

Quadruple Helix Approach to Boost Fashion Industry Innovation

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Abstract

Currently, the fashion industry continues to grow and increase, but there is a problem gap in the form of declining demand for orders and stagnant fashion products, which has an impact on 3,000 textile factory workers in Sukoharjo Regency who have been laid off. The problem gap needs to be resolved through the collaborative roles of the sectors in the quadruple helix consisting of the fashion industry, universities, government, and civil society. Therefore, the research question is how does the fashion industry build innovation through the support of sectors in the quadruple helix? The purpose of this study is to identify the role of the quadruple helix in encouraging the fashion industry to create innovations that have an impact on employment. The research method used was a qualitative study with the informants being the Industry Office as the government sector, two fashion MSMEs as industry sector representatives, one university in Indonesia as the university sector, and a sample from civil society. The results of this study indicate that the industry sector is the primary driver of innovation, universities provide foundational knowledge for other sectors, and the government plays a role in maintaining the smooth operation of the fashion industry through policies. Additionally, civil society is responsible for evaluating the work of industry, universities, and government policies. This research contributes to the body of knowledge on the quadruple helix innovation theory.

Keywords: *Quadruple Helix; Personalization; Co-Creation; Innovation; Fashion Industry*

INTRODUCTION

Innovation studies continue to evolve, and there is a multi-helix innovation study. The most popular multi-helix models are the triple helix and quadruple-helix models. The quadruple helix is an evolution after the triple helix model. The first triple helix model was initiated by [Etzkowitz and Leydesdorff \(1995\)](#) to explain the collaboration between universities, industry and government in encouraging entrepreneurship with innovation and economic growth in the era of knowledge-based economies ([Cai & Lattu, 2022](#)). Later, the quadruple helix model emerged to include civil society as a sector shaping innovation. Civil society is considered important to be a parallel link with industry, universities, and the government, and it is considered a key enabling condition for complex helix interactions ([Etzkowitz & Zhou, 2017](#)). For example, in creating group-based social innovation in rural areas, ([Nordberg et al., 2020](#)) explained that adding civil society as the fourth helix further explains the formal and informal ways of driving social innovation, so the quadruple helix is considered more capable of analyzing multi-sectoral collaboration for entrepreneurship in society ([Mok & Jiang, 2020](#)). Research on the quadruple helix model has been conducted in several creative industry sectors ([Colapinto & Porlezza, 2012](#); [Mok & Jiang, 2020](#); [Nordberg et al., 2020](#)), but research on creative industry sub-sectors, specifically fashion, is still limited. Therefore, this study takes the fashion industry as the object of research ([Parveen et al., 2015](#)).

The fashion industry is one of the pillars of Gross Domestic Product (GDP) in Indonesia, amounting to 18%. In addition, on the export side, the fashion industry is the largest contributor, accounting for 66% of the total export value for creative economy products ([Ginanjari, 2023](#)), with the main export destinations including the United States, Japan, Germany, Japan, the United

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Kingdom, and Belgium (Databoks, 2019). Therefore, studies on the fashion industry are crucial. Some of the fashion industry centers in Indonesia are Jakarta, Sukoharjo, and Solo. In 2018, Indonesia was ranked second in terms of the country with the best Muslim fashion in the world (Putra, 2018), indicating that Indonesia's fashion industry is not inferior to foreign countries and has the potential to continue to develop more optimally.

The problem gap in this study is the phenomenon gap in which the positive potential in the fashion industry has begun to experience obstacles since the global recession and the Russia-Ukraine conflict. These obstacles have made it difficult to obtain cotton raw materials, thus making it scarce and expensive. Expensive production costs create high product selling prices, coupled with product innovation that is still stagnant or even lacking. This is reinforced by data in the Global Innovation Index 2023 report released by the World Intellectual Property Organization (WIPO) that Indonesia ranks 61 out of 132 countries, with a total score of 30.3. This ranking is up from the previous year; however, Indonesia is still below the average of the Southeast Asia, East Asia, and Oceania countries for all indicators. A consequence was that as many as 3,000 textile factory workers in Sukoharjo Regency experienced layoffs and were laid off (Prass, 2022). This phenomenon has increased the unemployment rate, so this problem must be solved.

This research contributes to the body of knowledge on quadruple helix innovation theory because it takes a bottom-up perspective of the quadruple helix model, which involves civil society as the fourth sector to encourage innovation in the fashion industry (Carayannis & Rakhmatullin, 2014). The research question built in this study is how to build innovation through the role of the quadruple helix in the fashion industry. Therefore, the purpose of this study is to build a quadruple helix framework to encourage the fashion industry to create innovation, which will then have an impact on employment.

LITERATURE REVIEW

The Quadruple Helix Innovation Theory.

Quadruple Helix Innovation Theory is the development of the triple helix concept introduced by Etzkowitz and Leydesdorff (2000), by adding civil society as the fourth helix to encourage innovation and knowledge (Afonso et al., 2012; Cai & Lattu, 2022). The Quadruple Helix Innovation Theory is a theory that explains the collaboration of four sectors—government, industry, universities, and civil society—whose role is to encourage innovation growth to increase economic growth (Liu et al., 2020). The importance of government, university, and industry policies and practices as well as civil society's effective and efficient interaction (González-Martinez et al., 2021). Collaboration in the quadruple helix can arise from communication between networks or relationships (Calilao et al., 2024).

Innovation

In the face of increasing competition, the fashion industry needs to find a way to offer a competitive advantage (Hermawan et al., 2021). Innovation is needed so that fashion businesses can continue to grow, and fashion entrepreneurs must have the ability to innovate. Some characteristics that entrepreneurs must possess to create innovations (Nkambule, 2023) include: having a strong mindset, actively learning, and a strong determination to achieve their business (Asemokha et al., 2019). Innovation in the fashion industry can be realized through product innovation, which refers to the creation of new products; process innovation, which refers to new production processes, such as the use of new technology or new working methods; and market innovation, such as new marketing strategies, new targets, and others (Hanaysha et al., 2022).

Personalization

Personalization is the act of designing and producing a product that matches consumer preferences (Werner, 2016). In this study, personalization refers to fashion entrepreneurs' ability to capture the needs and desires of consumers (Nobile & Cantoni, 2023). Personalization has several indicators, such as fashion businesses paying attention to consumer needs, fashion businesses being able to adjust offers to consumer needs, and fashion businesses offering products according to consumer desires (Carvajal et al., 2011). The personalization ability of fashion entrepreneurs is obtained through research to produce new product innovations.

Co-Creation

Co-creation is a process that involves two or more parties to discover something new through the constructive exchange of different types of knowledge, resources, competencies, and ideas (Torfing et al., 2023). Co-creation is the collaboration of fashion businesses and consumers to create new value in products (Iglesias et al., 2020). The implementation of co-creation in fashion businesses can increase consumer loyalty, product innovation, and create competitive advantage (Adah et al., 2024).

Empirical Review

The study of Dhewanto et al. (2021) and Umiyati et al. (2023) provides a quadruple helix perspective used as perspective used to study phenomena in the shoe industry, furthermore, this study is built from the interception of the three domains in the body of knowledge. First, the applied business innovation domain (Günzel & Brehm, 2018), second the personalization fashion domain (Werner, 2016), and third the quadruple helix (Colapinto & Porlezza, 2012) domain in building national fashion innovation. Applied business innovation acquires the concept of economic sharing which is developing as an empowerment concept, personalization fashion acquires the current fashion trend which still leaves a market gap that has not been properly addressed, while the quadruple helix domain provides a business ecosystem perspective that supports the national fashion industry. This ecosystem is built from the four pillars of industry as a business unit, academics as knowledge agents, society as an element of power and market resources, and the government as a policy maker. The three domains in the body of knowledge will provide originality in this study.

RESEARCH METHOD

This research uses a qualitative approach with interviews to explore how fashion businesses foster innovation with the support of quadruple helix sectors (Lyon et al., 2015). The researcher adopts an interpretivist approach to understanding a subject. It is to understand the reality from the perspective of the informants involved in the study. This involves exploring how people construct their reality based on their experiences, beliefs, and interactions with others (Kwayu et al., 2021; Saunders et al., 1970). The participants in this research include representatives from each of the quadruple helix sectors: (1) the Industry Office of Sukoharjo Regency from the government sector (chosen because Sukoharjo is a central hub for the fashion businesses in Indonesia and a city facing significant gaps and challenges). (2) tailors representing the industrial sector, to analyze direct, on-the-ground perspectives on production, market dynamics, and the operational challenges they encounter. (3) a leading university in Indonesia representing the academic sector, integrating expertise in research, innovation, and knowledge transfer for advancing especially in the fashion industry. (4) consumers who frequently order fashion products representing civil society, showing essential insights into customer preferences and market demand. The informants in this research were carefully selected to represent each of the quadruple helix sectors, ensuring a comprehensive

understanding of the fashion industry in Sukoharjo Regency. These informants give a well-rounded view of the fashion industry, encompassing policy, practice, innovation, and consumer behavior.

This research examines two cases to compare the impact on fashion businesses between those that implement the quadruple helix model and those that do not. The interviewees represent the four sectors of the quadruple helix, making them representative informants for exploring how to encourage innovation in the fashion industry to promote growth and job creation. The interviews were conducted over the course of one week in October 2023, with each lasting approximately 2-3 hours and held at different times for each informant. All interviews were recorded automatically, and open-ended questions were used to gather respondents' thoughts, perceptions, and experiences regarding their contributions to the fashion industry's advancement. The audio recordings were transcribed verbatim by the researcher. The validity and reliability of the data, the study conducted triangulation by elaborating on the findings through comparisons with previous studies and existing theories. This approach allows the study to not only verify its results but also to position them within the broader academic discourse, highlighting how the findings align with, or diverge from, established knowledge in the field (Creswell & Poth, 2016).

FINDINGS AND DISCUSSION

This research analyzes two cases of fashion businesses in Sukoharjo Regency called Fashion Business A, which is a fashion business whose business conditions are stagnant and currently almost bankrupt, and Fashion Business B, which is a sustainable and growing (See Table 1). This research explores the factors that drive the progress of the creative industry. This dual perspective allows the study to identify critical success and failure factors, such as the entrepreneur mindset, knowledge capture, resource usage optimization an innovation, which differentiate thriving businesses from those in decline. It also highlights on how external environmental factors, like market conditions and government regulation, influence business outcomes differently, providing valuable insights into resilience and responsiveness to challenges. By balancing the analysis of both successful and struggling fashion industry, the study offers a nuanced view of the business's complexities, informing more realistic strategies and policies that can support struggling business while encouraging best practices in successful ones (McDonald & Eisenhardt, 2020).

Table 1. Industry Comparison

Sector	Fashion Business A	Fashion Business B
University	Has never been the object of service in polytechnics/universities	Has been the object of Polytechnic/University services
Government	Received training from the Vocational Training Center	Frequently invited to creative industry events
Civil Society	Not joining the community	Active in the fashion community and interacting with customers

Source: Primary data processed in 2024

Fashion Business A

Some of the information presented is as follows:

"So far, I have been independent, I have never collaborated with schools or universities, I have not joined communities or institutions either, at most I only joined the government's vocational training center to be able to sew."-Wartini

"Income has decreased, now it is getting quiet, incoming orders are also rare, at most it is only a neighbor who repairs the stitches, whereas in the past it was busy until it made stock such as

hijab, orders for clothes, robes, and others." Now they prefer to buy online, which has more choices and is cheaper even though sometimes the quality is also less. Yes, I may also not keep up with current trends, so I just wait for the demand for orders." -Wartini

Fashion Business A is experiencing problems with decreasing revenue because its customers prefer more diverse and inexpensive online products. This indicates that innovation in business is still lacking, and the network is very limited. It revealed that the business not effectively expanded its reach or established strong partnerships through networking that could help it compete more effectively in the market (Möller et al., 2020). This limitation not only hinders the business from accessing new markets and resources but also restricts its ability to stay informed about industry trends and technological advancements that could create innovation (Koentjoro & Gunawan, 2020). Perspective in the domain of innovation business, the national fashion industry has not developed, in the domain of applied technology, there are still few applications that provide breakthrough space for applied business technology that acquires empowerment through the concept of economic sharing (Hermawan et al., 2021). The implication is that academics need to take an important role in building technology with a policy climate built by the government. In addition, the entrepreneur's motivation is also still not strong enough to develop, which can be seen from the lack of active entrepreneurs, which causes the business to stagnate and continue to decline.

Fashion Business B

Based on the results of the research, fashion business B has received encouragement from all sectors in the quadruple helix. Some factors that make this fashion business survive and grow include the following:

Entrepreneur Mindset

The fashion mindset pillar consists of fashion preference and engagement in fashion:

1. Fashion Preference

Fashion preference is the view of entrepreneurs regarding the concept of fashion that will be developed how entrepreneurs solve challenges, be assertive, take responsibility for results, take advantage of opportunities, succeed in various situations (Lu et al., 2021). The mindset of fashion preference is formed on two aspects, first, entrepreneurial background, which is the background of the formation of a fashion mindset in entrepreneurs.

"I became a fashion entrepreneur because many of my friends are tailors. I learned from friends and courses"-Siti

Informant Siti built strong references through discussions with friends in the same profession. This is confirmed in studies that important aspects that are the background for the formation of preferences include: beliefs and social relationships (Ibrahim et al., 2011). The second aspect in building a mindset is Second, risk-taking where fashion entrepreneurs map problems, capture potential issues and trends, consider potential costs and project products that will go viral (Hermawan et al., 2022).

"WA, IG, Shopee, Tiktok. We use them so that we can keep going. There are several orders coming from there, even though there is a tax. We have, however, considered the price. In addition, sometimes for branding, I actively participate in events so that many people know me, and I am often invited to events by the agency as a representative too"-Siti

Second, risk-taking is when fashion entrepreneurs map out potential problems. By taking risk, fashion entrepreneurs can anticipate order trends and cost reserves that have the potential to become problems that can threaten business sustainability.

2. Fashion Engagement

Fashion engagement is the idea of fashion products that are always dynamic and represent consumers' lifestyles, so that consumers who represent the pillars of society in the quadruple helix have loyalty to entrepreneurs as fashion suppliers. Fashion engaged refers to the concept, firstly zero waste, where the current production concept allows no waste to be wasted in the business (Gupta & Saini, 2020).

"I usually use the leftover fabric to make doormats, so I make a profit."-Siti

The remaining fashion waste becomes added production value, thereby optimizing material sources and creating additional income. Second aspect, reuse, where entrepreneurs repair and use goods that can still be reused for operations (Hedegård et al., 2020).

"If the equipment breaks, we usually call a technician. If it doesn't work at all, we'll buy a new one, but buying a new one is really the last option because it's expensive."-Siti

The two concepts of waste and reused products in the previous study represent the concept of green management which has become a popular reference in line with green consumer (Payne, 2019).

Knowledge Capture

Knowledge capture is the entrepreneur's ability to capture ideas, build ideas in creating fashion products that are always renewable. The knowledge capture pillar consists of knowledge assembly, knowledge-based infrastructure, and knowledge-based experiment.

1. Knowledge Assembly

Knowledge assembly refers to the entrepreneur's ability to assemble his knowledge and convert it into new ideas for making fashion products. This indicator is built on two aspects. First, active learners, namely entrepreneurs who are proactive in learning new things to assemble knowledge to solve problems and create innovations in the fashion sector.

"I often learn from other tailors in the community. When we go to other seamstresses, we usually ask, "How do you make the needle not jump?" Yesterday I tried it, and it didn't work.' Approximately like that"-Siti

The implication in previous studies is that the active learner concept is attached to the millennial generation and generation Z to become agents who encourage fashion dynamics, changes in market tastes, can grow and develop rapidly (Patra & Shastry, 2022).

2. Knowledge-based Infrastructure

Knowledge based infrastructure are tools used in green entrepreneurship activities to support the formation of green innovation (Sahoo et al., 2023). Aspects in the indicators include:

(a) work agility, namely entrepreneurship has agility in seeking knowledge.

"I saw it on the internet after a customer said, 'mom, I want this model'. Then yes, I did. I will develop the picture from the internet myself."-Siti

Study of [Haaker et al. \(2021\)](#) have confirmed that the internet as a knowledge infrastructure has a strategic role in capturing information, storing, processing and converting knowledge into ideas for developing new products ([Marion & Fixson, 2021](#)). (b) Technology support is the use of applied technology-based instruments that are used to make work easier ([Haaker et al., 2021](#)). Entrepreneurship uses various technologies that support the implementation of entrepreneurial activities

"WA, IG, Shopee, Tiktok. We use them to increase sales. Our customer reach is wider too"-Siti

In many studies, social media platforms and marketplaces have become strategic tools for capturing knowledge and digital marketing media ([Lin & Wang, 2023](#)).

3. Knowledge-based experiment

Knowledge based experiment, namely conducting experiments in the process of creating green innovation. This indicator includes the trial and error aspect where in gaining knowledge, trials are carried out on product prototypes ([Bocken & Snihur, 2020](#)).

"We always test the fabric first. Therefore, we can maintain the quality and minimize missed communications with buyers"-Siti

The implications in the study ([Bocken & Snihur, 2020](#)) reiterate that the knowledge gained from previous failure experiences will improve both the process and the creation of better fashion products. So in this study knowledge capture is built on three main concepts: Knowledge Assembly, Knowledge-based Infrastructure and Knowledge-based experiment which creates acceleration in how entrepreneurs develop innovative products that can achieve market booms.

Resource Usage Optimization

The resource optimization pillars include price product optimization, co-creation, personalization, and innovation.

1. Price Product Optimization

Price product optimization is maximizing the selling price of a product, so that with minimum materials you can create optimal production ([Jahed et al., 2022](#)). Competitive product selling prices are influenced by production costs, the lower the production costs, the more competitive the price will be, so the aspect in this indicator is supplier support. Supplier support plays a role in determining production materials both in terms of quality and price which of course will influence the price of green products.

"80% of our suppliers are from a well-known supplier in Sukoharjo. The reason is that they are close in the same region, and they also support local MSMEs."-Siti

This is confirmed in a study [Jahed et al. \(2022\)](#) that suppliers can be filtered through the

closest supplier sources with a good service approach because this will encourage entrepreneurs to build the best cost of production.

2. Co-Creation

Co-Creation is a product creation process between entrepreneurs and consumers as feedback to develop new products together and fill a better market (Mandolfo et al., 2020). Nicer markets are target markets that have never existed in the market before and are needed by consumers, through collaboration with other parties.

"I often discuss with customers to make ordered products because that is the key so that we are always close to customers and can produce good products. I know this theory, and I was given knowledge from lecturers who gave training and service here first"-Siti

In the study of Mandolfo et al. (2020). Niche market is a target market that has never existed in the co-creation product market, which is an effective solution for solving target market problems and innovation obstacles that are experiencing stagnation. Co-creation products are indeed formed to build markets that have never been thought of before.

3. Personalization

Personalization means that entrepreneurs are able to understand customer knowledge where each consumer is a different person, has fashion needs with different solutions (Chandra, 2022). Personalization requires entrepreneurs to know customer needs and desires through preferences obtained from customer data.

"I usually look for design references that are favored by certain circles or groups from Google. Then, I just propose the design to the person. I match the shape of her body well"-Siti

Understanding the concept of personalization is relevant to creating business sustainability, encouraging consumers to engage with design approaches that represent their character and personality.

4. Innovation

Innovation is a discovery in processes, methods and the creation of new products that have never existed on the market which are effectively used as a means to achieve competitive advantage. Apart from that, innovation is used to optimize the benefits of existing resources (Kelliher et al., 2020).

"The leftover fabric is what we used to make the jacket. Many people say that it doesn't look like it was made from scrap fabric. Every time we have a lot of leftover fabric, we always make jackets like this, so if it's a year, yes, it's quite a lot. We searched for designs on social media, more often Google Tap. This was also taught by the college lecturer"-Siti

Entrepreneurs in this context can improve methods through information search on the internet and social media in order to build the best price, this innovation is generally built through observation, imitation and mudification.

In the perspective of model B, business innovation is built with production efficiency, market deadlock in the business ecosystem is solved through co-creation product development, although

entrepreneurs also experience limited ideas, as well as public tastes that represent the growing market creating new demands and challenges to be met through the development of applied business technology that reaches all elements in the quadruple helix.

Sustain & Profit

Sustain is a business condition that is able to maintain conditions by staying alive and not losing money or going bankrupt. On the other hand, profit is the state of the company that is able to generate profit (George et al., 2023).

"This business is growing because orders are continuous and always available from regular customers, so the turnover per year can be more than Rp 100 million."-Siti

From this perspective, an innovation business is built with production efficiency, market deadlocks in ecosystem businesses are solved through the development of co-creation products, although entrepreneurs also experience limited ideas, and the tastes of the community that represent an increasingly developing market create new demands and challenges to be met through the development of applied business technology that reaches all elements in the quadruple helix.

Figure 1 is an image of the conceptual framework of Innovation in Fashion Entrepreneurship. The challenge faced by fashion entrepreneurship is how to survive in the increasingly tight industrial era. Entrepreneurs must observe information in the market and convert it into knowledge as a strategic material. Figure 1 is an innovation framework for fashion entrepreneurship that consists of 5 domains, namely (a) the entrepreneurial mindset, which is a strategic tool that can be used as the foundation for building fashion entrepreneurship.

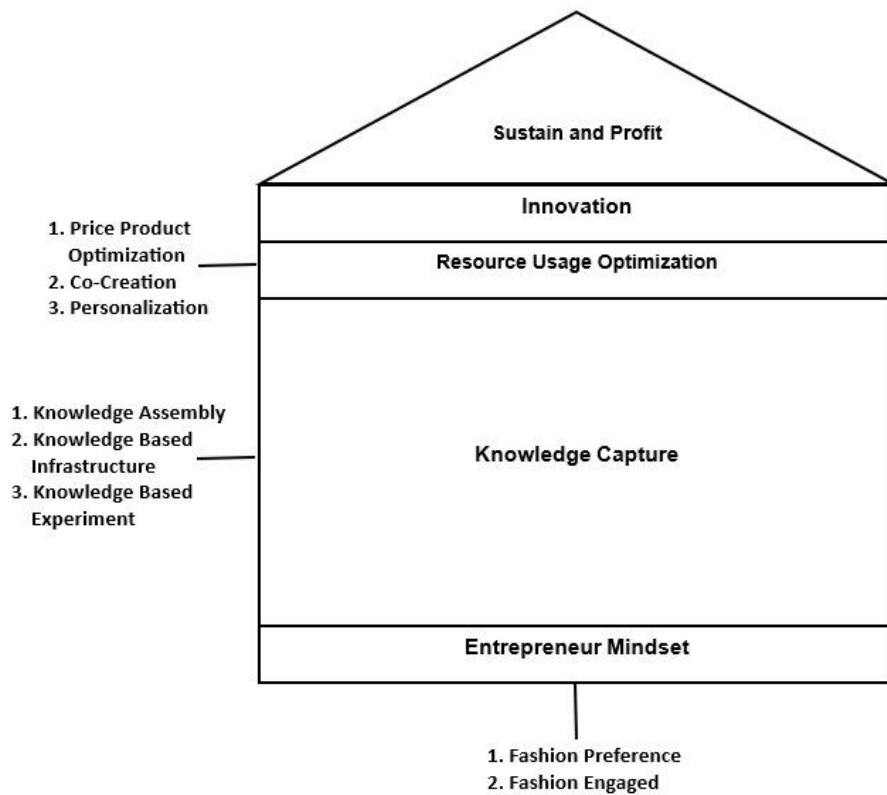


Figure 1. Framework for Building Innovation in the Fashion Industry

In building a sustainable fashion entrepreneurship, the main requirement is the fashion mindset of the entrepreneur as a decision-maker and direction determinant of the sustainability of entrepreneurship. The stronger the fashion mindset in entrepreneurship is, the more it affects his efforts in maintaining fashion entrepreneurship. Entrepreneurs who want to survive continue to innovate. This domain has two indicators, namely, fashion preference and fashion engagement.

(b) Knowledge capture refers to the process of capturing knowledge to optimize the resources owned to obtain innovation in fashion entrepreneurship. Internal and external factors must support the knowledge capture process. The support in question refers to the availability of access to information from external sources for the entrepreneur to gain knowledge. This domain comprises knowledge assembly, knowledge-based infrastructure, and knowledge-based experiments. Regarding external factors, the indicator of this domain is external knowledge access. (c) Optimizing the use of resources. This domain aims to reduce production costs by allocating resources according to needs and minimizing costs in the production activity process. To minimize these costs, entrepreneurs must be able to find more profitable alternatives and continue to innovate to create product innovations at competitive prices. Creating innovation requires a strong understanding of the market to recognize potential factors. This domain consists of three indicators, namely price product optimization, co-creation, and personalization. (d) Innovation, as the key to achieving sustain and profit. (e) Sustain and Profit is the pinnacle of entrepreneurship, where entrepreneurship is able to realize its business goals, such as being able to earn high profits while maintaining business sustainability.

University

Research

Research is the process of collecting, processing, analyzing a phenomenon to be used as problem solving or testing a hypothesis (Alaimo, 2022). Universities have an obligation to fulfill the three dharma of higher education, namely research and community service.

"Universities providing support to the fashion industry is also an obligation because it is included in the tri dharma of higher education, namely community service." -Lecturer

The university provides support in the form of research in technological development that empowers home tailors in their role as agents creating applied technological innovation.

Knowledge Transfer

Knowledge transfer is the transfer of knowledge possessed by academics to sectors that require this knowledge to increase knowledge of various aspects of the quadruple helix (Bacon et al., 2020).

"A university is a multidisciplinary knowledge agent. So whatever is needed in the world of society, the university or college is supporting." -Lecturer

The implication is that building applied technology requires multi-discipline in order to completely solve problems in society

Economic Sharing Development

Economic sharing has become an economic trend that builds a business ecosystem that enables broad economic empowerment in society (Wu et al., 2023). Universities are developing economic sharing by utilizing the latest technology to optimize business activity processes in the

fashion industry.

“Just like on campus, we develop virtual manufacturing chain implications that are relevant in industry 4.0, economic sharing that is related to the needs of the community related to the fashion industry.”-Lecturer

Virtual Manufacturing Chain is a concept for empowering home tailors that carries the theme of economic sharing. This concept is in line with the business-to-business development approach in the big concept of Industry 4.0. Based on the qualitative coding results of the interviews conducted with informants, 3 indicators were obtained that agree with the theories in the body of knowledge. The critical aspects governing the development of the overall indicators in line with the technical field are outlined in the table below.

Table 2. Critical Success Factors in University Sectors

Indicator	Critical Success Factor
Research	Universities are obliged to fulfill the three aims of higher education.
Knowledge Transfer	Transfer of academic knowledge to sectors that require such knowledge.
Economic Sharing Development	Universities are developing economic sharing strategies by using the latest technology.

Government

Regulation and Control

The government has the authority to establish regulations and controls for the sustainability of the fashion industry as stated in Minister of Industry Regulation Number 41 of 2020 concerning Implementation of the Indonesian National Qualifications Framework in the Field of Fashion Technology and Fashion Design (BPK, 2020). Supportive regulations and good control will increase the progress of the fashion industry.

“As for the policy itself, the training programs are intended for people or students from a work-ready age.”-Dinas

As for the policy itself, training programs are intended for people or students from the age they are ready to work.

Facilitating Collaboration

Collaboration is a form of government concern in building cooperation regarding what society needs, especially the fashion industry. The government facilitates fashion businesses to collaborate with the government as a form of support for the fashion industry.

“We support good collaboration with communities who especially want to develop in the industrial world, especially fashion, through the training we provide.”-Dinas

Apart from the collaboration built between the tailoring community and the Department of Industry, people affected by job layoffs due to the COVID-19 pandemic are going through structured programs such as pre-employment cards as a form of regulation and control.

Initiating Responsible Innovation

Innovation responsibility, where innovation requires ideas, ideas, access to finance and markets. In this concept, the government is present by providing support: training, funding and other needs for fashion businesses so that they continue to grow and develop.

"To support innovation, we conduct training for people of productive age to inspire continued growth. In addition to training materials, we have equipment. We also provide work clothes, sports facilities, transportation, and meals."-Dinas

Based on the results of qualitative coding from interviews with informants, 3 indicators were obtained, which agreed with the theories in the body of knowledge. The critical aspects for building the overall indicator in line with field techniques are outlined in the table below.

Table 3. Critical Success Factors of Government Sectors

Indicator	Critical Success Factor
Regulation and Control	Authority to establish regulations and controls for the sustainability of the creative industry.
Facilitating Collaboration	Facilitate fashion businesses to collaborate with the government.
Initiating Responsible Innovation	The government provides training, funding, and other resources to fashion businesses.

Civil Society

Costumer Engagement

The government provides training support, funding and other needs to fashion businesses (Ng et al., 2020), so that the customer experience will increase customer engagement.

"I use this tailor's service because I am a regular here, so I trust it."-Putri

In a study on fashion (Diputra & Yasa, 2021) brand trust will encourage consumer loyalty and customer engagement.

Consumer Preference

Consumers have preferences regarding fashion products that represent their lifestyle, where personalization of products encourages other users to have similar preference patterns and can be used as a reference recommendation (Chandra et al., 2022). Consumers' views about the fashion products they like, and are a source of information for fashion entrepreneurs to develop their businesses.

"In my opinion, the good ones are those who can keep up with changes in fashion."-Putri

The implication is that fashion changes are a challenge that is difficult to predict for entrepreneurs to follow existing fashion market trends, so that the potential for viral products in the future can be marked by recognizing changes in consumer tastes as consumer preferences.

Citizen Participation

The concept of Citizen Participation is a customer center that encourages community activity as consumers in expressing their opinions or desires (Kiss et al., 2022) in order to encourage results and zero complaints.

"I will clearly ensure that the custom product is comfortable wearing, fits the size, and is not hot."-Putri

This participation concept takes the form of the consumer's voice, which is in the concept of forward linkage relationships in the form of business to customer (B2C), which aims to encourage the creation of good consumer service and customer satisfaction.

Personalization

Consumer personalization is one way to see someone's fashion life style according to their characteristics and personality (Chandra et al., 2022) Personalization often refers to primordial product needs.

"I usually follow what's on social media, bro. This is a model like this. It's good, so I would like this. That is all, really."-Putri

Personalization in many studies refers to lifestyle, character, personality which determines fashion needs, so that it is in line with the growing study trend, in the form of specific custom order needs which is an unexplored market gap.

Co-creation

Co-creation is building a joint product between an entrepreneur and consumers, where the product becomes a new market because it solves specific consumer needs (Mandolfo et al., 2020). Consumers collaborate through discussions with fashion entrepreneurs to create the desired products.

"For orders, we still ask directly. I discussed with the tailor what kind of model I wanted, and later I was directed to see how good it would be."-Putri

In many needs studies this refers to feedback from consumers, in the form of custom orders where the product concept can be commercialized in a specific market segment. Based on the results of qualitative coding from interviews with informants, 5 indicators were obtained, which agreed with the theories in the body of knowledge. The critical aspects for building the overall indicator in line with field techniques are outlined in the table below.

Table 4. Critical Success Factors in the Civil Society sector

Indicator	Critical Success Factor
Customer Engagement	Consumers have ties to products, services, and brands that they trust.
Consumer Preference	Consumers' views about the fashion products they like.
Citizen Participation	Activeness of the community as consumers in expressing opinions and desires
Personalization	One way to see someone's characteristics.
Co-creation	Collaboration to create new products.

In line with the perspective of the quadruple helix theory, the theoretical implications for building national innovation fashion are that the industrial element must build a mindset,

resources, and knowledge, the university element must build innovation breakthroughs in the form of an applied business system on economic sharing, in the community element that represents the market, there needs to be an innovation approach that acquires collaboration and personalization, while the government encourages an adaptive climate that facilitates investment and infrastructure. The above explanations are summarized in a framework for the role of the Quadruple Helix as follows:

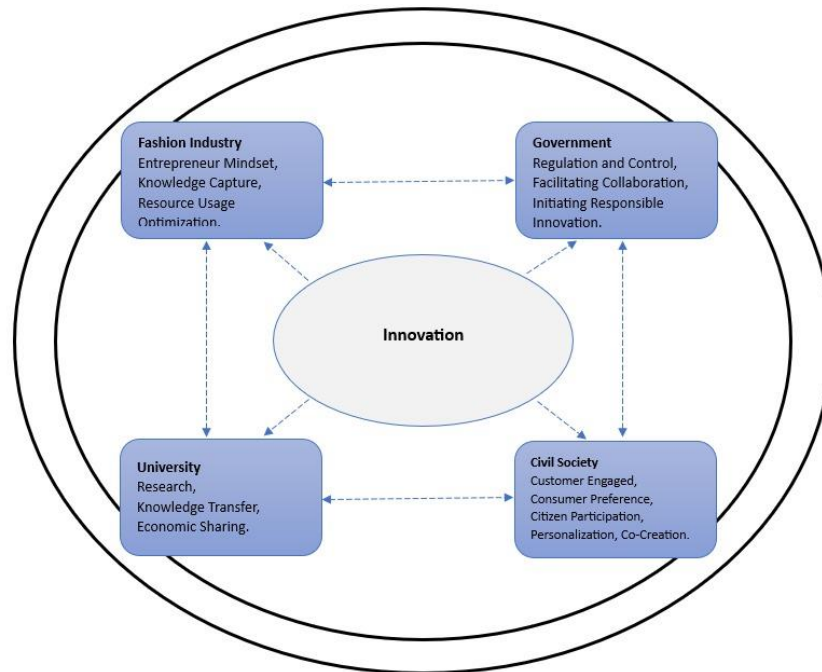


Figure 2. Quadruple Helix Model

CONCLUSIONS

This research succeeded in identifying factors that encourage innovation in the fashion industry so that it can continue to survive and develop through the support of the role of the quadruple helix. The theoretical contribution of this research is to fill the body of knowledge in quadruple helix innovation theory by building a framework that explains the role of sectors in the quadruple helix, which includes the roles of industry, universities, government and civil society. The managerial implications emphasized in this study include: first, the entrepreneurial mindset fashion where mindset is the basis for entrepreneurs acting is related to their responsibilities as people who play a role in making decisions and strategies in entrepreneurship so that in creating new innovations it will work if the entrepreneur has a strong mindset. Second, fashion entrepreneurs should collaborate with customers, such as discussing making clothes, trousers, or other events, to gain new knowledge so that fashion entrepreneurship can be sustainable. If the company can sustain and develop, it will impact employment. Third, the development of economic sharing by universities must be continued and supported by all sectors in the quadruple helix because it can be a potential forum for absorbing labor.

LIMITATION & FURTHER RESEARCH

The limitation of this study is that it is a cross-sectional study; thus, its findings are only valid for the specific period in which the research was conducted. The qualitative approach used in this research, which focuses on building a framework for the quadruple helix model and an innovation framework in fashion entrepreneurship, provides insights into how fashion businesses adopting the quadruple helix model survive and thrive. However, this framework and its findings are not

tested over time. Future research should consider longitudinal studies or quantitative research methods to confirm and expand upon these findings and evaluate the long-term impact and generalizability of the quadruple helix model in the fashion industry.

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