notable finding of Study 3, the identification of each component type within FDIE reflects the features of diversity. FDIE can be expanded by adding new components, such as joint design with designers and cooperation with artisans, both of which were

unique to the design and creative industries (Halbert, 2018; Linton, 2020). With the advancement of technology and society, certain components, such as digital service providers were generated, or disappeared. The emergence and demise of components reflected more inclusive characteristics: dynamics and openness, which resolved the boundary issue of FDIE and responded once more to the characteristic of diversity (Abecassis-Moedas, 2006).

The FDIE model has to be an ecosystem only with flexible configurations of stakeholders, activities, and resources in order to achieve FDI. For instance, fashion design was clustered with the dynamic of one stakeholder – startups (Wenting, 2008). All mutual interactions and diverse configurations of components, form networks to foster a complicated FDIE, as evidenced by the fact that the relationships between supply chain participants affected knowledge absorption (Abecassis-Moedas & Ben Mahmoud-Jouini, 2008). Through interaction, reciprocity delivers a beneficial rather than a rival perspective. Milan is a city that hosts various players negotiating reciprocally to build a fashion and design industry (Jansson & Power, 2010). Value-seekers aligned internal and external stakeholders in an effort to denote sustainability FDI (Macchion et al., 2018), and all stakeholders coevolved. A historical case was the coevolving expansion of the fashion industry in New York in order to close the manufacturing-to-consumption loop gradually (Rantisi, 2002). Additional traits beyond

those in Proposition 3 are recognized to assure FDIE evolution and lay the foundation for FDIE governance. Hence, Proposition 3 can be justified as “Fashion Design Innovation Ecosystem (FDIE) is characterized as diversity, dynamic, openness, reciprocity, and coevolution”.

After Proposition 2 and Proposition 3 are testified, the conceptualization of the Fashion Design Innovation Ecosystem (FDIE) is finalized as “sets of stakeholders participate in various activities with aggregations of resources in order to foster Fashion Design Innovation (FDI) in a diverse, dynamic, open, reciprocal, and coevolving manner”.

6.2.3 Finding III: Policy-driven Fashion Design Innovation (FDI)

6.2.3.1 Proposition 4

The third session of Study 3 FDIE’s interview addresses Proposition 4: “The government is capable of driving FDI”. Study 3 findings in Chapter 5 indicate that the government, as a critical stakeholder in FDIE, promotes FDI through a variety of policies, including industrial policy, talent policy, finance policy, land policy, and IP policy. Moreover, it discovers that associations serve as intermediaries and mediators between the industry and the government.

Researchers have been engaged in the fashion industries at the national and regional levels. Leveraging policies increased the EU's competitiveness in the fashion and design fields (Wysokińska, 2015). Several political projects contributed to the development of "Designers in New Zealand" (Lewis et al., 2008). Some measures have been enacted to promote policy-driven FDI. For example, immigration policy called for foreign human capital with specialized skills (Moodley, 2003). The government acted as a direct investor in innovation and slowly transitioned into a passive investor with a small stake (Wessner, 2007). It was argued that the government should exert effort and implement policies being measures since innovation posed challenges for Australian fashion (Craik, 2015). Other countries were also examined, such as Canada's Entrepreneurship Ecosystem in the fashion sector (Brydges & Pugh, 2021). The South Korean government established the Center for Creative Economy and Innovation (CCEI) to explore competing perspectives on the government-driven entrepreneurial ecosystem (Jung et al., 2017). Therefore, it was urged to create an open government ecosystem (Harrison et al., 2012).

Additionally, Study 3 findings show a tendency for associations to facilitate the policy-driven FDI. Researchers stated the necessity to discover the intermediary function of associations, particularly in the absence of a lead firm, in order to assemble professionals and host events (Kozlowski et al., 2018; Rantisi, 2014). Typically,

associations organize events such as fashion week, trade shows, workshops, and study trips. The pipeline was an additional request for associations as intermediaries to enhance FDI through knowledge collaboration (C. Y. Lin, 2018). The Syndicate Chamber of Parisian Couture entrenched Paris as the global center of haute couture (Wenting, 2008). Similarity included the formation of a fashion system with the emergence of trade associations to connect fashion magazines with local designers and to promote style innovators (Rantisi, 2002). The first fashion week in India held by an association demonstrated that India is one part of the global fashion system (Khaire & Hall, 2016). Both designer associations and trade associations contributed to the transition from Haute Couture to the high street on a worldwide scale (Majima, 2008). It should be noticed how various associations established color trends (Cassidy, 2019). Much research has highlighted the positive efforts of associations on sustainable fashion, including national and local industrial associations, professional associations (PA), and NGOs (Bukhari et al., 2018; Wahga et al., 2018). The innovation of traditional crafts such as batik and mud dye, was modified by SME professional associations (Kurniati et al., 2019; Linton, 2020).

Policies can be implemented through collaboration with associations (Padovani & Whittaker, 2015; Smith & Finn, 2015; Vale & Caldeira, 2007). Associations helped the government in selecting firms that will present the nation abroad after receiving a

governmental award (Damoah, 2018). As the coin has two sides, the middleman raised opposing voices for the industry against licenses issued by the government (Paras et al., 2019).

The findings respond to the research question that FDI can be supported by the government. Proposition 4 is justified as "the government positively drives FDI, either directly or indirectly through associations as intermediaries".

6.3 Model and Performance of Fashion Design Innovation Ecosystem (FDIE)

According to the interview data analysis, interviewees credit FDIE's performance. The policy-driven FDI is further applied to exemplify and validate the FDIE model.

6.3.1 Performance of Fashion Design Innovation Ecosystem (FDIE)

Diversity and balance, dynamic and openness, as well as reciprocity and coevolution are coded based on the collected interview data, which indicates FDIE performances.

6.3.1.1 Diversity and Structure

SHIKANG ZHOU emphasized the diversity of FDIE by using the Chinese idiom "*A hundred flowers bloom and a hundred schools of thought dispute*". YANG LIU stated

that FDIE functioned well with the cooperation of individuals, society, government, academics, and entrepreneurs. SHIKANG ZHOU identified that the essence of diversity was the value of appealing entities to survive and develop. INTERVIEWEE I1 reported that components of the complete ecological chain, encompassing "*the entire supplier system from design to textile, the market-end system, and the government system such as policy formulation*", constituted FDIE. FUJUN FAN highlighted the inherent characteristics of FDIE which involved diverse values, organizational cultures, and goals. INTERVIEWEE L3 used LVMH, Richemont, and Swatch as examples of businesses that absorbed all kinds of talents, technologies, and materials. Several interviewees stressed interdisciplinary stakeholders. For instance, the HAIYAN WU mentioned that bio-scientists contributed to the material innovation of FDI. INTERVIEWEE D4, a physicist, dealt with the technology dimension of FDI using her scientific expertise. ZHIDONG XU stated the joint design with embroiders and artists.

Since FDIE encompasses a variety of stakeholders, interviewees hold two contradictory views on structure: flat and hierarchical. According to INTERVIEWEE I5, the chain owner policy gathered multiple stakeholders connected to the industrial chain: small and micro enterprises comprised the majority of those with annual revenues of less than 5 million RMB, whereas chain owners were enterprises above the designated size. One focal firm was surrounded by several small and micro businesses in a flat structure.

INTERVIEWEE I1 stated that it was challenging to achieve an absolute head monopoly in the fashion industry because the current information development could be integrated from the production end to the sales. Decision-making during the integration process was decentralized, and FDIE flattening was inevitable. He said "*without decentralization, it will be impossible to operate on such a large scale*". YANLIN CHEN and INTERVIEWEE I1 acknowledged that the fashion sector adopted the flat structure.

However, the opposite opinion is that FDIE may have a hierarchical structure, which would be detrimental to FDI. For instance, INTERVIEWEE L3 elaborated on the topics of potential FDIE drawbacks by saying "*The value matrix can completely direct the market, but there is also the risk of forming a monopoly that may and will hasten the death of fashion within FDIE*". She argued decentralization was a broad notion that might be globalized, but it was still very challenging to decentralize in a certain field. It was difficult to discuss added value without a benchmark for decentralization. She cited Shenzhen Fashion Week as an instance of flatness without leading function.

YANLIN CHEN argued that "*the combination of the big ecology and the small ecology has spawned the entire FDI ecology in China*", regardless of whether Ellassay[4] built a small ecology from its own business perspective or the government founded a fashion research institute to form an innovative ecology. In general, no matter if the structure

is flat or hierarchical, interviewees attribute that diversity, a vital characteristic of FDIE, supports FDI.

6.3.1.2 Dynamic and Openness

Interviewees discussed FDIE dynamic specific to fashion phenomenon and trend leadership. The generation, development, and demise of businesses and brands result in FDIE's stakeholder dynamic. Along with the uncertain environment, activities such as government sponsorship, entrepreneurship, as well as value creation like R&D and customer satisfaction change. Any individual, entity, or activity could be added to FDIE in order to maintain the dynamic, which reflects boundaryless.

YANG LIU stated that the FDIE was still in its infancy and was developing steadily. FUJUN FAN drew attention to the dynamical characteristic of FDIE, which "*alternately affect each other"* and *"primary and secondary appear alternately*". "*The only constant is change*", he addressed, referring to the fact that on a certain occasion, a certain ecology might take center stage, while on another occasion, certain changes occurred since it might be unnecessary for the position or functionality.

Fashion itself was a dynamic phenomenon, according to HAIYAN WU, hence it would force FDIE to consistently provide newness and originality. She also noted that a fashion designer may design exclusively for and serve other entities at the beginning

phase, or may design for a first-class brand before gradually developing their own first-class brand. INTERVIEWEE I1 stated that FDI changed or evolved with the times, so both active and passive changes occurred.

According to INTERVIEWEE L3, the focal firm could only occupy some leading positions more quickly; it was not possible to achieve complete trend leadership. She further contended that FDIE in China was poorly constructed, lacked a solid foundation, and was incapable of playing a leading role in the fashion sector. A leading position should be multidimensional, with individuals and entities consciously preserving FDIE in each dimension.

Both INTERVIEWEE O1 and SHIKANG ZHOU concurred that all large businesses began as small ones. INTERVIEWEE O2 stated that "*a large number of innovative enterprises are SMEs and micro enterprises... Large enterprises are all developed from small, medium, and micro enterprises*." SHIKANG ZHOU stated that "*in terms of strategic development, small businesses will grow into medium and large enterprises. Therefore, SMEs cannot be completely separated from large enterprises. They are ever changing. However, the overall ratio may just be one percent or one thousandth*."

SHIKANG ZHOU believed that activities in FDIE were contingent on the stage of social development. YANLIN CHEN had a relatively manipulating opinion that the

FDIE might grow violently at the beginning, necessitating management and control at a certain time to support more standardized and institutionalized operations. INTERVIEWEE I5 discussed that, regarding policy change within FDIE, prior to 2021, even if the investment was between hundreds of thousands and two million RMB, SMEs in Shenzhen were eligible to apply for one category of government funding. Then, it was raised to 300 million RMB, representing an even larger impediment. This caused over 100 firms to leave out of 10,000 firms.

According to INTERVIEWEE I2, FDI might have consisted of aimless behavior in the early stage that took a long time to develop. As FDIE evolved into a somewhat successful system, it became possible to incubate a brand. Entrepreneurship might benefit from more comprehensive, long-term, and systematic government backing. Nevertheless, in the beginning, there was essentially no such depth, and at best it provided a few gathering spots.

According to YAOHUA DONG, nowadays, the combination of fashion innovation and high technology is extremely powerful. Previously, it might not have been able to display fashion in a way that both visually and aurally engaging. The possibilities of FDI should be explored with this change, "*because in the offline real world, FDI must be constrained by materials, but in the Metaverse, there are no limitations, and designers can think freely*".

Since the epidemic, style and marketing innovation have exploded, as noted by HAIYAN WU and INTERVIEWEE I1. The emergence of the online scene severely undermined the offline consumption scene. There were numerous distinct consumer groups, such as the ethnic group and the subcultural group, whose complex and multi-level requirements must be considered. Consequently, experiencing the real scene and real needs were the toughest challenge.

HAIYAN WU explained openness by saying that "*numerous new brands are registered every day, and numerous old brands disappear, which is similar to the ecology as they generated and were extinct naturally*". Because the future would be increasingly diverse and distinct, INTERVIEWEE I1 predicted that the user's perspective should serve as the starting point, rather than designers thinking about what others need. With regard to the target of FDI, INTERVIEWEE D4, and HAIYAN WU suggested that scientists should be involved in material FDI, whereas ZHIDONG XU suggested that artists and artisans should be included in the joint design of open FDI.

6.3.1.3 Reciprocity and Coevolution

Regarding corporations between businesses, designers, academics, government, startups, and associations, it can be characterized as reciprocity based on the majority of interviews. SHIKANG ZHOU stressed that "*a system of mutual support, promotion,*

and achievement is not intended to undermine and conflict with each other". According to YANG LIU and INTERVIEWEE I5, multiple stakeholders gained benefits from the chain owner economy elaborated in the preceding session. The chain owner economy was established based on the reciprocity principle with the intention to benefit small and microenterprises associated with the industrial chain whose focal firm was a large business. Small and micro firms belonged to the chain owner in terms of output value, but the tax was based on the size of the enterprise. Then, as a result of the increased output, the chain owner would receive rewards, which would be distributed to those small and micro enterprises. It is comparable to multiple policies because it provides both incentives and tax reductions. This is a typical a case of a win-win mechanism designed by the government in FDIE. Regarding the commercial process, reciprocal gains such as sale commissions arise from big companies purchasing a startup's design and prototype. Big companies might provide startups with inspiration, concepts, and development from their archives.

YANG LIU mentioned that decades ago, the relationship between fashion designers and businesses, famous fashion designers partnered with businesses merely for the small advertising impact generated by several fashion shows. INTERVIEWEE I5 noted that two advantages for high-level talents to settle in big business included applying for the Master Workshop from the government and winning honors and competitions with

big business endorsement. Data was shared between doctoral workstations in the incubator and her company. These cases exemplify how large companies collaborated with individuals, original designers, and studios to achieve a win-win situation.

INTERVIEWEE I5 argued that startups were encouraged to join associations in order to gain access to more resources and that associations were endorsed by large companies. She continued by explaining that there were reciprocal considerations because associations were responsible for some government projects.

The links between industry and academia are mutually beneficial. For instance, JIGUO QIANG stated that he had been invited to deliver a speech at a university due to his considerable professional experience. Internships and collaborative research, according to INTERVIEWEE I5, helped businesses, colleges, and students reach their respective goals.

Regarding the other sectors, YANG LIU indicated that Guangzhou Panyu was a vital center for the global jewelry industry; the government was also looking for interaction between jewelry and fashion for mutual benefit.

INTERVIEWEE L3 emphasized the organic nature of FDIE, comparing it to the coevolution of stakeholders and their relationships within an ecological process. YANG LIU claimed that FDIE functioned well with the coevolution of stakeholders, including

individuals, society, government, academics, and entrepreneurs. INTERVIEWEE I1 argued that because FDI changed or evolved over time, FDIE as a collection of powerful social forces was also coevolving along with FDI. HAIYAN WU stated that "*the brand and fashion designers coevolve in terms of design, innovation, and long-term development*". Examples included YANLIN CHEN's case of Ying'er and its annual competition winners and INTERVIEWEE A5's case of Shanshan Group[5] and prominent fashion designers and fresh blood. INTERVIEWEE D4 asserted that those who invented and manufactured tools and those who had brands and fashion would mutually evolve if brands and clothing manufacturers could be educated to update old factories with new machinery.

Overall, on the basis of interviews, the performance of FDIE can be concluded as diverse, open, boundaryless, reciprocal, and coevolving. Thus, a model can be generated to illuminate FDIE.

6.3.2 Fashion Design Innovation Ecosystem (FDIE) Model

6.3.2.1 Fashion Design Innovation Ecosystem (FDIE) Model

Based on the Study3 result, the FDIE model is designed. From a focal firm's structural perspective, components of the ecosystem comprise activities, stakeholders, positions, and links (Adner, 2017). A pie model concentrated on the value proposition of the

innovation ecosystem by connecting resources and activities, but it omitted stakeholders and might be confusing to who could offer support and should be approached (Talmar et al., 2020). A design-driven innovation ecosystem model consisted of stakeholders from the supply and demand standpoint, however, it did not involve resources and activities that were critical in the ecosystem lens (Whicher, 2017). Hence, a four-layer concentric circle is created to incorporate three key components: stakeholders at the outermost layer, activities at the middle layer, and resources at the innermost layer, with FDIE at the center, as shown in Figure 6.1.

The stakeholder layer reflects the integration of individuals, stakeholders in the supply chain, such as firms, suppliers, sellers, and customers, stakeholders that provide services and complementary functions, such as investors, incubators, parks, digital service providers, logistics, and third parties, and stakeholders reflecting the "Quadruple Helix", such as the government, associations, universities, and media (Carayannis & Campbell, 2009). The middle layer encompasses activities that can facilitate FDI conducted by various stakeholders, including those specific to the fashion sector, such as show and fair; those productive and generic in most industries, such as competition and award, as well as R&D and value creation; those service-related, such as IP protection, digitalization, investment, and entrepreneurship; and those reflecting social characteristics, such as education and sustainability.

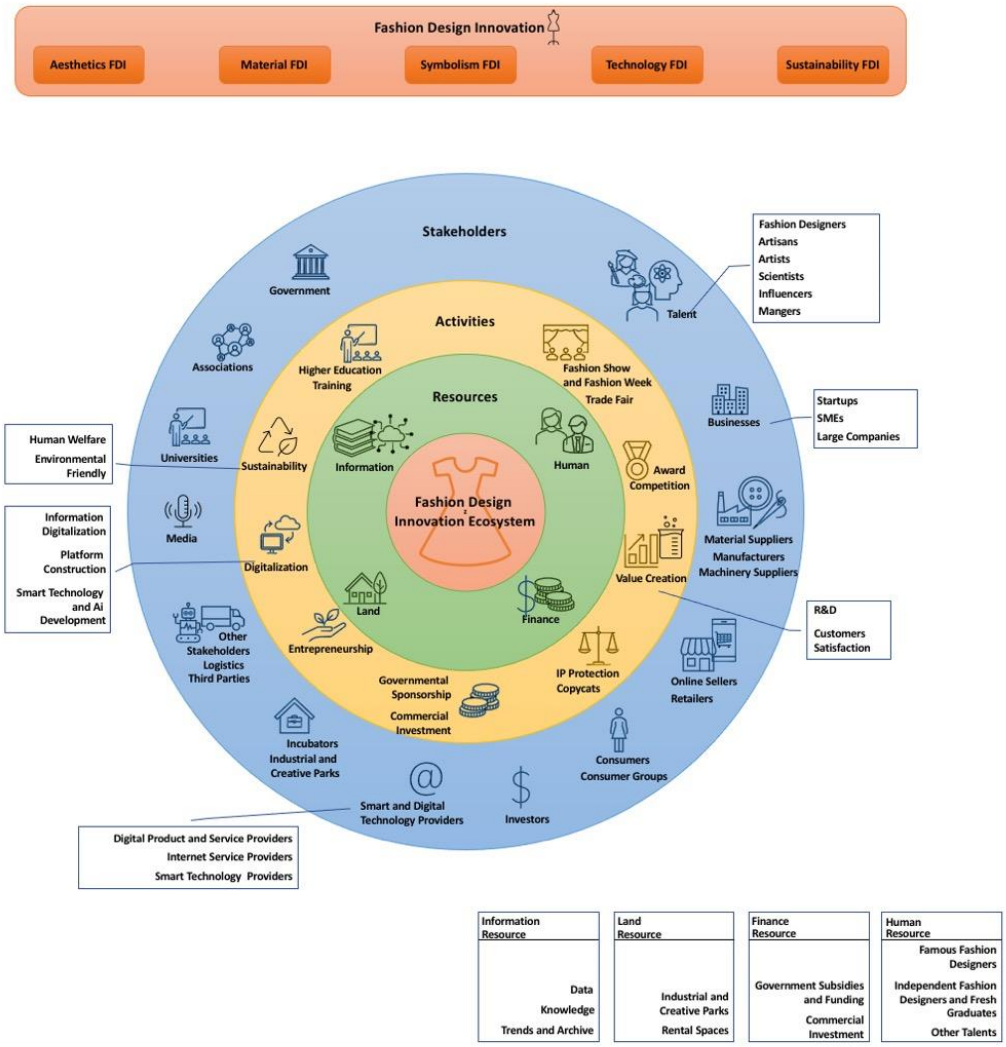


Figure 6.1 Fashion Design Innovation Ecosystem (FDIE) Model

The resource layer covers the general inputs and demands for FDI, including money, human, land, and information. The top of the circle was added FDI to illuminate the output of FDIE. Each layer can be expanded with additional categories with an awareness of limitless boundaries and openness. The logic of the FDIE model is displayed in Figure 6.2.

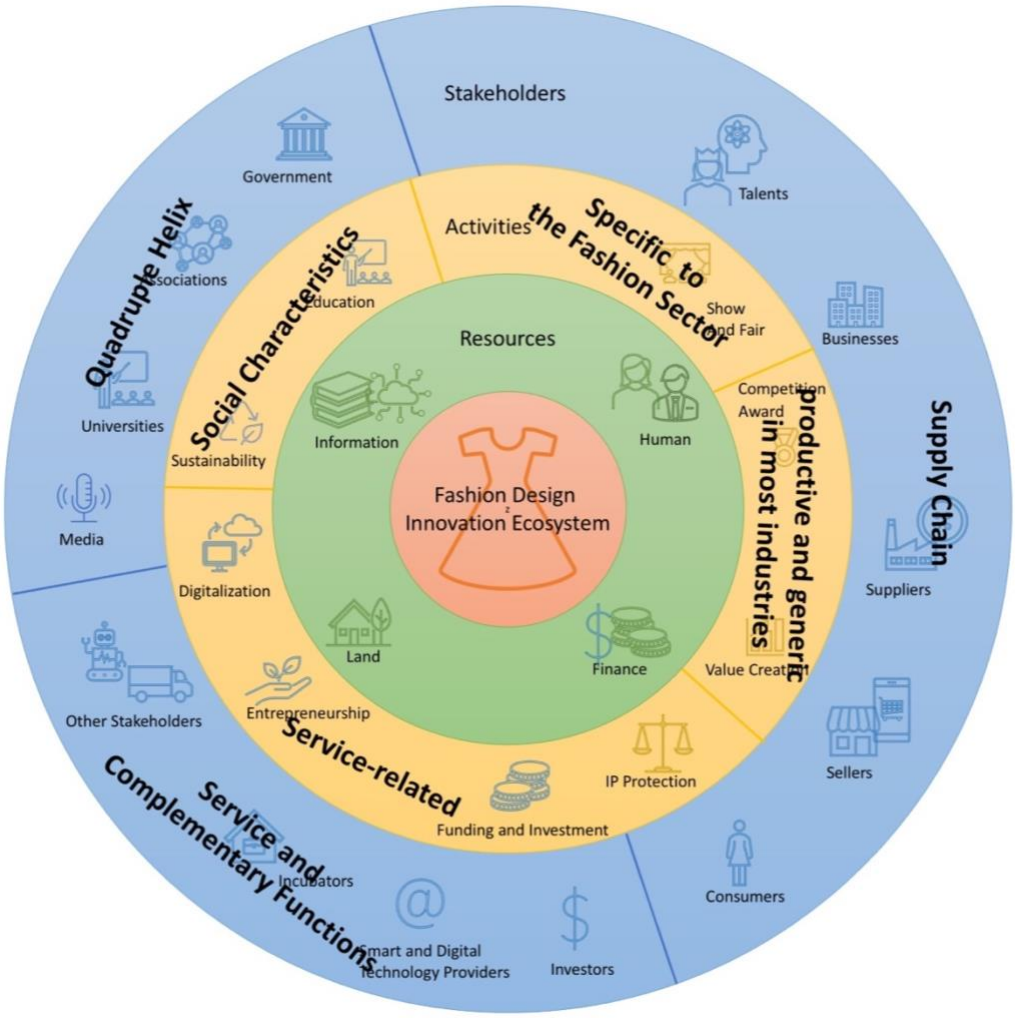


Figure 6.2 The component placement of the FDIE model

6.3.2.2 Application of Fashion Design Innovation Ecosystem (FDIE) Model

Based on the aforementioned findings, the tremendous possibility of interaction between components across different FDIE layers is capable of paving the way for FDI. The starting points can be stakeholders, activities, or resources, depending on the requirements and availability. The potentiality of relationships embodies the notion of

ecology's variety, flexibility, and win-win coevolution. Arrows can be used to direct the connection between various components and their respective types, which ultimately results in FDI and expresses FDI application. Thus, FDIE paths are mapped through the reciprocity and coevolution of stakeholders, engagement in a variety of activities, and the accessibility of four general and essential resources. The target of FDI will be attained by the evolution of FDIE with boundless boundaries.

For instance, Figure 6.3 depicts the combination of talent, businesses, associations, and government at the stakeholder layer, prize and award and investment at the activity layer, and finance and human capital at the resource layer, which produce FDI outputs in FDIE. This can be explained by the fact that fashion designers and fresh graduates can achieve government-supported financial resources by winning competitions and that their winning design works output FDI.

Depending on the dynamic and openness of FDIE, more stakeholders can participate in the activity, as Figure 6.4 shows. Thus, other activities will be added to achieve more resources. Arrow 10 signifies that the company funds the competition. Arrow 11 implies the association contacts universities to seek more participants from students.

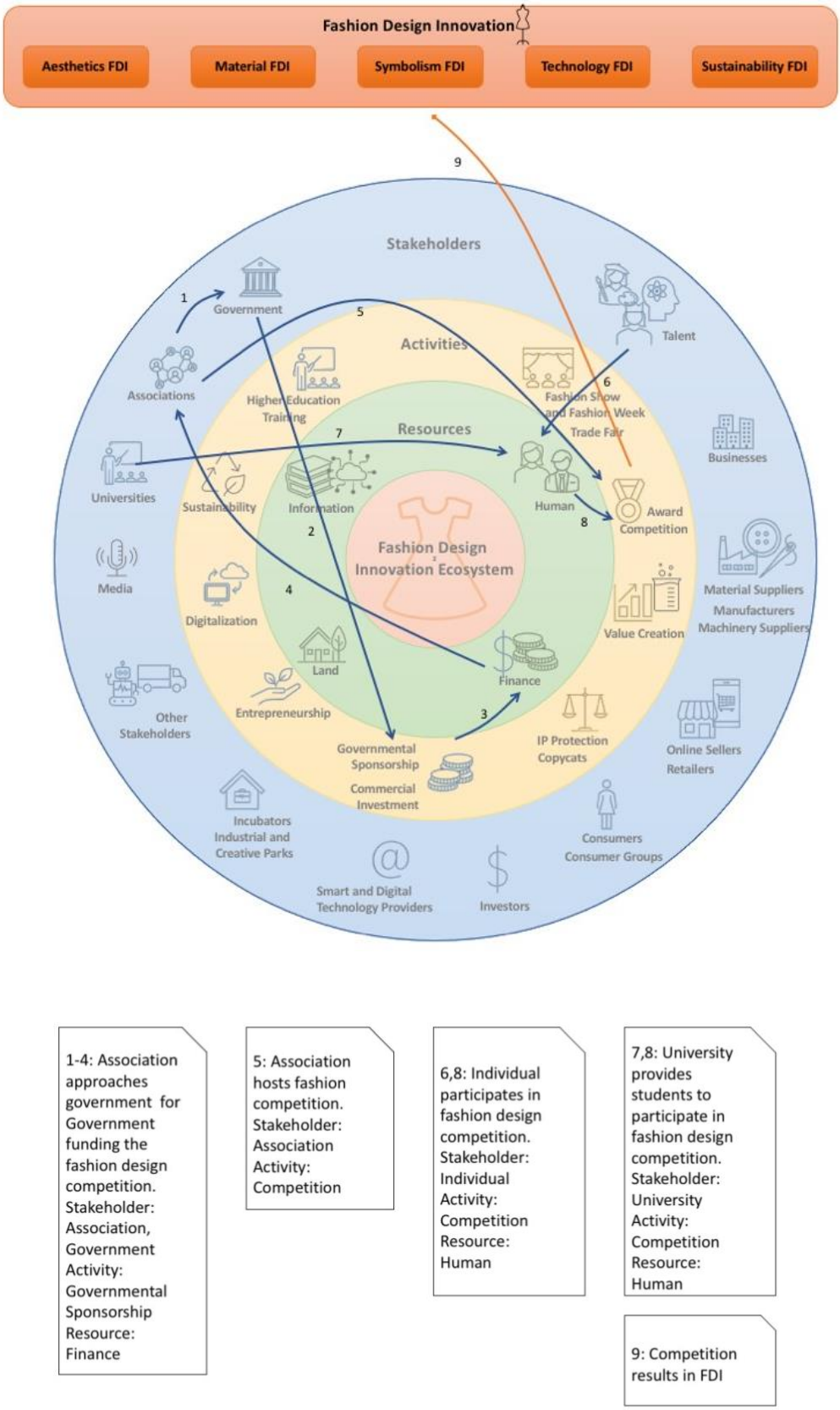


Figure 6.3 A government-sponsored fashion design competition

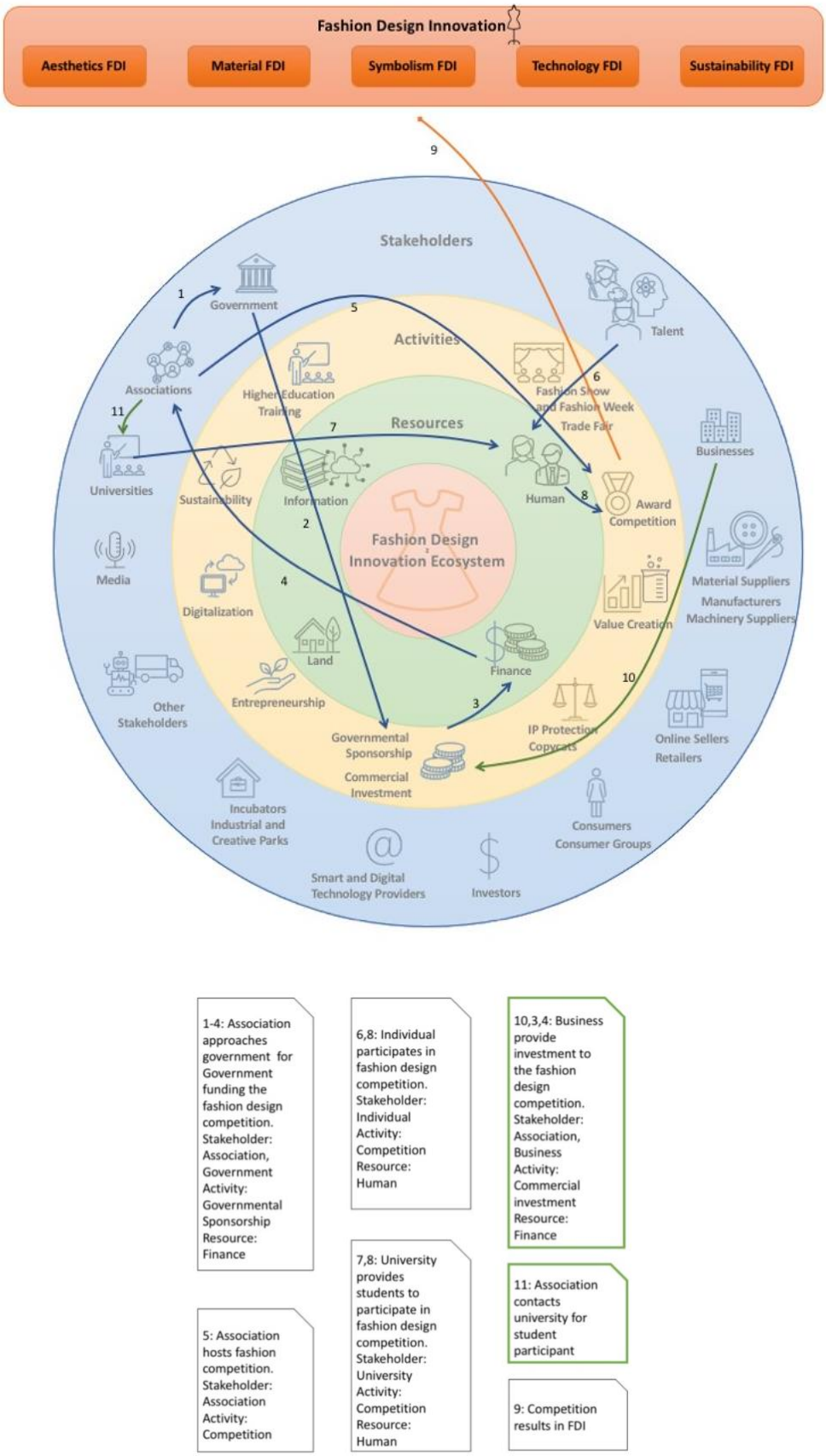


Figure 6.4 Expansion of the government-sponsored fashion design competition

As the outcome of the fashion design competition, FDI can be leveraged as an entrepreneurial resource. Figure 6.5 displays one potential application of the aesthetics FDI in FDIE, in which the stakeholders provide resources through entrepreneurial activity. It combines talents, businesses, and creative parks at the stakeholder level, commercial investment and entrepreneurship at the activity level, and human, finance, and land at the resource level.

Regarding entrepreneurship education in universities, it can be referred to one research article that utilizes the BIF teaching approach to generate a roadmap (Zeng, 2020). BIF is an acronym for "*Business+Internet+Fashion*", which "integrates business, computer technology/internet, and fashion design across disciplines, and implements fashion product development and commercial operation." Its map in FDIE is presented in Figure 6.6. Based on the result of the publication, the integration of stakeholders, activities, and resources fosters three dimensions of FDI: aesthetics FDI (via form, color and pattern, style, and surface design), symbolism FDI (via the embodiment of Shui Minority), and technology FDI (via laser cutting, digital embroidery, and digital printing technology). A double-headed arrow 2 connecting higher education and entrepreneurship demonstrates the FDIE reciprocity between universities and startups.

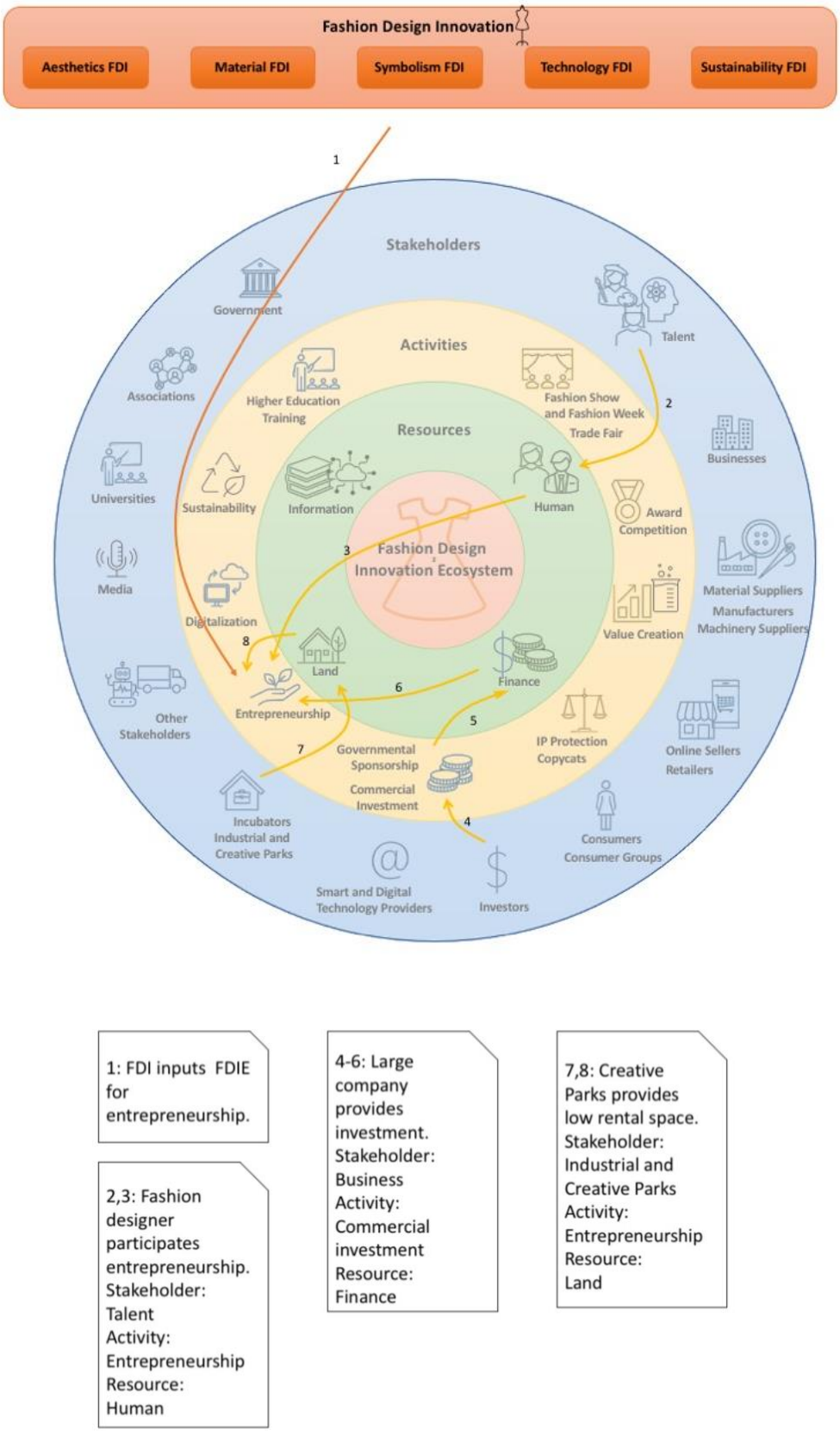
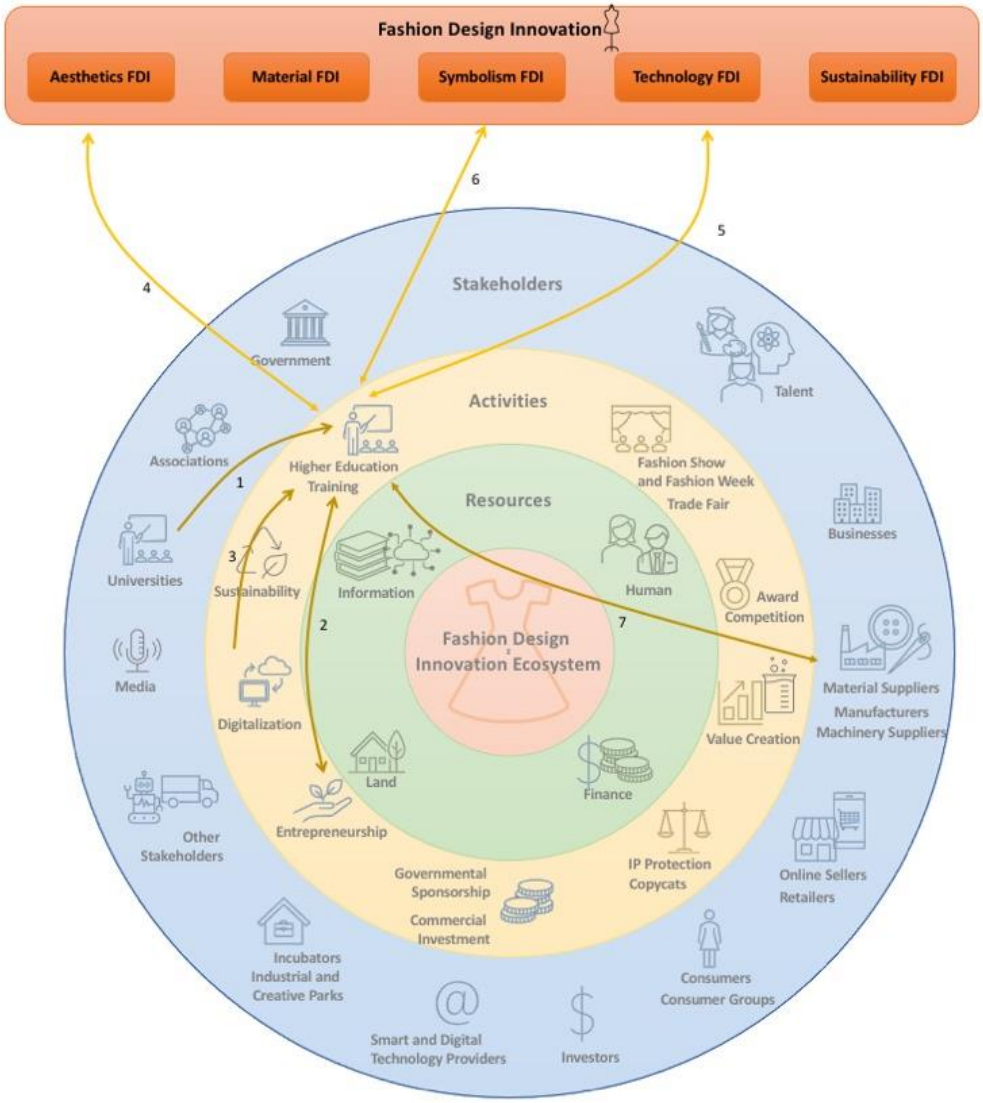


Figure 6.5 Entrepreneurship in FDIE Model



1: Fashion Entrepreneurship Education.

4-6: The program generates FDI that can be used for prototypes.

7: Students place orders with manufacturers, and manufacturers produce student's FDI prototypes. Stakeholders: Material suppliers, manufacturers

2,3: Activities are included in entrepreneurship education. Activity: Entrepreneurship, Digitalization

Figure 6.6 FDI entrepreneurship education

In general, as SHIKANG ZHOU's statement that "*FDIE is fairly good*", the performance of FDIE is approved by the interviewees.

6.3.3 Model and Performance of Policy-driven Fashion Design Innovation (FDI)

Using the FDIE model, it is possible to map a policy-driven FDI model as previously discussed. As shown in Figure 6.7, the route must still be revealed via comprehensive understanding. The government issues various policies that directly distribute resources to stakeholders, that support activities indirectly allocate resources to stakeholders, and that stakeholders might leverage to engage in activities to acquire resources. Consequently, the ultimate outcome of FDI is generated by stakeholders using resources dispersed through policies or activities supported by policies. Therefore, the arrows between stakeholder, activity, and resource can be incorporated flexibly and flow in any direction. Moreover, associations serve as a bridge and semi-official stakeholder between the government and individuals and businesses, despite the fact that individuals and businesses can directly connect to the government.

Based on interview data, the model performance is proven. Despite the fact that government assistance had long been addressed, INTERVIEWEE I2 believed that "*a path could exemplify how to implement it more effectively*". This depends on the priority

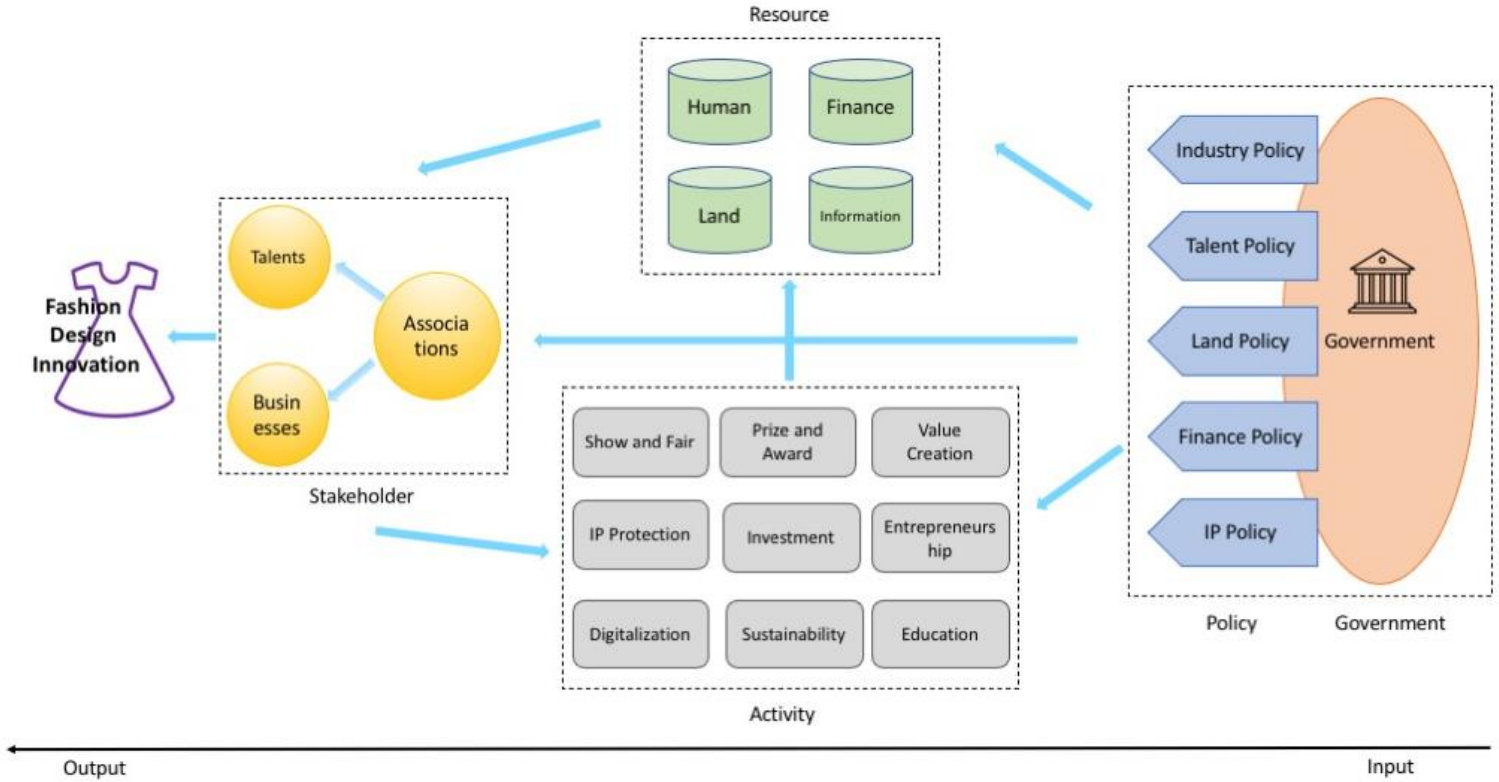


Figure 6.7 Policy-driven FDI model

the government places on this issue, such as its investment in human and material resources, and on whether this issue aligns with the enterprise's goals or actual demands. When the match is strong, so too is the enterprise's enthusiasm.

YANLIN CHEN stated that the government could introduce policies and the collaborative innovation mechanism to stakeholders in order to improve policy comprehension. INTERVIEWEE I2 noted that occasionally, the execution mechanism was not totally transparent. The company must spend time to pay close attention; otherwise, it might be unaware that the policy would be beneficial and might not completely understand what must be done and how to meet the requirements. SHIKANG ZHOU criticized the government for not taking more initiative to publicize policies, especially to artists and professional workers who may be unfamiliar with policies. Additionally, he also urged the government to issue policies beforehand and expedite the subsidy.

SHIKANG ZHOU suggested that the government provided an ecological environment, such as protection, with certain maintenance and fertilizers. Additionally, INTERVIEWEE I2 and INTERVIEWEE I3 requested that the government might build a platform for connection, such as cross-border communication between fashion and

high-tech enterprises, which would facilitate the technological empowerment of intelligent manufacturing.

6.4 Chapter Summary

Three studies are integrated to achieve the findings and models. Five propositions based on two research questions are justified as follows: P1: FDI can be evaluated at the product level using factors including aesthetics, material, symbolism, technology, and sustainability; P2: FDIE components consist of stakeholders, activities, and resources; P2.1: FDIE includes stakeholders such as talents, fashion businesses, suppliers, sellers, consumers, investors, incubators, smart and digital technology providers, media, government, associations, universities, and other stakeholders; P3: FDIE is characterized as diversity, dynamic, openness, reciprocity, and coevolution; P4: The government positively drives FDI, either directly or indirectly through associations as intermediaries. After the justification of propositions, a FDIE model is designed to contain three components and their corresponding types. FDIE performance is demonstrated as diversified, dynamic, open, reciprocal, and coevolving. It is also used in several practical situations. Meanwhile, the policy-driven FDI model is designed and exemplified.

Chapter 7

Conclusions and Suggestions for Future Research

7.1 Chapter Introduction

In this chapter, the research questions, propositions, research design, and the results are briefly reviewed. An advanced theoretical framework is regenerated. The theoretical contributions and practical implications for policymakers and practitioners are elaborated. Following the discussion on limitations, the research agenda is presented.

7.2 Conclusions

Compared to mature topics on technology innovation and innovation ecosystem, this research raises two research questions in the realm of fashion design: “What Fashion Design Innovation (FDI) is?” and “How to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?”. In Chapter 2, five propositions are generated based on four disciplines of literature: design innovation, fashion design, innovation ecosystem, and policy-driven innovation in order to investigate two research questions. The

following three chapters respectively elaborate on three separate studies in response to these questions and propositions, as shown in Table 7.1.

Using the software VOSviewer and CitnetExplorer, as well as the manual grouping method, the researcher conducts a literature review in Study 1 on the fashion research that has claimed to be innovative or produce innovation. The results present two clusters and three main paths, which are mainly involved in the sustainability and design domains. In addition, seven categories of FDI based on unclustered academic papers are manually finalized. Further investigation of the categories in Study 2 continues by merging previous studies on the evaluation of design innovation and product design to solidify the categories' dimensions and items for measurement. A questionnaire is developed and verified through four sub-studies: expert review, focus group survey, semi-structured interview, and large-scale survey. Finally, eighteen items in five dimensions are identified via statistical analysis. These two studies address one research question "What Fashion Design Innovation (FDI) is?".

Study 3 continues to explore how to stimulate FDI from the structural perspective of the innovation ecosystem. Utilizing the interview method, the components of FDIE, including stakeholders, activities, and resources, are captured and incorporated into FDIE to foster FDI. Each component comprises diverse categories and is arranged into a circle model. Examples, such as competition, entrepreneurship, and education, are

employed to test the application of the model. Meanwhile, from the viewpoint of the driving force, the policy-driven FDI, as one FDIE pathway involving a key stakeholder, the government, is also investigated by using interview methods; policies are identified as moderators; associations mediate the government and the industry. As a result, the FDIE model and the policy-driven FDI model are designed. In addition to interview outcomes such as diversity, dynamic, openness, reciprocity, and coevolution, exemplary route mapping verifies FDIE performance. In the meantime, the policy-driven FDI is validated. Overall, the comprehensive and holistic study elucidates FDIE at both micro and macro levels, as well as at both systematic and example levels.

An advanced theoretical framework is regenerated based on the initial theoretical framework and the discussion and conclusion of all three studies. Comprehensive categories of each component and the relationships are delineated, as shown in Figure 7.1.

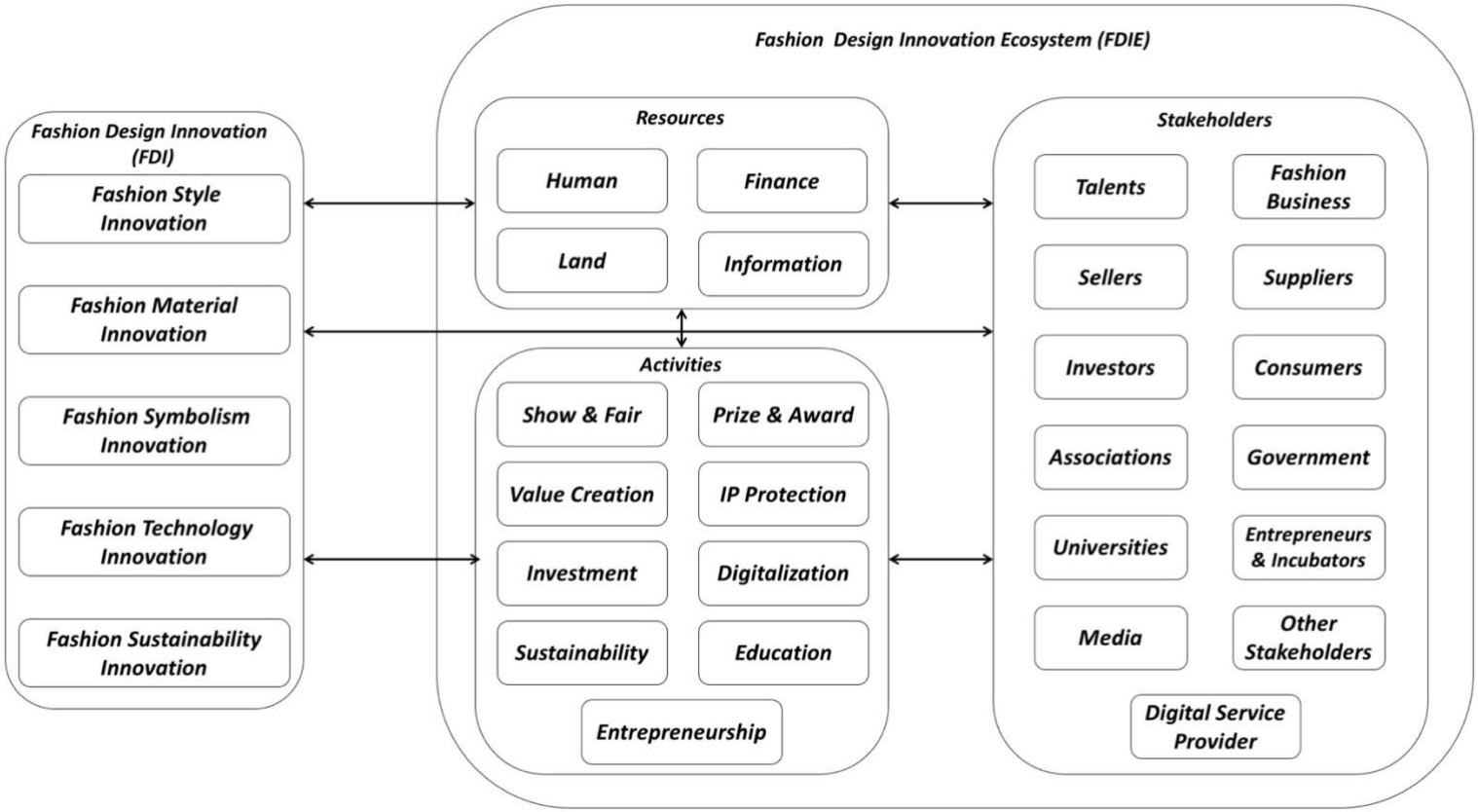


Figure 7.1 Advanced theoretical framework of FDIE & FDI

Table 7.1 Research questions and propositions with three studies

<table>
<tr><td>RQs</td><td colspan="2">What Fashion Design Innovation (FDI) is?</td><td>How to facilitate Fashion Design Innovation (FDI) through an ecosystem lens?</td><td>Justified Proposition</td></tr>
<tr><td>Study</td><td>Study 1

FDI Literature Review</td><td>Study 2

The Measurement of FDI</td><td>Study 3

FDIE</td><td></td></tr>
<tr><td>Methods</td><td>Literature review, content analysis</td><td>Expert review, semi-structured interview, focus group survey, large group survey</td><td>Semi-structured interview</td><td></td></tr>
<tr><td rowspan="2">Proposition</td><td colspan="2" rowspan="2">P1: FDI can be evaluated at the product level using factors including style, color, material, function, technology, and meaning.</td><td></td><td>P1: FDI can be evaluated at the product level using factors including aesthetics, material, symbolism, technology, and sustainability.</td></tr>
<tr><td>P2: Components of FDIE consist of stakeholders, activities, and resources.</td><td>P2: FDIE components consist of stakeholders, activities, and resources.</td></tr>
</table>

		P2.1: FDIE includes stakeholders, such as industrial companies, suppliers, users, the government, and universities.	P2.1: FDIE includes stakeholders, such as talents, fashion businesses, suppliers, sellers, consumers, investors, incubators, smart and digital technology providers, media, government, associations, universities, and other stakeholders.
		P3: FDIE is diverse, interactive, and expansion-capable.	P3: FDIE is characterized as diversity, dynamic, openness, reciprocity, and coevolution.
		P4: The government positively drives FDI.	P4: The government positively drives FDI, either directly or indirectly through associations as intermediaries.

7.3 Research Implications

This research is the first study to investigate and coin Fashion Design Innovation (FDI), to design the measurement of FDI, and to establish and conceptualize the Fashion Design Innovation Ecosystem (FDIE).

7.3.1 Theoretical Implication

The highly exploratory research fills a research gap on how to foster innovation in the fashion sector through an innovation ecosystem lens. It expands the high-tech setting of the innovation ecosystem to a low-tech one by first introducing an innovation ecosystem in the fashion sector. The research treats the innovation ecosystem as a container for both stakeholder theory and resource-based theory. Both stakeholder theory and resource-based theory have undergone divergent evolutions over the decades. Stakeholder theory has grown to be related to norms, sustainability, human, and cooperation. The resource-based theory concerns competitive advantage. The theoretical foundation of the research on FDIE is illuminated by debates on two theories that mutually informed each other (Barney et al., 2021; Freeman et al., 2021).

The study contributes to studies on innovation management and strategic management in the fashion field. It gives a holistic map of innovation development in the fashion domain after a comprehensive investigation of literature claiming to be innovative.

Moreover, it helps to categorize and evaluate FDI which few scholars are concerned about. Therefore, this research has theoretical significance in the realms of strategy, innovation, and fashion. In addition, it crystallizes the concepts of FDI and FDIE and provides a conceptual framework and a model for future exploitative research into a variety of domains.

7.3.2 Practical Implication

The FDIE is constructed based on experienced professionals' insights and is testified by mapping FDI routes in the real world. Hence, it is unquestionable for its practical value. In a turbulent world with pandemics and wars that have broken out, both companies and the government must have a more comprehensive and systematic strategic view, not only for planning but also for execution and control. This research provides insight for managers to identify special stakeholders, their relationships, and pertinent issues, and guidance on how to deal with the formulation and monitoring strategies for specific stakeholders to achieve FDI. For example, as it is described in the policy-driven FDI, the company may take advantage of various policies and access various resources provided by governments.

Moreover, it informs policymakers and practitioners that, due to the openness and boundlessness of FDIE. It is anticipated that new stakeholders, activities, and resources

will be included whenever and wherever possible in an effort to explore the potential for value creation and value propositions within FDIE. Their interactions change because of FDIE's dynamic for leveraging diverse integrations amongst multiple components. All joint stakeholders win-win and coevolve through participating in various activities.

The FDIE model also contributes to the explicit articulation of the FDI route, interactions, stakeholders, and resources. It is possible to map the potential inclusion and deletion of components in advance in order to determine the practicability. Know-how of FDIE can be easily acquired by practitioners.

The research also suggests that the policy-driven FDI path can be considered by policymakers to design and issue pertinent policies and by practitioners to seek out appropriate policies and obtain resources. Associations may take on semi-institutional and intermediary responsibility between individuals, businesses, and the government.

7.4 Research Limitations

Threats to the generalizability of findings are posed by the sampling strategy. It should be noted that geographic location influences the ecosystem, for example, local resources vary largely (Rantisi, 2002; Rieple et al., 2015; Smith & Finn, 2015). Due to

time and financial constraints, the majority of samples have been restricted in China, mainly in Shenzhen City. Only one of the twenty interviewees works outside of China. Only ten percent of survey participants reside overseas. The conclusion could be contested in different contexts, such as Europe, other countries, and even other regions in China.

FDIE, its model, and the policy-driven FDI have not been thoroughly testified by employing methodologies such as case studies or fieldwork, which may be detrimental to the credibility (Byrne, 2001). Validity is ensured by the performance generated from interviews and applications of roughly mapping routes. However, it is necessary to examine models and theories in the context of real-world practices so that a comprehensive understanding reflects and improves the models' and the theories' merits and drawbacks.

The accordance between FDI and FDIE is challenging. The dimensions of FDI are discovered by a survey based on a review of the literature; however, they are not directly and exactly linked to the components of FDIE identified by the interview data analysis. Because the matching mechanism is presumed to be a separate research issue, it restricts the research findings of FDIE. For example, regarding style and technology dimensions of FDI respectively, stakeholders and activities would vary substantially, necessitating a similar research design and investigation in FDIE.

The research aims to construct an innovation ecosystem and focuses on the industry level as opposed to the firm level; furthermore, no interviewees mentioned competitors, so competitors are not included in the stakeholder component. However, a healthy ecosystem requires proper orchestration, including the position of the focal firms, competitors, substitutes, and complementary stakeholders (Valkokari et al., 2017).

7.5 Suggestions for Future Research

7.5.1 Methodological Improvement

7.5.1.1 Sampling

Regarding the limitation on generalization, the sample locations should be expanded to a global context. It contributes to comparative research on FDIE in various places and cultures, which might be at different stages of the development of the fashion design industry. Coveted cross-nation samples could be based on the top five fashion weeks in the world, namely Paris, Milan, London, New York, and Tokyo. As a commercial authority on fashion trends, WGSN expands its runway collection to Shanghai and Korea, both of which should be involved in the presentation of FDI and FDIE. If research resources support additional sampling, Brazil in South America, some countries in the EU, the Middle East, and Asia can be considered. These areas show

excellent FDIE representativeness for regions that desire to develop the fashion design sector.

7.5.1.2 Empirical Research

Given that the research implies “how” questions on FDI promotion via FDIE, the research is temporal rather than historical, and the researcher has no control over the phenomena, the case study method will be employed as a common approach of empirical research to demonstrate FDIE, FDI, and their models (Yin, 2018). In order to solidify and enrich the foundation of FDIE, the case selection criteria should be either crucial, extreme or unusual, prevalent, illuminating, or longitudinal. Greater validity may be achieved by using multiple case studies, as opposed to a single study. Comparability is an additional advantage of the multiple-case design.

7.5.2 Contextualization of FDIE

Regarding the generalization, the findings should be examined in a specific region, such as the Greater Bay Area (GBA) in China. FDIE findings may be affected by the geographic, economic, and cultural factors at the macro level, as well as the particular stage of the local fashion sector (Rantisi, 2002). It should be noted that geographic location influences the ecosystem, for example, local resources vary considerably (Rantisi, 2002; Rieple et al., 2015; Smith & Finn, 2015).

7.5.3 FDIE Life Cycle

The research concentrates on a stage of maturity in which stakeholders, activities, and resources are assumed to be relatively stable. However, due to the dynamic feature of FDIE, birth, growth, maturity, and demise are usually based on its ecological metaphor, as are entry, initial licensing, and the most successful output based on a regional market (Moore, 1993; Rong et al., 2015). In order to detect the dynamic and coevolution of stakeholders and their interactions, as well as the alteration of activities and resources, prolonged engagement of the research based on the ecosystem life stages is necessary. The continued participation in the research also contributes to future study on the life cycle of FDIE.

7.5.4 Fashion Innovation Ecosystem (FIE)

The macro-level framework and the models offer the adaptability to accommodate contents and contexts in the fashion sector. FDIE can be modified into a holistic and comprehensive Fashion Innovation Ecosystem (FIE) and specific IE including the Fashion Sustainability Innovation Ecosystem, the Fashion Entrepreneurship Innovation Ecosystem, Fashion Digital Innovation Ecosystem, and the Fashion Technology Innovation Ecosystem (Bertola & Teunissen, 2018; Brydges & Pugh, 2021; Whicher et al., 2018). Stakeholders and activities are subject to revision according to distinct

innovation domains, which would be one of the main streams of future study. Sets of FIE would constitute the FIE as a whole and take advantage of other sectors and disciplines, thus would strengthen the fashion industry.

7.5.5 FDI Scale

The FDI measurement research focuses on the identification of dimensions, rather than the scale development with precise weights for each item and factor because the purpose of the research is to explore FDIE. However, it is essential to conduct more statistical analysis, such as regression, to generate equations that accurately evaluate FDI, preferably with a score. The possibility of the FDI scale will further produce variables for assessing the effectiveness and efficiency of FDI. In this regard, quantitative skills and sufficient sample size are required (DeVellis, 2017). Additionally, other fashion innovation and design innovation measurements can be developed based on this FDI measurement.

7.5.6 Impact of FDIE, FDI, and Policy-driven FDI

The research findings have an effect on the stock market, firm performance, and customer royalties (Aspara, 2009; Lo et al., 2018). The effectiveness of FDI can be measured by financial indicators such as sales growth, profit growth, and return on assets, as well as nonfinancial indicators such as the evolution of innovation and

diffusion of innovation (Arshi et al., 2021). Future research could investigate inferential correlations between FDI and dependent variables, enabling the adjustment of FDI based on the prediction of its performance and informing FDIE stakeholders of the need to modify pertinent actions for better FDI performance.

There are still many opportunities to investigate FDIE in the future, such as the relationship and interactions between stakeholders, the mechanism of accordance between FDI and FDIE, its governance, the mechanism of value creation and value proposition, the utilization of input-output and demand-supply perspectives, and the combination with a cross-disciplinary theoretical foundation such as Actor Network Analysis (ANA).

7.6 Chapter Summary

This chapter first briefly revisits the research by introducing research questions, propositions, research design, and research outcomes. An advanced theoretical framework is proposed based on the initial theoretical framework and the discussion and conclusion of all three studies. Moreover, the theoretical and practical implications offer the significance and contribution of the research for policymakers and practitioners with a comprehensive and holistic perspective of FDIE and the practical

policy-driven FDI path. It finds out that limitations include generality in sampling strategy, credibility caused by the absence of empirical research, and stakeholder position issues. Finally, the research agenda presents the improvement of global sampling, empirical method, and transferability, the development of FDIE in the life cycle paradigm, the development of FDI sets, the impact of FDI and FDIE, and other possibilities.

Appendix 1

Online Questionnaire (The Focus Group Survey)

(source: https://www.wjx.cn/)

服装设计创新

本调查目的是如何衡量和定义时装设计创新。该问卷为匿名进行，所有数据将被保密处理。

根据您的专业经验，请您判断下列因素是否可以评估时装设计创新。

—— 审美 ——

*1. 审美 —— 形式 （比如廓形；衣领、袖子、口袋、门襟、下摆等部件；比例等）

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

*2. 审美 —— 色彩及图案（比如色彩趋势、配色等）

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

*3. 审美 —— 表面肌理及装饰（比如金属涂层、刺绣等）【多选题】

- ☐ 非常不同意
- ☐ 不同意
- ☐ 同意
- ☐ 非常同意
- ☐ 没意见

*4. 审美 —— 风格 (比如1920年代风格、嬉皮风格等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

5. 能否提供衡量服装设计创新的其它美学因素？(不能归类为上述类型)

—— 材料 ——

*6. 材料 —— 原材料 （比如纤维等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*7. 材料 —— 面料（比如新功能面料等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*8. 材料 —— 辅料（比如缝纫线、纽扣等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*9. 能否提供衡量服装设计创新的其它材料因素？（不能归类为上述类型）

—— 性能 ——

*10. 性能 —— 舒适性 (比如说合体性、湿热性能等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*11. 性能 —— 防护性 (比如防水、防火、防紫外线等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*12. 性能 —— 维护性 （比如洗涤、熨烫等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

13. 能否提供衡量服装设计创新的其它功能性因素？(不能归类为上述类型，如耐用性等)

—— 象征意义 ——

*14. 象征意义 —— 个人价值 (比如个人身份、自我认同等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

*15. 象征意义 —— 社会价值 (比如个人社会身份、公众形象等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

16. 能否提供衡量服装设计创新的其它象征性因素？（不能归类为上述类型）

—— 技术 ——

*17. 技术 —— 制造技术 (比如3D人体扫描、CAD、自动化、人工智能等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

18. 技术 —— 整理技术 (比如印花和激光等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

-- 可持续性因素 --

*19. 技术 -- 展示技术 (比如虚拟现实等)

- 非常不同意
- 不同意
- 同意
- 非常同意
- 没意见

*20. 技术 -- 以用户为中心的技术 （比如可穿戴技术、交互技术、传感器技术等)

- 非常不同意
- 不同意
- 同意
- 非常同意
- 没意见

*21. 技术 -- 互联网技术 (比如大数据、移动终端等)

- 非常不同意
- 不同意
- 同意
- 非常同意
- 没意见

22. 能否提供衡量时装设计创新的其它技术因素？(不能归类为上述类型的因素)

*23. 可持续性 --环境 (比如3R(减少、回收、再利用)和循环经济等)

- 非常不同意
- 不同意
- 同意
- 非常同意
- 没意见

*24. 可持续性 -- 人类福祉 (比如老人、小孩、残疾人、弱势群体、社区等)

- 非常不同意
- 不同意
- 同意
- 非常同意
- 没意见

*25. 可持续性 -- 社会（比如社区、物质和非物质遗产等）

- 非常不同意
- 不同意
- 同意
- 非常同意
- 没意见

26. 能否提供衡量时尚设计创新的其它可持续性因素？(不能归类为上述类型的因素)

—— 个人信息 ——

*27. 您所从事的岗位

岗位

*28. 您的从业年限

○ 3年以下	○ 3～10
○ 10～20	○ 20～30
○ 30年以上	

*29. 您的年龄段：

○ 18~25	○ 26~30
○ 31~40	○ 41~50
○ 51~60	○ 60以上

*30. 请选择城市:

提交

Appendix 2

Online Questionnaire (The Large-scale Survey)

(source: https://www.wjx.cn/)

服装设计创新

THE HONG KONG POLYTECHNIC UNIVERSITY 香港理工大學

本学术调查目的是如何衡量和定义时装设计创新。该问卷为匿名进行，所有数据将被保密处理。

根据您的专业经验，请您判断下列因素是否可以评估时装设计创新。

—— 审美 ——

*1. 审美 —— 形式 （比如廓形；衣领、袖子、口袋、门襟、下摆等部件；比例等）

非常不同意
不同意
同意
非常同意
没意见

*2. 审美 —— 色彩及图案（比如色彩趋势、配色等）

非常不同意
不同意
同意
非常同意
没意见

*3. 审美 —— 表面肌理及装饰（比如金属涂层、刺绣等）【最少选择1项】

非常不同意
不同意
同意
非常同意
没意见

*4. 审美 —— 风格 （比如1920年代风格、嬉皮风格等）

非常不同意
不同意
同意
非常同意
没意见

*5. 审美 —— 穿戴方式 (比如内衣外穿等)

非常不同意
不同意
同意
非常同意
没意见

—— 材料 ——

*6. 材料 —— 原材料 （比如纤维等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*7. 材料 —— 面料（比如新功能面料等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*8. 材料 —— 辅料（比如缝纫线、纽扣等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

—— 性能 ——

*9. 性能 —— 舒适性 (比如说合体性、湿热性能等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*10. 性能 —— 防护性 (比如防水、防火、防紫外线等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*11. 性能 —— 维护性 （比如洗涤、熨烫等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

—— 象征意义 ——

*12. 象征意义 —— 个人价值 (比如个人身份、自我认同等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

*13. 象征意义 —— 社会价值 (比如个人社会身份、公众形象等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

—— 技术 ——

*14. 技术 —— 制造技术 (比如3D人体扫描、CAD、自动化、人工智能等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

15. 技术 —— 整理技术 (比如印花和激光等)

- ○ 非常不同意
- ○ 不同意
- ○ 同意
- ○ 非常同意
- ○ 没意见

*16. 技术 —— 展示技术 (比如虚拟现实等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*17. 技术 —— 以用户为中心的技术 （比如可穿戴技术、交互技术、传感器技术等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*18. 技术 —— 互联网技术 (比如大数据、移动终端等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

—— 可持续性因素 ——

*19. 可持续性 ——环境 (比如3R(减少、回收、再利用)和循环经济等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*20. 可持续性 —— 人类福祉 (比如老人、小孩、残疾人、弱势群体、社区等)

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

*21. 可持续性 —— 社会（比如社区、物质和非物质遗产等）

- ◯ 非常不同意
- ◯ 不同意
- ◯ 同意
- ◯ 非常同意
- ◯ 没意见

—— 个人信息 ——

*22. 您所从事的岗位

岗位

*23. 您的从业年限

○ 3年以下	○ 3～10
○ 10～20	○ 20～30
○ 30年以上	

*24. 您的年龄段：

○ 18~25	○ 26~30
○ 31~40	○ 41~50
○ 51~60	○ 60以上

*25. 请选择城市：

提交

Appendix 3

Results (The Focus Group Survey)

(source: https://www.wjx.cn/)

—— 审美 ——

第1题　审美 —— 形式
（比如廓形；衣领、袖子、口袋、门襟、下摆等部件；比例等）

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	4	44.44%
非常同意	5	55.56%
没意见	0	0%
本题有效填写人次	9	

第2题　审美 —— 色彩及图案（比如色彩趋势、配色等）

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	4	44.44%
非常同意	5	55.56%
没意见	0	0%
本题有效填写人次	9	

第3题　审美 —— 表面肌理及装饰（比如金属涂层、刺绣等）

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	8	88.89%
非常同意	1	11.11%
没意见	0	0%
本题有效填写人次	9	

第4题　审美 —— 风格 (比如1920年代风格、嬉皮风格等)

选项	小计	比例
非常不同意	0	0%
不同意	2	22.22%
同意	4	44.44%
非常同意	2	22.22%
没意见	1	11.11%
本题有效填写人次	9	

第5题　能否提供衡量服装设计创新的其它美学因素？(不能归类为上述类型)

—— 材料 ——

第6题　材料 —— 原材料 （比如纤维等）

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	7	77.78%
非常同意	2	22.22%
没意见	0	0%
本题有效填写人次	9	

第7题　材料 ——面料（比如新功能面料等）

选项	小计	比例
非常不同意	0	0%
不同意	1	11.11%
同意	7	77.78%
非常同意	1	11.11%
没意见	0	0%

本题有效填写人次	9	

第8题　材料 —— 辅料（比如缝纫线、纽扣等）

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	8	88.89%
非常同意	1	11.11%
没意见	0	0%
本题有效填写人次	9	

第9题　否提供衡量服装设计创新的其它材料因素？（不能归类为上述类型）

—— 性能 ——

第10题　性能 —— 舒适性 (比如说合体性、湿热性能等)

选项	小计	比例
非常不同意	0	0%

不同意	0	0%
同意	4	44.44%
非常同意	4	44.44%
没意见	1	11.11%
本题有效填写人次	9	

第11题　性能 —— 防护性 (比如防水、防火、防紫外线等)

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	6	66.67%
非常同意	2	22.22%
没意见	1	11.11%
本题有效填写人次	9	

第12题　性能 —— 维护性 （比如洗涤、熨烫等）

选项	小计	比例
非常不同意	0	0%
不同意	2	22.22%
同意	5	55.56%
非常同意	1	11.11%
没意见	1	11.11%
本题有效填写人次	9	

第13题

能否提供衡量服装设计创新的其它功能性因素？(不能归类为上述类型，如耐用性等)

—— 象征意义 ——

第14题　象征意义—— 个人价值 (比如个人身份、自我认同等)

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	7	77.78%
非常同意	2	22.22%
没意见	0	0%
本题有效填写人次	9	

第15题　象征意义 —— 社会价值 (比如个人社会身份、公众形象等)

选项	小计	比例
非常不同意	0	0%

不同意	0	0%
同意	6	66.67%
非常同意	2	22.22%
没意见	1	11.11%
本题有效填写人次	9	

第16题
能否提供衡量服装设计创新的其它象征性因素？（不能归类为上述类型）

—— 技术 ——

第17题　技术 —— 制造技术 (比如3D人体扫描、CAD、自动化、人工智能等)

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	5	55.56%
非常同意	4	44.44%
没意见	0	0%
本题有效填写人次	9	

第18题　技术 —— 整理技术 (比如印花和激光等)

选项	小计	比例
非常不同意	0	0%
不同意	1	11.11%
同意	5	55.56%
非常同意	3	33.33%
没意见	0	0%
本题有效填写人次	9	

第19题　技术 —— 展示技术 (比如虚拟现实等)

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	6	66.67%
非常同意	2	22.22%
没意见	1	11.11%
本题有效填写人次	9	

第20题　技术 —
以用户为中心的技术（比如可穿戴技术、交互技术、传感器技术等)

选项	小计	比例
非常不同意	1	11.11%
不同意	1	11.11%
同意	5	55.56%

非常同意	2	22.22%
没意见	0	0%
本题有效填写人次	9	

第21题　技术 —— 互联网技术 (比如大数据、移动终端等)

选项	小计	比例
非常不同意	0	0%
不同意	1	11.11%
同意	4	44.44%
非常同意	3	33.33%
没意见	1	11.11%
本题有效填写人次	9	

第22题

能否提供衡量时装设计创新的其它技术因素？(不能归类为上述类型的因素)

—— 可持续性因素 ——

第23题　可持续性 ——环境 (比如3R(减少、回收、再利用)和循环经济等)

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	6	66.67%
非常同意	3	33.33%
没意见	0	0%
本题有效填写人次	9	

第24题　可持续性 —— 人类福祉
(比如老人、小孩、残疾人、弱势群体、社区等)

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	4	44.44%
非常同意	4	44.44%
没意见	1	11.11%
本题有效填写人次	9	

第25题　可持续性 —— 社会（比如社区、物质和非物质遗产等）

选项	小计	比例
非常不同意	0	0%
不同意	0	0%
同意	4	44.44%

非常同意	4	44.44%
没意见	1	11.11%
本题有效填写人次	9	

第26题
能否提供衡量时尚设计创新的其它可持续性因素？(不能归类为上述类型的因素)

—— 个人信息 ——

第27题　您所从事的岗位

第28题　您的从业年限

选项	小计	比例
3年以下	0	0%
3～10	2	22.22%
10～20	4	44.44%
20～30	3	33.33%
30年以上	0	0%
本题有效填写人次	9	

第29题　您的年龄段：

选项	小计	比例
18~25	0	0%
26~30	1	11.11%
31~40	5	55.56%
41~50	3	33.33%
51~60	0	0%
60以上	0	0%
本题有效填写人次	9	

第 30 题　请选择城市:

填空题数据请通过下载详细数据获取

Appendix 4

Frequency of Items (The Large-scale Survey)

1.Form

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.7	1.7	1.7
	Agree	67	57.8	57.8	59.5
	Strongly agree	45	38.8	38.8	98.3
	No opinion	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

2.Color and pattern

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	4	3.4	3.4	4.3
	Agree	59	50.9	50.9	55.2
	Strongly agree	49	42.2	42.2	97.4
	No opinion	3	2.6	2.6	100.0
	Total	116	100.0	100.0	

3.Surface

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	5	4.3	4.3	4.3
	Agree	57	49.1	49.1	53.4
	Strongly agree	53	45.7	45.7	99.1
	No opinion	1	.9	.9	100.0
	Total	116	100.0	100.0	

4.Style

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	9	7.8	7.8	8.6
	Agree	67	57.8	57.8	66.4
	Strongly agree	36	31.0	31.0	97.4
	No opinion	3	2.6	2.6	100.0
	Total	116	100.0	100.0	

5.How to wear

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.7	1.7	1.7
	Disagree	17	14.7	14.7	16.4
	Agree	61	52.6	52.6	69.0
	Strongly agree	30	25.9	25.9	94.8
	No opinion/Don't know	6	5.2	5.2	100.0
	Total	116	100.0	100.0	

6.Raw material

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	5	4.3	4.3	5.2
	Agree	69	59.5	59.5	64.7
	Strongly agree	38	32.8	32.8	97.4
	No opinion	3	2.6	2.6	100.0
	Total	116	100.0	100.0	

7.Fabric

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	4	3.4	3.4	4.3
	Agree	60	51.7	51.7	56.0
	Strongly agree	50	43.1	43.1	99.1

	No opinion	1	.9	.9	100.0
	Total	116	100.0	100.0	

8.Accessories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.7	1.7	1.7
	Disagree	6	5.2	5.2	6.9
	Agree	72	62.1	62.1	69.0
	Strongly agree	33	28.4	28.4	97.4
	No opinion	3	2.6	2.6	100.0
	Total	116	100.0	100.0	

9.Comfort

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	8	6.9	6.9	6.9
	Agree	60	51.7	51.7	58.6
	Strongly agree	45	38.8	38.8	97.4
	No opinion	3	2.6	2.6	100.0
	Total	116	100.0	100.0	

10.Protection

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.7	1.7	1.7
	Disagree	5	4.3	4.3	6.0
	Agree	71	61.2	61.2	67.2
	Strongly agree	33	28.4	28.4	95.7
	No opinion	5	4.3	4.3	100.0
	Total	116	100.0	100.0	

11.Maintenance

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9

	Disagree	10	8.6	8.6	9.5
	Agree	70	60.3	60.3	69.8
	Strongly agree	32	27.6	27.6	97.4
	No opinion	3	2.6	2.6	100.0
	Total	116	100.0	100.0	

12.Personal value

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	12	10.3	10.3	11.2
	Agree	60	51.7	51.7	62.9
	Strongly agree	36	31.0	31.0	94.0
	No opinion	7	6.0	6.0	100.0
	Total	116	100.0	100.0	

13.Social value

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	12	10.3	10.3	10.3
	Agree	68	58.6	58.6	69.0
	Strongly agree	30	25.9	25.9	94.8
	No opinion	6	5.2	5.2	100.0
	Total	116	100.0	100.0	

14.Manufacturing technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	4	3.4	3.4	4.3
	Agree	67	57.8	57.8	62.1
	Strongly agree	42	36.2	36.2	98.3
	No opinion	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

15.Finishing technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	2.6	2.6	2.6
	Agree	70	60.3	60.3	62.9
	Strongly agree	39	33.6	33.6	96.6
	No opinion	4	3.4	3.4	100.0
	Total	116	100.0	100.0	

16.Showing technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.7	1.7	1.7
	Disagree	3	2.6	2.6	4.3
	Agree	62	53.4	53.4	57.8
	Strongly agree	44	37.9	37.9	95.7
	No opinion	5	4.3	4.3	100.0
	Total	116	100.0	100.0	

17.User-centered technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	2	1.7	1.7	1.7
	Disagree	4	3.4	3.4	5.2
	Agree	63	54.3	54.3	59.5
	Strongly agree	42	36.2	36.2	95.7
	No opinion	5	4.3	4.3	100.0
	Total	116	100.0	100.0	

18.IoT technology

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	2.6	2.6	2.6
	Disagree	8	6.9	6.9	9.5
	Agree	69	59.5	59.5	69.0
	Strongly agree	30	25.9	25.9	94.8
	No opinion	6	5.2	5.2	100.0

	Total	116	100.0	100.0	

19.Environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	1	.9	.9	.9
	Disagree	3	2.6	2.6	3.4
	Agree	64	55.2	55.2	58.6
	Strongly agree	46	39.7	39.7	98.3
	No opinion	2	1.7	1.7	100.0
	Total	116	100.0	100.0	

20.Wellbeing

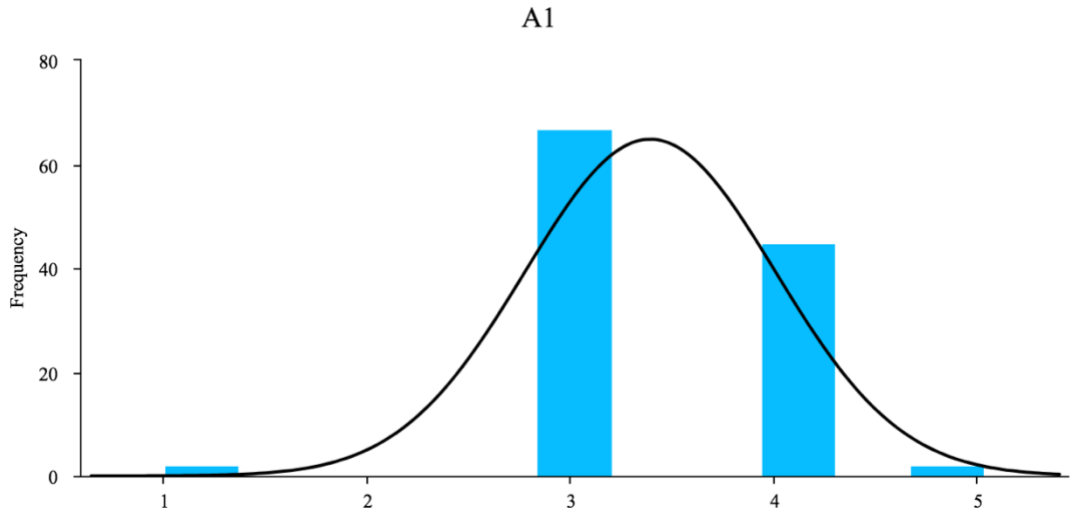
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	3	2.6	2.6	2.6
	Agree	60	51.7	51.7	54.3
	Strongly agree	46	39.7	39.7	94.0
	No opinion	7	6.0	6.0	100.0
	Total	116	100.0	100.0	

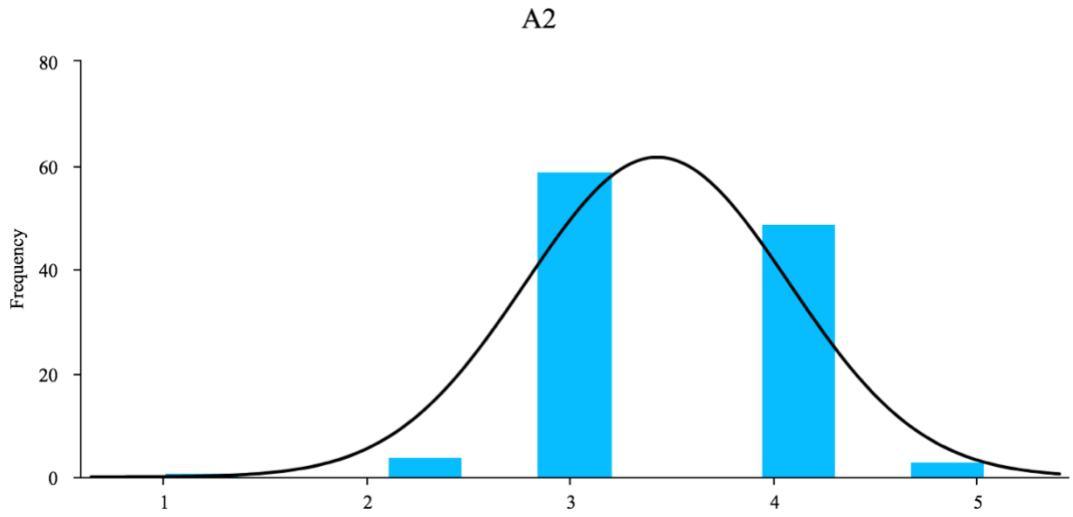
21.Society

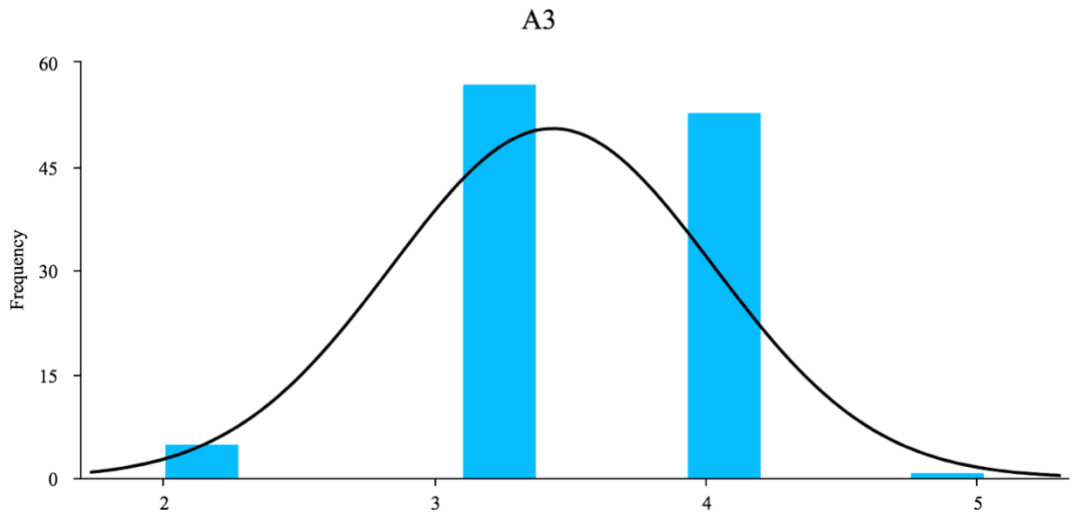
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	6	5.2	5.2	5.2
	Agree	68	58.6	58.6	63.8
	Strongly agree	38	32.8	32.8	96.6
	No opinion	4	3.4	3.4	100.0
	Total	116	100.0	100.0	

Appendix 5

Bart Char of Items (The Large-scale Survey)






A3
Frequency
60
45
30
15
0
2
3
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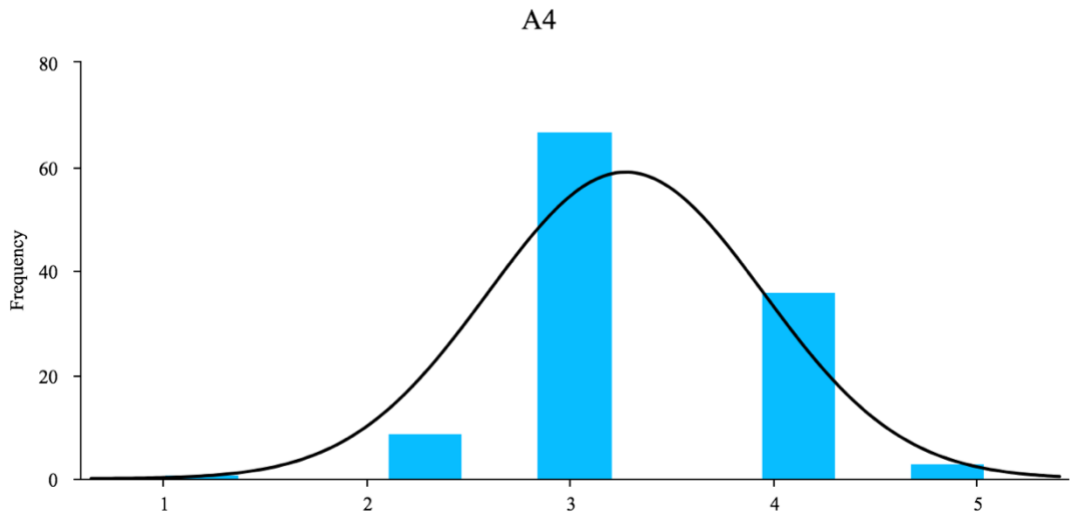
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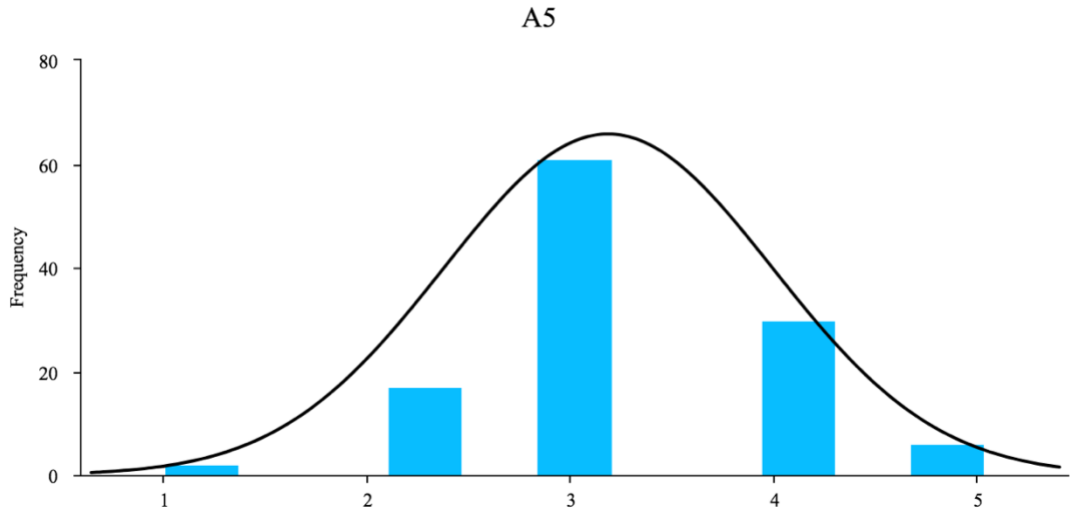
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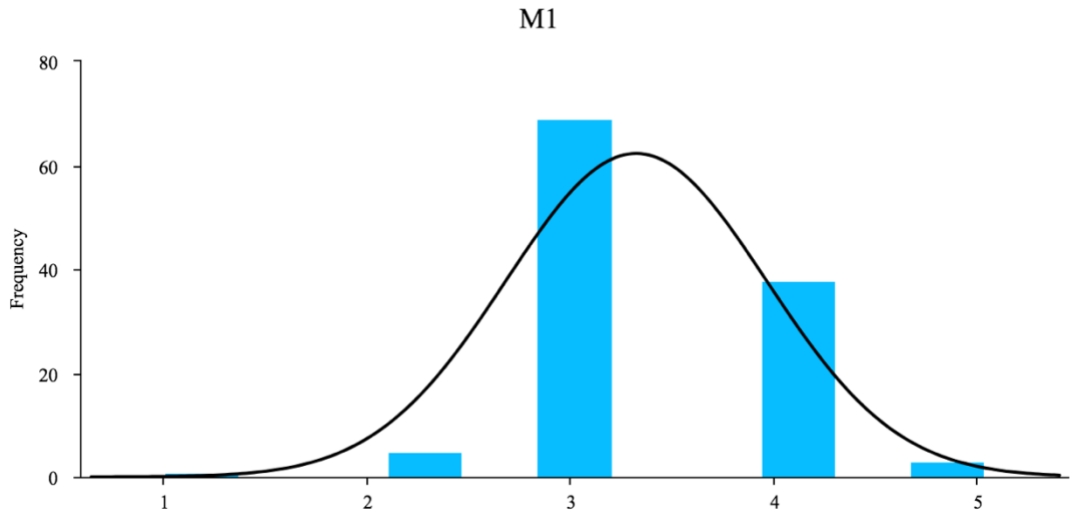
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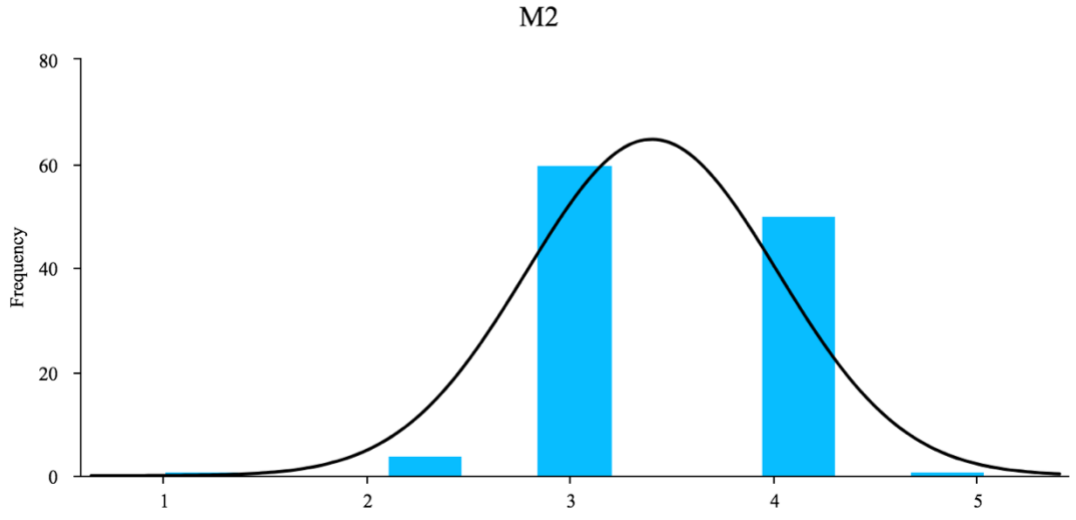
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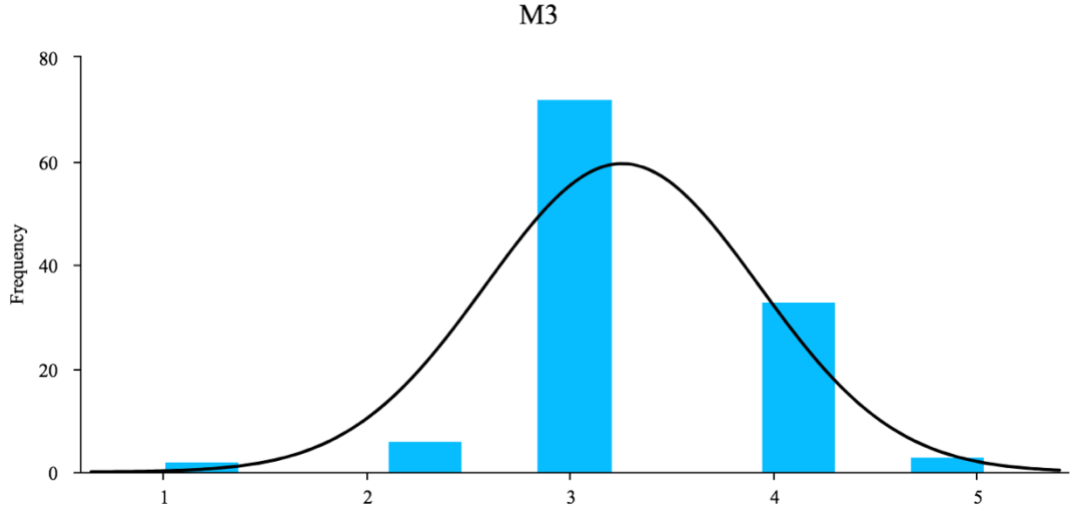
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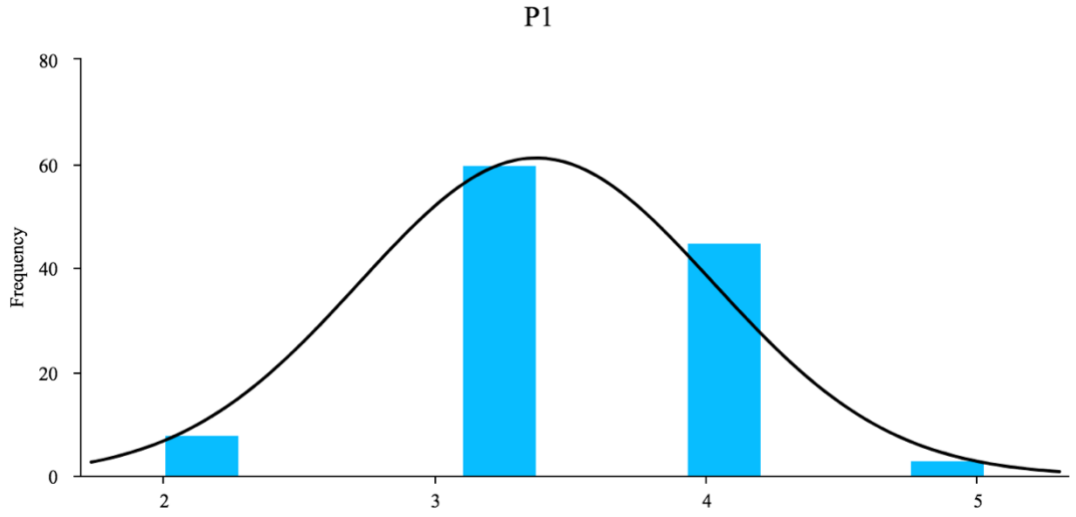
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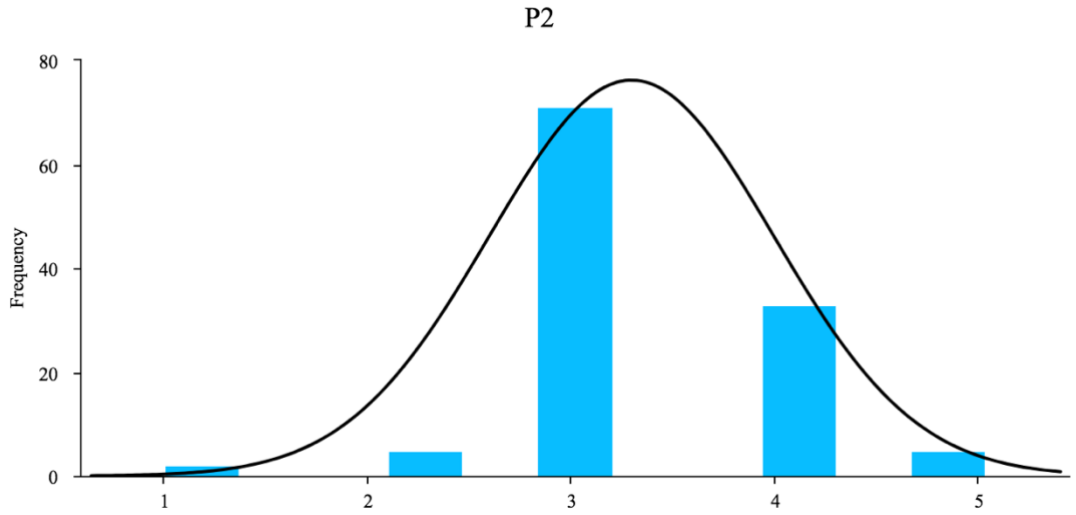
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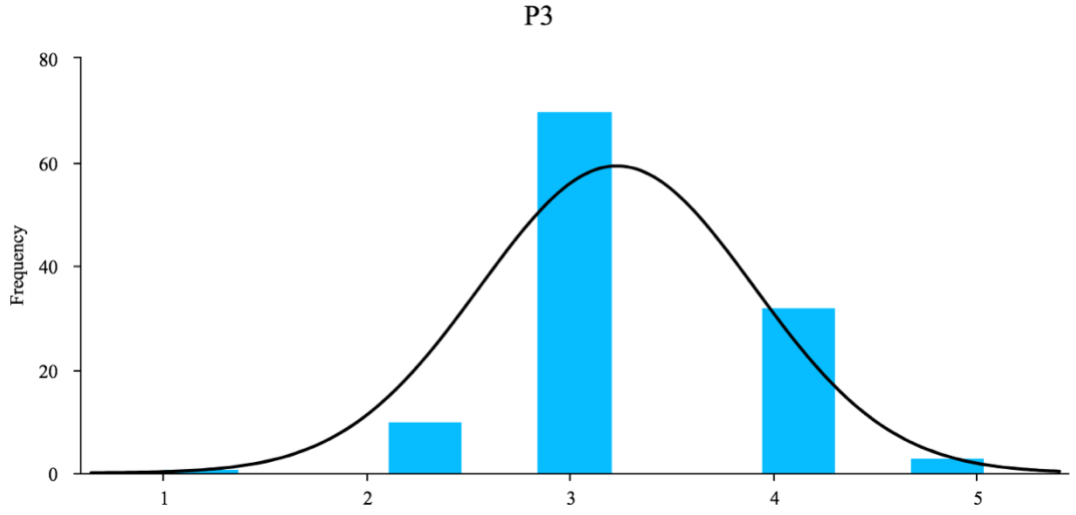
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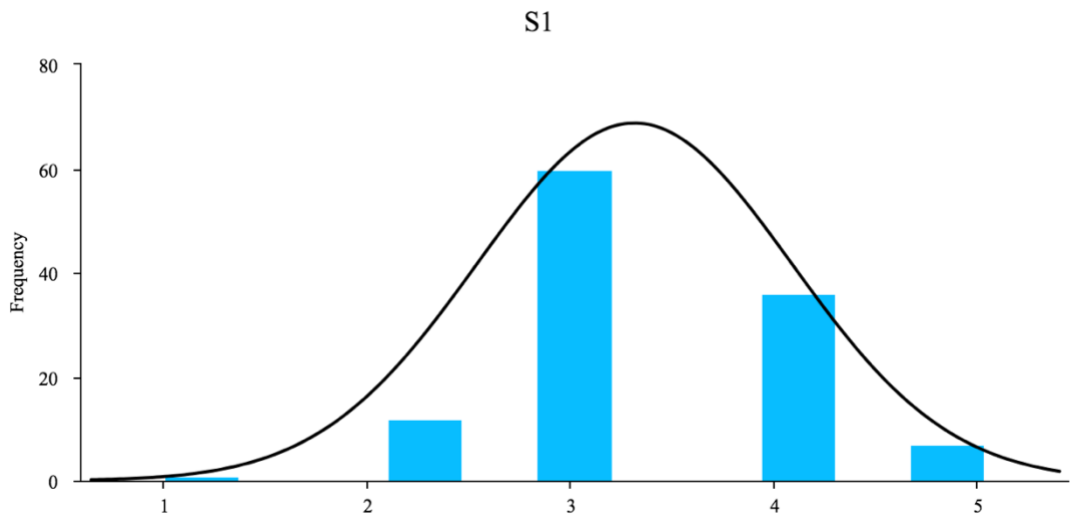
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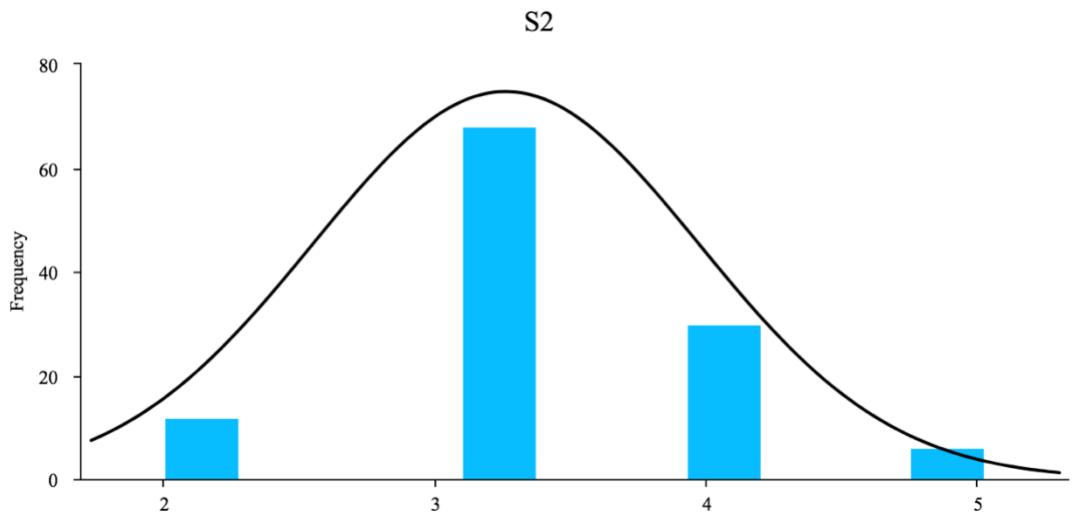
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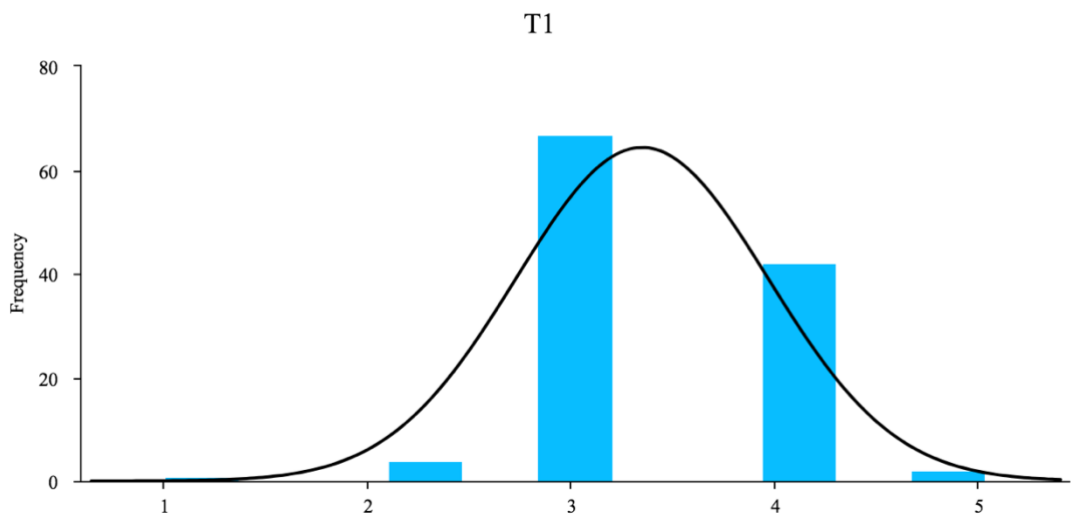
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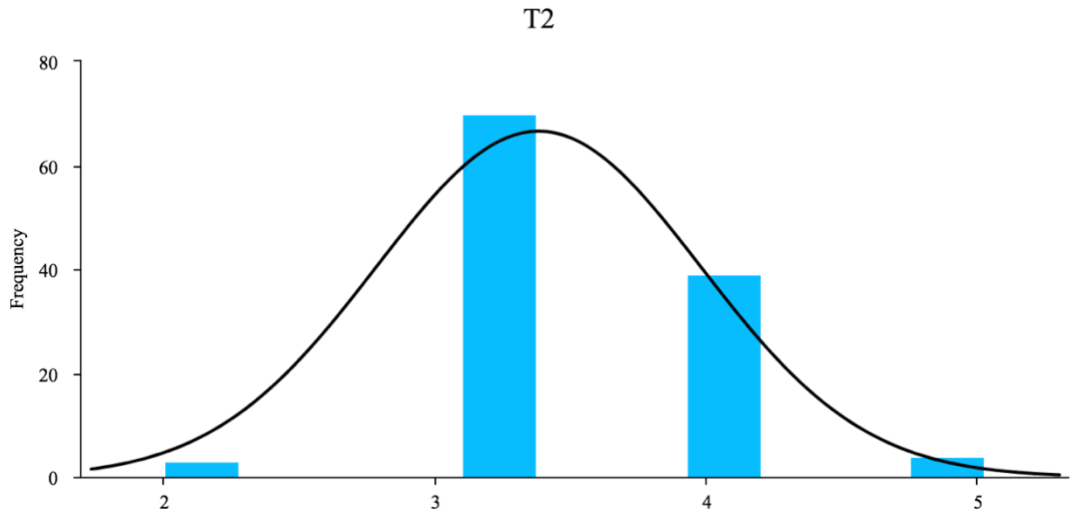
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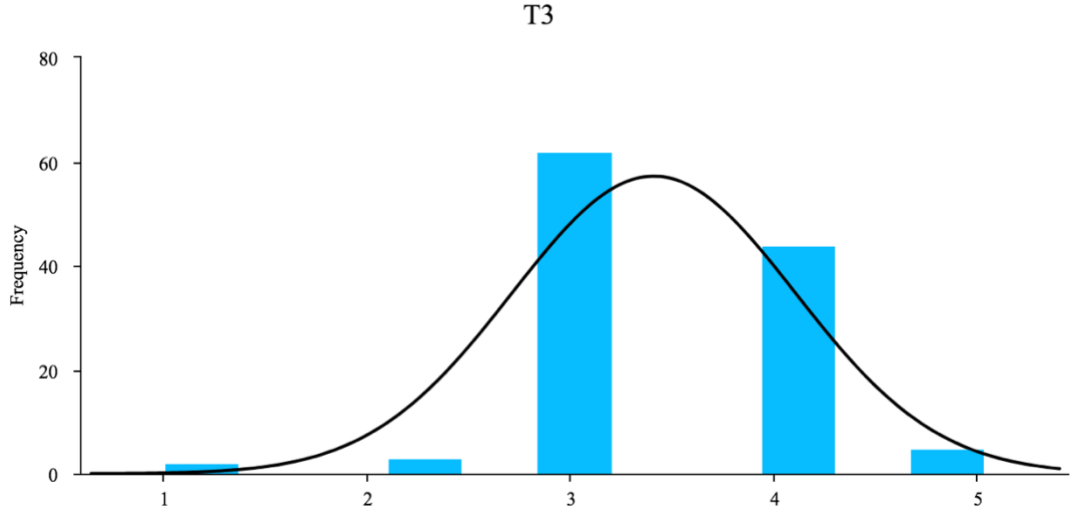
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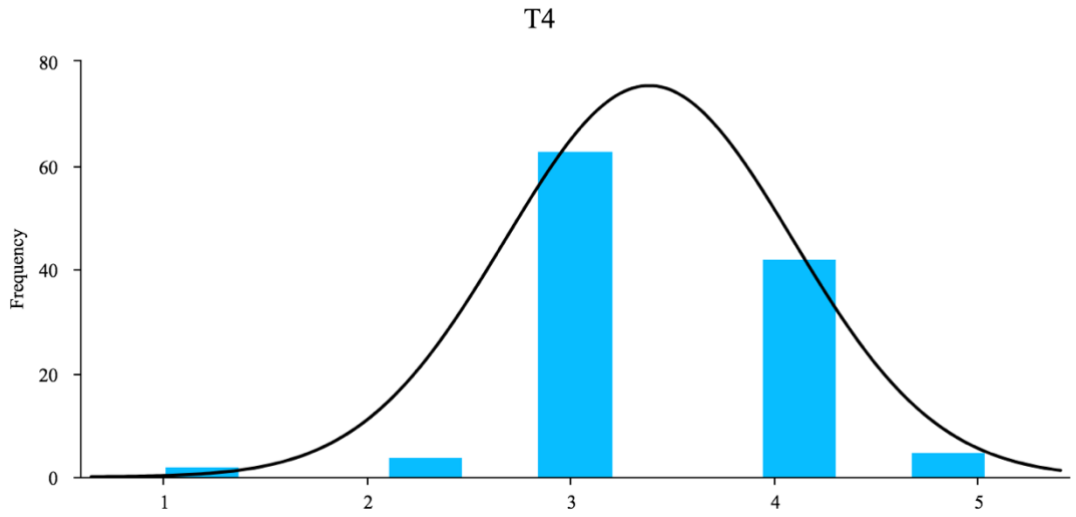
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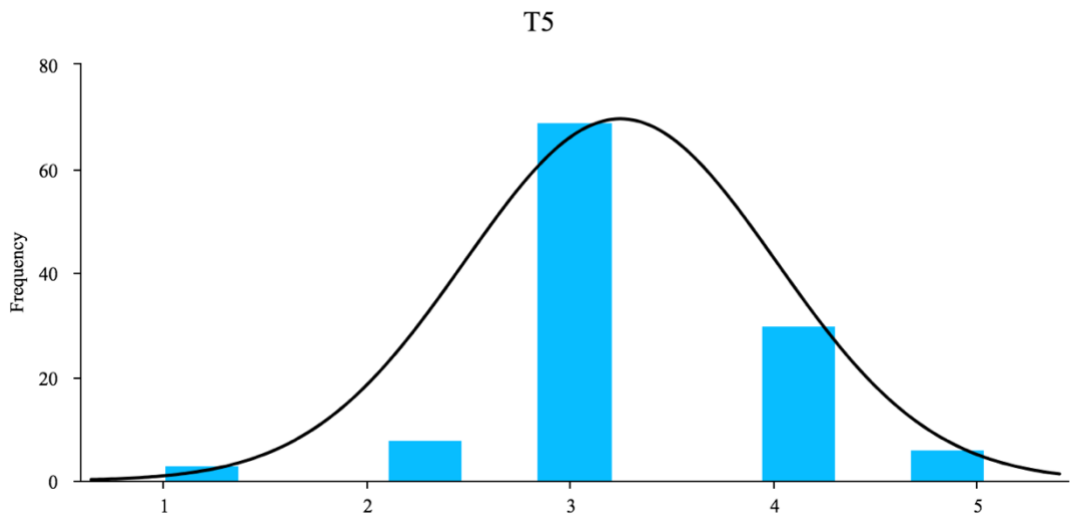
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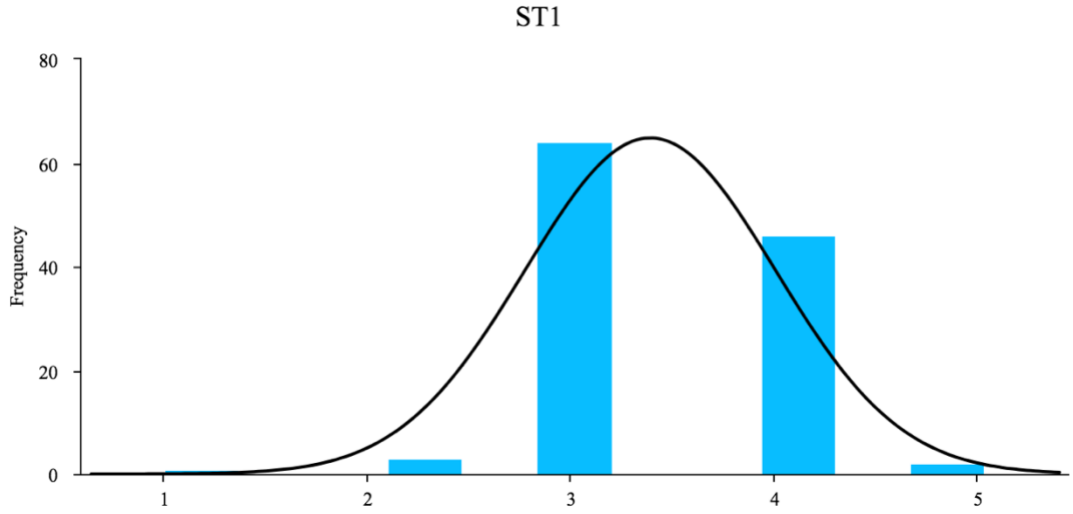
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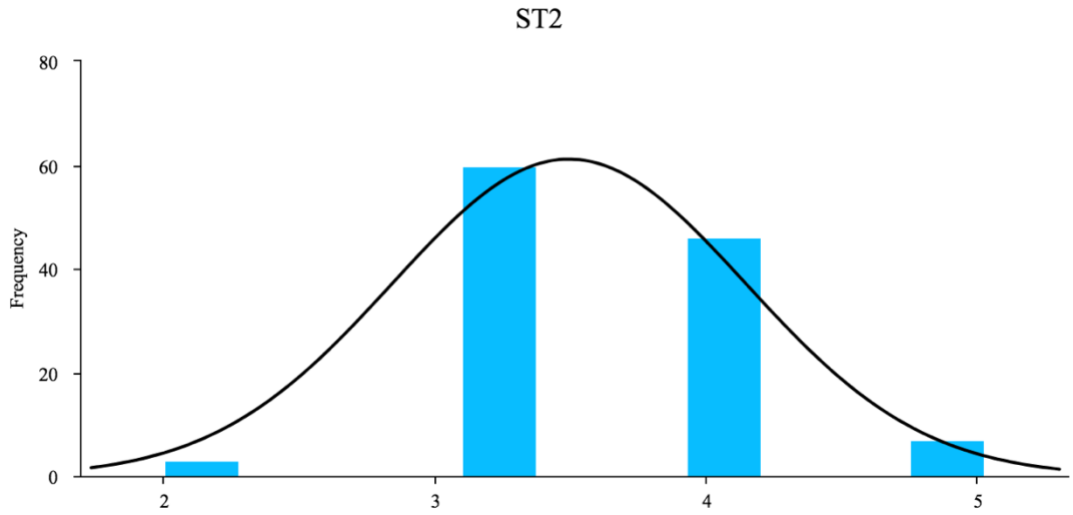
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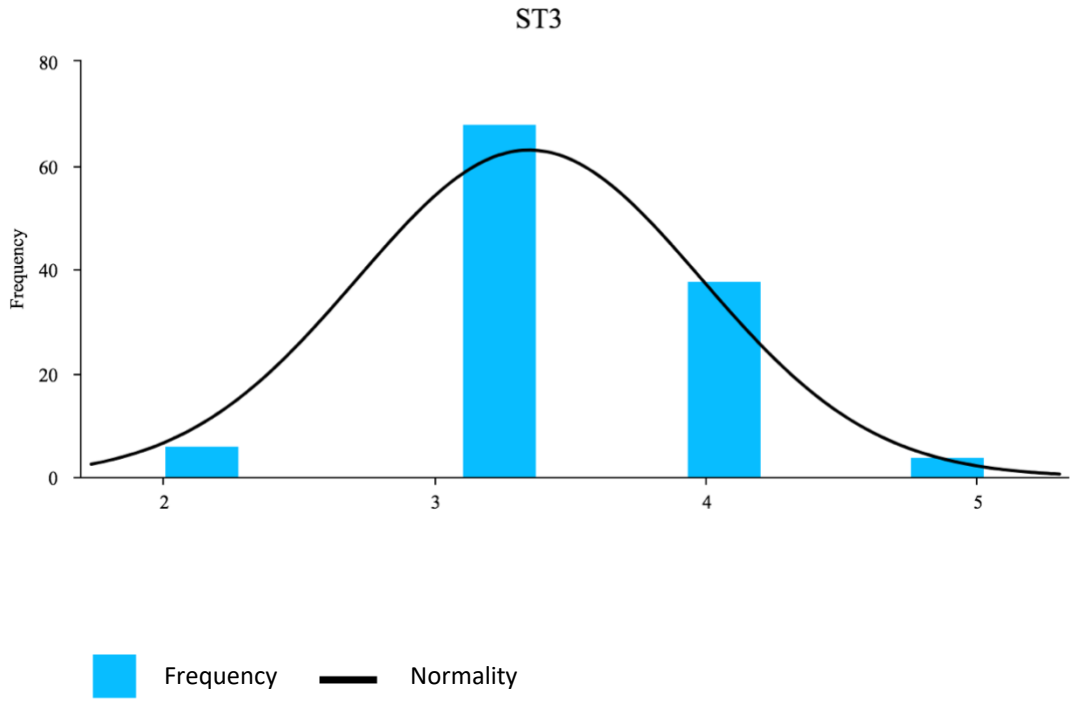

1: Strongly disagree

2: Disagree

3: Agree

4: Strongly agree

5: No opinion

Appendix 6

Interview Guide

Date: _____

Time: _____

Venue: _____

Welcome Message

My name is ZENG Li, a PhD Candidate at School of Fashion and Textiles of The Hong Kong Polytechnic University. Thank you for participating this interview!

Part 1 Brief Introduction

This interview is PhD research on "Fashion Design Innovation Ecosystem". It will benefit fashion industry from a systematic and holistic perspective both for practitioner and policymaker in a new academic direction, namely ecosystem -- a metaphor from ecology.

The interview will be recorded. After the researcher ask a specific question, additional follow-up questions may be added based on your respondence. A transcription will be sent to you to review for accuracy.

The interview and research will be conducted anonymously if you are not willing to uncover your name and company/organization. Alternatively, your real name and company/organization are welcomely disclosed. All data will be handled confidentially and secured.

Part 2 Consent agreement

1. Do you agree to be voluntarily interviewed, recorded and analyzed for the purpose of academic without any payment?

2. Do you agree your statements will be anonymously quoted in publications and presentations?

You may feel free to stop at any time. Is there any question before we start?

Part 3 Background

1. What position have you been working and how long?

2. Can you introduce your company/organization?

3. What is your nationality, age, gender, and education level? / What is your major?

4. Have you participated similar research interview?

Part 4 Open-ended Questions

1. Fashion design innovation

1.1 Do you have any knowledge or experience about “fashion design innovation”?

1.2 Can you give examples of fashion design innovation?

1.3 How will you measure fashion design innovation?

2. Fashion design innovation ecosystem[1]

2.1 Do you have any knowledge that there is Fashion Design Innovation Ecosystem?

2.2 If there is Fashion Design Innovation Ecosystem, what stakeholders should be involved?

2.3 What activities do you expect the innovation ecosystem has?

2.4 How does the innovation ecosystem support fashion design innovation?

3. Policy-driven fashion design innovation[2]

Do you think there are any government actions or any policies relevant to fashion design innovation, both explicitly and implicitly?

3.1 If yes, do you have any idea about what policies are?

3.2 If no, do you think there is a need to for government to take action and develop policy for fashion design innovation?

Is there anything else you would like to share?

Acknowledgement

This is the end of interview questions.

Thank you very much for your time and support. Your opinions are valuable to the research!

If there is any question or further thinking, please feel free to contact the researcher!

Email: leah-li.zeng@

Tel: 0086 1868247

Wechat: leah_

Linkedin: Leah/Li

Note:

1: Innovation ecosystem is defined as "the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors" (Granstrand & Holgersson, 2020).

2 : "Policy-driven" can be integrated with other types of incentives, such as designer-driven (Cillo & Verona, 2008), customer-driven/market-driven and technology-driven.

Appendix 7

Cover Letter

Dear Participant,

I am a PhD candidate at The Hong Kong Polytechnic University's School of Fashion and Textiles. I am conducting a research on Fashion Design Innovation Ecosystem. The target interviewees are people with rich experience and insights in fashion and relevant sector. I would very much like to invite you to participate the research and have an in-depth interview to share your perceptions and views. Your valuable support will substantially benefit the present knowledge.

The interview is semi-structured with open-ended questions. It is supposed to last within 1 hour either in a face-to-face or online way. The time and venue will be at your convenience. The conversation will be recorded. The interview and research will be conducted anonymously if you are not willing to uncover your name and company/organization. Alternatively, your real name and company/organization are welcomely disclosed. All data will be handled confidentially and secured.

I sincerely appreciate your voluntary time, experience and insights and thank you in advance for your support. The participation has no cost neither compensation. You may request a copy of summary result of the study which is hoped to contribute to your business.

If you have any questions, please do not hesitate to contact me. I am looking forward to your reply soon.

Thank you.

Sincerely,

Li ZENG

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School of Fashion and Textiles
The Hong Kong Polytechnic University
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Tel: 0086 1868247
Wechat: leah_
Linkedin: Leah/Li

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