DIGITAL TRANSFORMATION THROUGH BUSINESS MODEL INNOVATION：AN EXPLORATORY CASE STUDY IN JEWELRY INDUSTRY

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Abstract - The ongoing global Covid-19 epidemic has brought an incalculable impact on various industries. Digital transformation is urgent for the jewelry industry which dominated by traditional business models for a long time. At the same time, digital transformation through business model canvas of jewelry enterprises has both theoretical and practical significance.This study adopts an exploratory case study as well as time series analysis to analyzethe digital transformation strategies of benchmark enterprises in China's jewelry industry. Business model canvas isadopted as an analytical tool to explore business model innovation and nine elements are applied to explore how jewelry enterprises conduct digital transformation in such a competitive environment. Important milestoneevents in the selected enterprisesare analyzed as research samples, and different elements in the business model canvas exhibit different characteristics in each development stages of the jewelry enterprises. Finally, this study summarizes the business model innovation of the jewelry industry andconcludes strategies of digital transformation. In the theoretical contribution, this study further developed business model canvas as a tool in digital transformation. In addition, it provides an innovativeway to analyze digital transformation and business model innovation in jewelry industry.

Keywords - Digital Transformation, Jewelry Industry, Business Model Canvas, Business Model Innovation

I. INTRODUCTION

The black swan of world epidemic affects different industries worldwide, and industry digital reform is imminent.The personalized and fashionable characteristics of jewelry industry require additional factors such as culture and emotion which are not suitable for mass production. Therefore, the concept of terminal manufacturing will gradually form the future manufacturing.Manufacturing factoriesmay continuously carry out process research, creativity, and design to form a collectionof jewelry products and exhibitthem in the store. The marketingperformance of digital stores that have undergone digital transformation is much better than that of ordinary stores. The digital anti-epidemic has also brought into its advanced advantages, such as the conversion of offline business to online mini-program orders. Emerging industries represented by digital technology are breaking through the walls of traditional industries in an all-round way, and the digital age of the jewelry industry is coming.

As the global regulatory landscape evolves, digital technologies increase the transparency and accountability of businesses (George &Schillebeeckx, 2022). Successful digital transformation requires organizations to develop diverse and broad capabilities, the importance of which will vary depending on the business context and organizational needs (Reis et al., 2018). In our broader definition, a business model refers to the way in which a single organization or network collaborates at the strategic and operational levels to provide and leverage products and services (Bouwman et al., 2019).Digital transformation requires companies to rethink and innovate their business models (Bouwman et al., 2019).

Although several frameworks have been developed in previousresearch, most the understanding of business model innovation is still limited (Ramdani et al., 2019). For instance, some research neglected elements and/or activities that could explore alternative business models (Sinfield et al., 2012; Chatterjee, 2013; Dmitriev et al., 2014). Other frameworks ignore value proposition (Zott and Amit, 2010), value creation (Dmitriev et al, 2014) and/or value capture (Sorescu et al, 2011).The business model strategy practice is defined as the activities and working methods of the team responsible for the experimental process (Bouwman et al., 2019). The increasing relevance of business models to practice has led scholars and to propose several avenues to support business model innovation. A popular tool is the Business Model Canvas, which provides a generic business model template obtained by enumerating and visualizing the nine key components of a business model (Massa & Tucci, 2013;Mansour &Barandas, 2017). Previous studies on digital transformation lacked exploratory and in-depth research on business model innovation in the jewelry industry. More, the application of the business model canvas as a tool for analyzing companies in the jewelry industry is almost blank.

The following sections review empirical literature on digital transformation, business model canvases, and business model innovation. In Chapter 3,an exploratory case study approach is used to summarize and analyze digital transformation events in two

benchmark jewelry companies, as well as the development of data collection processes and measures. Chapter 4 presents the results of the case studies through the present of business model canvas. Chapter 5 outlines the conclusions of this study and its contributions, limitations, and considerations for future work.

II. LITERATURE REVIEW

2.1. Digital transformation

Digital transformation is defined as the use of new digital technologies, such as social media, analytics, or embedded devices, to achieve significant business improvements (Fitzgerald, 2014). Previous research has proposed several concepts to label digital transformation, includingdigitalization, digitation, which boundaries are not clear (Reis et al., 2018).Digital transformation is not just about digitizing resources, but about creating value and revenue through digital assets (McDonald & Rowsell-Jones, 2012). The definition of digital transformation can be summarized into three distinct elements, including technology, organization, and social, and almost all these topics are used in researchers' definitions of digital transformation (Reis et al., 2018). Digital transformation strategies share some common elements, which can be divided intofour basic dimensions, including the use of technology, changes in value creation, structural changes, and financial aspects (Matt et al., 2015). Digital transformation is not just about optimizing internal processes or integrating new technologies, but more about fundamentally changing a company's business model (Loebecke& Picot, 2015).

2.2. Business model canvas

In the previous research on the business model canvas, only very limited literature provided its use as a strategy for coping with COVID-19. Business model canvas was first proposed by Alexander Osterwalder and Yves Pigneur (2010), which provides a toolto analyze the revenue and cost components of a company. Business mode canvas is simple and intuitive without oversimplifying the complexities associated with corporate functions (García-Muiña et al., 2020). The business model canvas includes nine modules, including key partners, key activities, key resources, valueproposition, customer relationships, customer segmentation, channels, cost structure, and revenue streams (shown in Fig.1). They describe the logic of how the company expects to generate profits. At the heart of the business model canvas is the value proposition, which explains why customers choose the company and the benefits the company creates for customers (Massa et al., 2017).Moreover, it enhances the understanding on how they relate and support each other to achieve goals and provides a benchmark against best practices (Boroh, J., 2021). In addition, thebusiness model canvas provides a common framework and set of guiding principles for developing and redeveloping business models (Carter & Carter, 2020).The business model canvas is represented as a triangle with the customer (who) at the center (Gassmann et al., 2020). The three corners are the value proposition (what), the value chain (how), and the profit mechanism (why), and they are on the corners of the triangle because modification of one of the three aspects requires modification of the other two (García-Muiña et al., 2020). The business model canvas has become the focus of a large amount of academic research, and it is used as a tool for developing new business modelling or as a basis for reassessment and interpretation of specific contexts(García-Gutiérrez & Martínez-Borreguero, 2016; Carter & Carter, 2020).

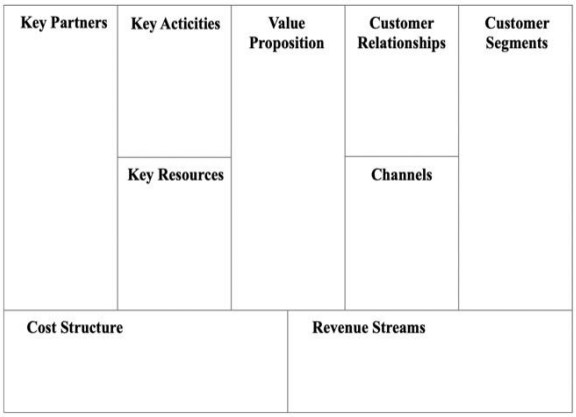

Fig.1. Business Model Canvas Elements

2.3. Business model innovation

Business model innovation is critical to company survival, source of competitive advantage, and company performance (Casadesus-Masanell and Zhu, 2013; Ramdani et al., 2019). Previousresearch has used resource-based perspectives and well-established theories such as transaction cost economics to conceptualize business model innovation (Al-Debei& Avison, 2010; DaSilva &Trkman, 2014; Ramdani et al., 2019). Based on an active systems perspective, the design themes that describe the sources of value creation and the design elements that describe the architecture to develop innovative business models (Zott & Amit, 2010). From the perspective of dynamic capabilities, business model innovation is conceptualized as a unique dynamic capability, which is the ability of a company to sense opportunities, seize opportunities by developing valuable business models, and reallocate the company's capabilities and resources (Mezger, 2014; Ramdani et al., 2019).Business model innovation can cover various aspects: (1) value creation innovation (2) new proposition innovation (3) value capture innovation (Clauss, 2016).

Business model innovation sees business models rather than products, services, or processes as the subject of innovation (Baden-Fuller &Haefliger, 2013; Sorri, et al., 2019).

III. METHODOLOGY

3.1. Research method

This study presents an exploratory multi-case study analysis of two benchmark companies operating in the jewelry industry which differ in market share, organizational structure, and firm size. Multiple case study analysis can answer “how” and “why” questions, which is suitable for cross-case comparison (Yin, 2003; Chiesa et al., 2007). Moreover, this study focuses on the adoption of the "Business Model Canvas" as a method for analyzing business model innovation and transformation. And it will identify the important elementswhich may affect company's digital transformation, such as technology. Following the data collection method proposed by Eisenhardt (1989), this study collected in-depth interviews and secondary data, which allowed us to further form the database needed for the research.

3.2. Introduction of cases

This study selects Chow Tai Fook (Holding) Limitedand Guangdong CHJ Industry Co. Ltd. as research objects. The reasons are as follows. First, the case study aims to answer the "how" question, while this study aims to analyze the principles of business model innovation in the era of digital transformation. Combining time series analysis and company life cycle, this research summarizes the development of the two research case companies into four stages, including the start-up stage, growth stage, maturity stage, and digital transformation stage (Fig.2). And further analyze the nine elements through the business model canvas, selecting important milestones in the company's development stage, and analyze the company's digital evolution.The detail introduction of Chow Tai Fook and CHJ Jewelry are as follows.

Chow Tai Fook

Chow Tai Fook is one of the most famous jewelry companies in Hong Kong. Founded in 1929, it has a history of more than 90 years, and its products are trusted and loved by consumers. Over the years, Chow Tai Fook's retail network in Greater China, Japan, Korea, Southeast Asia, and the United States has grown rapidly and has more than 4,800 retailstores worldwide. Chow Tai Fook has been vigorously developing e-commerce, integrating smart retail technology and omni-channel retailing into the jewelry shopping experience, and strive to grow in a rapidly changing market. In addition, Chow Tai Fook has also enhanced its online shopping services, allowing customers to place orders online, pick up in store, and connect online orders with brick-and-mortar stores and its e-commerce platform. Chow Tai Fook Jewelry continues to achieve many important milestones such as digitalization andenforce to develop the Chinese mainland market. It keeps pursuing a culture of innovation, such as the implementation of the "Smart+" strategy, focusing on innovation, technology,and sustainable development to create a seamless customer experience.

CHJ Jewelry

CHJ Jewelry was founded in early 1997, which is the first domestic jewelry brand in China with fashionable jewelry inlaid with K gold diamonds and plain gold as its core products. The main consumer groups are fashionable women. Its shareholding structure is stable, and the founder Liao Muzhi is the actual controller. With the 21 years continuous development, the firm performance has grown steadily, but the company's revenue growth has been slow down from 2014. Affected by the Covid-19 pandemic in 2020, the company's revenue fell by 9.24%, but there are signs ofimprovement in 3Q/4Q20, and the revenue growth rate has changed from negative to positive.By 2020, The company has perfected the digital management system, opened the national direct sales + franchise inventory/members/transaction data through the cloud store system, helped franchisees achieve good store management and operation, and optimized the franchise management system.

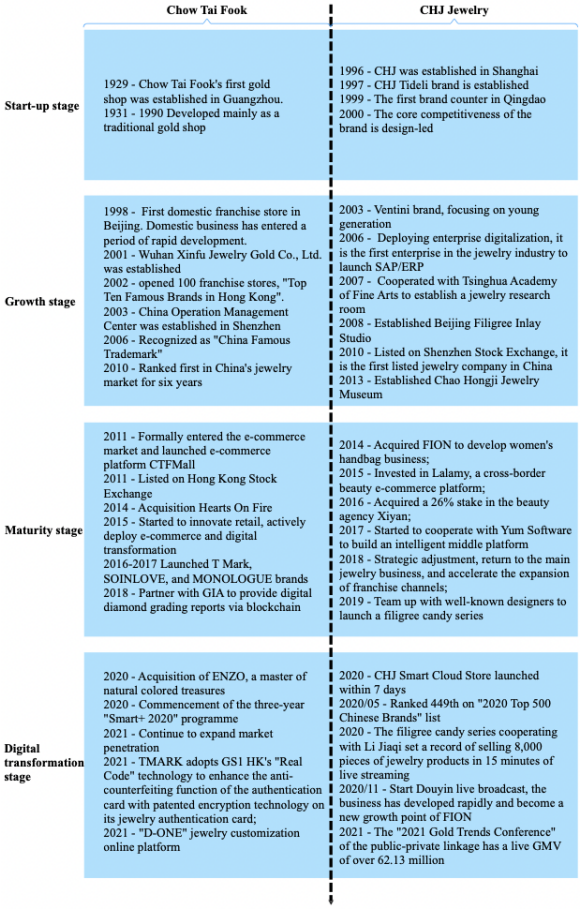

Fig.2.Four stages of case firms

3.3 Data collection and analysis

This studyis based on in-depth interviews with senior executives at two jewelry companies between September 2000 and September 2021. In the selection

stage of interviewee, we make sure all of them can understand company digital transformation and business model innovation strategies and have decision-making power. Each interview lasts at least 1 hour. After the interview, the relevant interview records were carefully compiled and organized. The collection of data includes four ways: 1. Interviews with the chairman, board members, and middle and senior managers by follow-up emails, communication App records, and telephone interviews. 2. Real-time internal observation within the company (headquarters building, digital exhibition lab) 3. Internal company documents (business plans or strategicreports) 4. Archive data includes company websites, news reports, published journals and other databases. The diversity of the data enhances the accuracy of inferences and reduces retrospective bias. Detailed information is shown in Table I.

Categories	Sources	No.	Coding
1.	Chow Tai Fook		
In-depth interview (CT)	Chairman	*3*	CT-1
	Board members	5	CT-2
	Middle and senior managers	14	CT-3 to CT-6
Internal observation (HI)	Chow Tai FookHeadquarters	4	HI-1
	Digital Exhibition Lab	3	HI-2
Internal documents (OD)	Business plans	15	OD-1
	Strategic reports	22	OD-2
Archive data(WA)	Official website	25	WA-1
	News reports	38	WA-2
	Published journals and magazines	18	WA-3
	Other databases	9	WA-4
2.	CHJ Jewelry		
In-depth interview (HT)	CEO	*2*	HT-1
	Board members	4	HT-2
	Middle and senior managers	16	HT-3 to HT-6
Internal observation (JI)	Chow Tai Fook Headquarters	2	JI-1
	Digital office	2	JI-2
Internal documents (ED)	Business pan	21	ED-1
	Strategic reports	13	ED-2
Archive data(RA)	Official website	31	RA-1
	News reports	27	RA-2
	Published journals and magazines	20	RA-3
	Other databases	14	RA-4

Table I: In-depth interview of jewelry enterprises

Continuing to conduct in-depth interviews with the two case firms, a total of 30 interview surveys were conducted, with 6,680 datasets were screened and categorized in 6 times. Finally, 112 pages of documents were collected. Table II shows that different companies' members are invited to attend the interviews and they are from different departments and positions. This study pays more attention on people of digital exhibition lab and the heads of the digital office in the two jewelry companies tocollect more data and strengthen the understanding of the digital transformation of the company.

Interviewee	Length	Times	Coding
1.	Chow Tai Fook		
Chairman	60	3	CT-1
Board members	90	5	CT-2
Senior vice president	150	2	CT-3
Technical specialist	180	3	CT-4
Digital exhibition labmanager	180	5	CT-5
Other staffs	120	4	CT-6
2.	CHJ Jewelry		
CEO	60	2	HT-1
Board members	120	4	HT-2
Senior vice president	90	3	HT-3
Technical specialist	120	4	HT-4
Digital office manager	180	4	HT-5
Other staffs	120	5	HT-6

Table II: Data collection and coding

3.4 Reliability and validity

This study adopts the following methods to ensure reliability and validity. First, dataset is formed through different sources which is mainly interview data and events related to digital transformation as well as business model innovation in two jewelry companies. By this way, a unified and meticulous database is established with sufficient evidence chain. Secondly, after the normative case report is formed, the interviewee is contacted again by email, and the research results are double checked toensurethe validity and authenticity of the evidence. Thirdly, a case study database is established to convert enterprise interview data and internal files, and convert video, audio materials into text files and encode the data to present the coding results more objectively. Finally, in the process of data analysis, the abstraction of the theory is enhanced through repeated induction and iteration between the collected databases.

IV. CASE STUDY AND DISCUSSION

Thisexploratory case study mainly includes the following steps. First, according to the original data, this study analyzes how each case company adopts digital technology to design products and services and carry out business model innovation in the context of digitalization.Second, in the discussion part, it is based on the business model canvas to make contrast analysis and compare the similarities and differences of the business models of the two

companies follow before (Fig.2) and after (Fig.3) the digital transformation, and then constantly compare with existing theories. Finally, innovative, and reasonable transformation strategies for the jewelry industry are summarized.

4.1 Business model canvas before digital transformation

Chow Tai Fook is the top enterprise in China jewelry industry in terms of operating income, which is the representative of Hong Kong-funded enterprises. From raw material procurement to sales, Chow Tai Fook responds to changing market conditions with a flexible business model leading the jewelry industry.From the perspective of business layout, sales network layout, business model structure and operating performance, Chow Tai Fook is a leading enterprise in China's jewelry industry.Chow Tai Fook started jewelry business in 1929; opened the first retail point in mainland China in Beijing in 1998; Chow Tai Fook was successfully listed on the main board of the Hong Kong Stock Exchange in 2011. During the past century of development, Chow Tai Fook has continued to expand its jewelry business layout through acquisitions and other means. Chow Tai Fook has extensive professional experience in polishing rough stones into brilliant diamonds. It has an automated diamond polishing process, which helps to improve processing efficiency and accuracy. Chow Tai Fook is one of the few diamond experts in the industry who can have hundreds of automatic polishing machines and advanced laser cutting technology.Under the development strategy of "mutual promotion by domestic and international dual circulation", domestic demand will continue to be the driving force for consumer demand and the growth of the overall economy, and the momentum of consumption upgrading will continue.

The choice of business model is a crucial step in business operation. There is no uniform standard for a successful business model, and it is not uncommon for different business models to succeed in the same field.CHJ's business model before digital transformation focus on deepening in strategic markets and enter second and third-tier cities. The competition of China's jewelry industry in the first-tier cities is showing an increasingly fierce trend, and the occupation of the second and third-tier cities is the development direction of the brand sellers. From the perspective of the industry, the future development trend of the competition pattern of the jewelry industry will show that the industry concentration will gradually increase, the market will gather towards well-known brands, and the process technology and sales network will become the core of competition. The second is increasing the speed of store expansion and the construction of organizational capabilities. The company takes "strengthening and strengthening the CHJ brand, building a multi-brand portfolio, and a multi-angle and multi-level development pattern" as a strategic measure. CHJ jewelry has always focused on improving the performance of a single retail store and achieved obvious performance. Continue the relevant measures to improve the performance of a single retail store, through classified management, defend core stores, develop potential stores, cultivate new stores, and take differentiated measures for stores at different stages and sustained profitability.

	Chow Tai Fook	CHJ Jewelry
Key Partners	Upstream gem raw material suppliers / Jewelry retailer / Wholesale supplier	Jewelry Wholesale / Gold processing suppliers / Up-stream material suppliers / Fine Arts Academy
Key Acticities	Raw materials procurement and processing, sales gems and other products	Gold and color jewelery sales
Key Resources	Diamond processing factory / Advanced equipment / Automatic grinding machine / Diamond expert	Jewelry design and mosaic craft / Jewelry Processing Factory / Designer team / ERP system
Value Proposition	Provide diversified brands and products	Originality drives differentiation
Customer Relationships	Shopping guide / Customer care / Marketing activities / After-sales service	Multi-brand combination / After-sale service / Marketing activities
Customer Segments	Downstream retail store customers	Second, three-tier city customers / Color jewelry buyers
Channels	Advertisement / Department store / Direct sale / E-commerce platform / Offline franchising	Department store / Direct retail store / Offline franchising
Cost Structure	Raw materials procurement costs / Retail store operating costs / Labour costs / Brand management costs / Advertisement cost	Sales cost / Management cost / Store decoration cost / Production cost / Labour cost
Revenue Streams	Franchising income / Retail store income	Jewelry online retail Income / Handbag retail income / Offline franchise income

Fig.2. Business model canvas before digital transformation

4.2 Business model canvas after digitaltransformation

Chow Tai Fook has been committed to developing e-commerce, integrating smart retail technology and omni-channel retailing into the jewelry shopping experience. SD-WAN managed service to speed up Chow Tai Fook's network deployment and increase its agility. The platform provides Chow Tai Fook with efficient cloud access, which can effectively utilize network resources by offloading non-critical applications to the Internet, thereby reducing network costs.Chow Tai Fook creates a unique and seamless customer experience for customers, integrating online and offline experiences, installing self-service experience service cloud counters in more than 2,000 branches, allowing customers to place orders online and pick up goods offline. The Group launched the "Smart+" strategy, focusing on innovation, technology, and sustainable development to create a seamless customer experience. And launched TMARK diamonds, allowing customers to trace the life journey of diamonds from procurement to production. T MARK also uses GS1 HK's "real code" technology to enhance the anti-counterfeiting function of the authentication card with patented encryption technology on its jewelry authentication

card. All diamond information obtained is completely true and correct. The first application of blockchain technology to provide customers with a secure digital diamond identification certificate. Chow Tai Fook is committed to intelligent production and customer-oriented continuous innovation. With the customer-driven manufacturing (C2M) business model, customers can make personalized jewelry through the D-ONE jewelry digital customization platform. In addition, customers can use the D-ONE WeChat applet to select diamonds and setting styles. Coupled with automatic logistics and distribution centers, jewelry products can be more distributed to customers.

The jewelry industry is highly dependent on user experience and brand services. With the sudden outbreak of the epidemic, CHJ, supported by digital operations, has developed user value maximization, extreme experience, and efficiency, and built its core capabilities. CHJ began to cooperate with Yum Software to build the middle platform as early as 2017. During the epidemic, CHJ has made a keen transformation, accelerated the realization of retail digital layout, and won with efficiency. Build the application architecture of the front, middle and backstage, and the middle-stage service layer serves the front-end applications through the distributed service framework. Form a unified collection of commodity master data, inventory management center, order processing center, promotion and price center, member management center, and warehousing logistics center, centrally manage a unified view, create an efficient supply chain, realize global inventory sharing, and improve enterprise operation efficiency.

	Chow Tai Fook	CHJ Jewelry
Key Partners	Reputable suppliers such as De Beers and Rio Tinto / Live commerce Web celebrity	Raw matarial suppliers / Third-party software supplier /
Key Acticities	Smart production / Constant customer-focused innovation	OTO Jewelry retail / Retail digital layout / Customized design and manufacturing
Key Resources	RFID-enabled Smart Trays/ Dedicated Data Intelligence Space / Strong omni-channel retailing capabilities / State-of-the-art polishing and manufacturing	An efficient supply chain / Inventory sharing platform / Payment settlement system for cross-channel fusion
Value Proposition	Value, Quality, Knowledge and Convenience	User value maximizes, ultimate experience and efficiency
Customer Relationships	Customisation platform D-ONE / D-ONE WeChat mini program	Cleaning of the jewelry / Maintenance / Change / Repair / Saha Ferration Recycling / Rental
Customer Segments	Diamond and fine jewellery segments / Private label offerings / Online and offline customers	Online and offline jewelry buyers
Channels	Global wholesale jewellery business hub / Live commerce / Digital Membership Program	Offline store / Virtual stores / Online shop/ Traditional media / Self media / New media / E-commerce media
Cost Structure	R&D cost / Manufacturing cost / Digital innovation cost / Operational cost / Labour cost	Software maintenance cost / Operational cost / Labour cost / Marketing cost
Revenue Streams	Online and offline retail income / Franchise income	Jewelry sales revenue / Maintenance revenue / Replacement revenue / Recycling revenue / Rental revenue

Fig.3. Business model canvas after digital transformation

V. CONCLUSIONS

The purpose of our study is to explore the Business Model Canvas to analyze the possiblefactors influencing digital transformation and business model innovation in the jewelry industry, thus laying the foundation for future research. By adopting a multi-case study method, this study can draw some inspirations for the development of academia and the jewelry industry from the changes of the nine elements of the business model canvas before and after the digital transformation of Chow Tai Fook and CHJ jewelry companies, based on the relevant data collected such as the eventsof digital transformation.

Finally, this research draws from the case study of the Business Model Canvas to three studies that impact a company's digital transformation: technology, organization, and customer (Fig. 4). This is consistent with the research of Hrustek et al. (2019), and the drivers of digital transformation arise from trends in the organization itself or in its environment. Moreover, this model might be applicable to businesses in the jewelry industry, categorizing the business model canvas into these three categories based on the degree of impact by digital transformation. In addition, each of these three factors is interdependent, as previous research on the Business Model Canvas has shown that just as the nine elements are interrelated, modifying one of them affects the others as well (García-Muiña et al., 2020). However, these demonstration needs to be explored in detail for the future research.

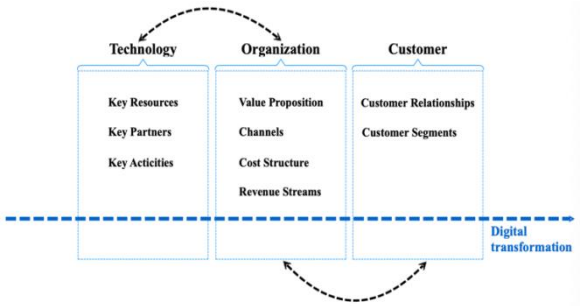

Fig.4. Conceptual model of digital transformation through business model canvas

Obviously, the digital transformation of enterprises has become inevitable with the development of digital technology. Jewelry enterprises cooperate with omni-channel digital solution service providers to accelerate digital transformation and committed to providing better services for consumers in the industry, so as to seize more opportunities in the future.

The study also has limitation. This study analyzes the transformation of business models for two jewelry company cases in China. More samples are needed for future research to analyze the digital transformation and business model innovation of the jewelry industry around the world.

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