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The impact of digital technologies on urban community resilience - An empirical study of Chengdu city

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Doctor of Management

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May, 2023

BUSINESS
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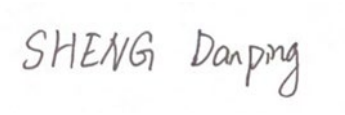
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SHENG Danping

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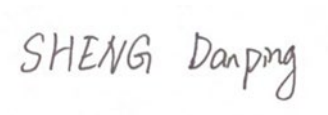


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Abstract

A goal of building modern smart communities is to enhance community resilience, which refers to the ability to respond to unexpected hazards or events and learn to recover after an event, through the use of digital technologies such as big data, cloud computing, blockchain, the Internet of things (IoT), artificial intelligence, and 5G. However, there is a significant gap in knowledge regarding the association between digital technologies and community resilience. This thesis aims to fill this gap to explore the processes and mechanisms underlying the impact of digital technologies on community resilience. To the best of our knowledge, this is the first empirical study to examine the influence of digital technologies on community resilience. Data was collected from 912 communities located in seven major urban areas in Chengdu, Sichuan province. Data was collected and analyzed using survey questionnaires, structural equation modeling, and qualitative comparative analysis. The results indicate that digital technology positively impact community dynamic capability, community social support, and community social capital, which in turn significantly positively affect community resilience. Community technological opportunism positively moderates the effects of digital technology on community dynamic capability, community social support, and community social capital. Moreover, the results suggest that the influence of digital technology on community resilience may vary according to community characteristics such as community size. This study makes significant theoretical contributions to community administration, digital technology, technological opportunism, social capital, and social support theory.

Keywords: community resilience; digital technology; technological opportunism; dynamic capabilities; social support; social capital;
JEL: M00, M1, M15

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Resumo

Aumentar a resiliência das comunidades (ou seja, a sua capacidade de responder a perigos ou eventos inesperados e aprender e recuperar após um tal evento) através de tecnologias digitais como big data, cloud computing, blockchain, Internet of Things, inteligência artificial e 5G tornou-se um dos objetivos de construir comunidades inteligentes modernas. No entanto, há pouca investigação sobre a associação entre as tecnologias digitais e a resiliência das comunidades. Para preencher este gap, o objectivo desta tese foi explorar os processos e os mecanismos inerentes ao impacto das tecnologias digitais na resiliência das comunidades. Tanto quanto sabemos, este é o primeiro estudo empírico a examinar a influência das tecnologias digitais na resiliência das comunidades. Este estudo recolheu dados de 912 comunidades localizadas em 7 grandes áreas urbanas em Chengdu, na província de Sichuan, através de um questionário. Equações estruturais e análise comparativa qualitativa foram usados para analisar os dados. Os resultados da modelagem da equação estrutural mostram que a tecnologia digital tem um efeito positivo significativo na capacidade dinâmica da comunidade, no apoio social comunitário e no capital social comunitário, respetivamente. A capacidade dinâmica da comunidade, o apoio social comunitário e o capital social comunitário têm um impacto positivo significativo na resiliência da comunidade. O oportunismo tecnológico comunitário modera positivamente os efeitos da tecnologia digital na capacidade dinâmica da comunidade, no apoio social comunitário e no capital social comunitário. Além disso, os resultados da análise de heterogeneidade mostram que a influência da tecnologia digital na resiliência da comunidade pode variar de acordo com as características da comunidade.

Palavras-chave: resiliência comunitária; tecnologia digital; oportunismo tecnológico; capacidade dinâmica; apoio social; capital social

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摘要

通过大数据、云计算、区块链、物联网、人工智能和 5G 等数字技术，增强社区韧性（即应对危险或突发事件并在此类事件后学习和恢复的能力），已成为建设现代智慧社区的目标之一。但很少有研究表明数字技术与社区韧性之间的联系，为填补这一空白，本文目的是探索数字技术对社区韧性影响的过程和内在机制。据我们所知，这是第一个检验数字技术对社区韧性影响的实证研究。本研究收集了位于四川省成都市 7 个主要城市地区的912个社区的数据。采用调查问卷、结构方程模型和定性比较分析来对收集的数据进行分析。结构方程模型的结果显示，数字技术对社区动态能力、社区社会支持和社区社会资本分别有显著的积极影响。社区动态能力、社区社会支持和社区社会资本对社区韧性有显著的积极影响。社区技术机会主义正向调节了数字技术对社区动态能力、社区社会支持和社区社会资本的影响。此外，异质性分析的结果显示，数字技术对社区韧性的影响可能因社区特征而异。这项研究对关于社区治理、数字技术、技术机会主义以及社会资本和社会支持理论的文献做出了理论贡献。

关键词： 社区韧性；数字技术；技术机会主义； 动态能力；社会支持；社会资本

JEL: M00, M1, M15

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List of Abbreviations

DT	Digital Technology
CTO	Community Technological Opportunism
AUC	Area under Curve
CDC	Community Dynamic Capability
CSS	Community Social Support
CR	Community Resilience

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Chapter 1: Introduction

1.1 Research background

With the increasing maturity of technologies such as artificial intelligence, big data, and the Internet of Things, the construction of smart cities has swept China since 2020 (Kummitha, 2020). A smart city is a technologically modernized urban area that uses various digital methods, linguistic recognition techniques, and sensors to collect structured and unstructured data from multiple sources, including citizens, devices, buildings, and assets (e.g., macroeconomic database, financial information database). The information obtained from the processing and analysis of these data is used to effectively manage assets, resources, and services, thereby improving the overall operation of the city (J. B. Anthony, 2020; Muhammad et al., 2021). A smart city uses information and communication technology (ICT) to enhance operational efficiency of government management, share information with the public, and provide better quality government services and citizen welfare. The use of ICT technologies plays a decisive role in the construction of smart cities. These technologies "sense" the operation of the entire city, collect data on the operation of different entities in the city, and analyse and process these collected data using efficient algorithms and powerful servers. The ultimate goal is to create an ecologically friendly environment, promote healthy industrial development, improve government management efficiency, and increase citizen happiness (J. B. Anthony, 2020; Muhammad et al., 2021). The level of intelligence of a city is an important reflection of its level of development and competitiveness (A. P. Wang et al., 2021).

Smart cities and their associated information and communication technologies (ICTs) offer great promise in disaster-related work. The term "community" and its related terms have become the default terminology in the field of disaster risk-related work. However, in practice, there are still significant challenges as the concept of "community" is vague and there are differences in how communities are defined by various studies (F. X. Zhang, 2022). At the beginning of the COVID-19 outbreak, the Chinese government at all levels implemented standardized preventive measures, including closed-loop management, which involves a point-to-point docking management approach that are designed to minimize the risk of infection and spread of the virus. This means that, apart from personnel with full-body protection (e.g.,

implementation of social distancing, mask-wearing), there should be no contact with anyone else and no social activity, and household quarantine should be observed. In fact, a smart community is the spot, line and area that constitute a smart city, and is one of the key elements in the development of a smart city. Traditionally, defining a community has not always been easy. However, in the context of COVID-19 pandemic, the once vague concept of "community" became clearer. Considering the specific administrative divisions of the country, and with reference to F. X. Zhang (2022) definition of community, which is regarded as the basic unit of the city. Neighborhood committees were the basic unit of community for implementing household quarantine orders, which was a top-down government management approach. Checkpoints were set up at neighborhood committees' entrances to restrict people from leaving. These measures created a relatively static situation, making the geographic boundaries of communities clearer. Therefore, this thesis uses neighborhood committees as research object, which is an autonomous organization of residents' self-management. And, community resilience refers to the ability to respond to unexpected hazards or events and to learn to recover after such events have occurred.

Community is regarded as the basic unit, area or organization of the city, is also the "last kilometre" of urban refinement administration to overcome (Betancourt & Vivier, 2021) (see Figure 1.1). Urban refinement administration refers to the comprehensive use of market, legal, administrative and social self-government means to form a refined, detailed, in-depth and standardized urban management model through the quantification of urban management objectives, the refinement of management standards, and the clarification of the division of responsibilities. A smart community aims to enhance the well-being of its inhabitants, businesses, visitors, organizations, and administrators by offering digitally enabled services such as smart door locks, smart parking systems, smart security systems, and customer service robots, which can contribute to a better quality of life. Smart door locks automatically unlock the door when people arrive home and securely lock it again when they leave. People can keep control over the smart lock, check the status at any time, and manage access permissions on their smartphones. The smart parking system leverages IoT and sensor technology to capture real-time data about parking availability in and around the community, as well as community traffic and road conditions, providing a solution to the growing parking and road traffic jams in communities. The smart security system combines smart road gates, face recognition, license plate recognition systems, infrared temperature measurement, and other facilities to strictly control the access of people in the community. It not only facilitates the lives of community

residents, but also reduces the burden of security personnel in the community and greatly improves the security of the community environment. Although this does raise potential privacy and ethical concerns, such systems can help to improve the ability to fight crime and enhance the effectiveness of social security prevention and control. Customer service robots can use face recognition, intelligent voice question and answer, screen and action interaction, ID card recognition and other technologies, and can intelligently manage and record the people and vehicles entering and leaving the community, and interconnect with the cloud network, community property information system and mobile APP background. Other characteristics attributed to smart communities include livability, efficiency, accessibility, and sustainability.

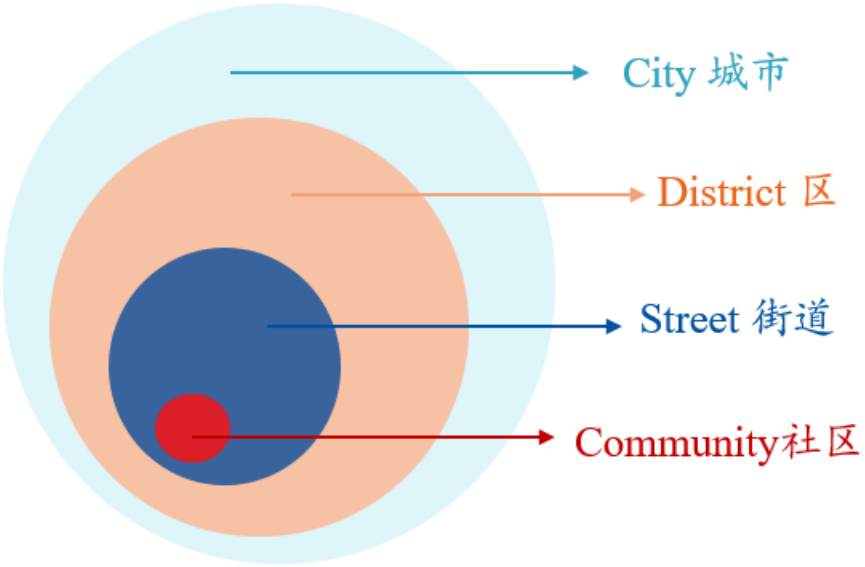


Figure 1.1 Scope of community

Similar to smart cities, digital technologies such as the Internet of Things, cloud computing, artificial intelligence, and big data analytics play a key role in building smart communities. For example, artificial intelligence technologies such as face recognition and voice recognition can be used for community security monitoring and seamless human-computer interaction. Big data analytics can integrate and analyse data from multiple sources obtained from community sensors to provide a guarantee for the realization of smart community management based on information and intelligent management and services, contributing to a safe, comfortable, and convenient modern and intelligent living environment for community residents. These digital technologies can also help communities to better manage resources such as energy or water, monitor and reduce work-life pollution, enable non-contact collaboration and communication between community residents, and adopt greener ways of lighting and heating buildings. However, there are inevitable security and ethical concerns in the use of these technologies to enable personalized service support. Communities can alleviate these concerns by making the

use of these technologies known in detail to community residents and allowing them to voluntarily choose whether they want to use these personalized services based on strict controls over the security and use of the data. Such an initiative would, to some extent, reduce privacy concerns.

Communities have been regularly exposed to various forms of crises and disruptions, and the widespread and extended periods of shutdown and lockdown during the COVID-19 pandemic disrupted community activities. However, the effect of these disruptions varied significantly among different communities. While some communities were able to responded well to the COVID-19 pandemic. For example, effectively guarantee the life of their residents and maintain normal operations, others suffered heavily with basic necessities becoming difficult to access, and the community coming to a standstill (Miao et al., 2021). This phenomenon was not only seen in China but also in various countries and regions around the world (Gaynor & Wilson, 2020). For example, a report released by International Monetary Fund shows that around the world, poor communities have higher rates of Covid-19 infection and more deaths than wealthier communities. While this phenomenon is now being articulated primarily from an economic perspective, whereby residents of wealthy communities have better access to life-saving medical care, receive timely vaccinations for immunization, and are better equipped to purchase higher quality protective gear, there may also be a link between this phenomenon and the deployment of digital technologies in communities. Indeed, recent empirical research studies have demonstrated that digital technologies can have a positive impact on the mental health and overall well-being of community residents, potentially alleviating anxiety levels and enhancing quality of life (Babbage et al., 2018; Narayan, 2020). For instance, the results of a recent survey on anxiety and the psychological resilience of people in a community under lockdown during COVID-19 shows that the anxiety level of the population was related to the community service support system provided by the digital technologies (Chang et al., 2019).

Community resilience refers to the ability of a community to respond to and recover from unexpected dangers or events that have already occurred (Sinha & Ola, 2021). Community resilience enables communities to withstand and recover from disruptions and disasters, and to continuously strive towards a better future. Enhancing communities' resilience through digital technologies is one of the objectives of building smart communities. However, there is still little research examining this association between digital technologies and communities' resilience. Currently, findings on the relationship between these two variables are mostly included in the reports released by industrial consulting agencies. For example, a report claim

that digital technologies help improve communities' resilience E. Roberts et al. (2017). However, these agencies have typically not dwelled much on theoretical explanations or trying to understand the underlying mechanisms through which digital technologies affect community resilience, and even less so in the context of an external environment that is volatile and fraught with high levels of uncertainty due to events as was during the pandemic. At present, there is a lack of verifiable empirical evidence to support the claim that digital technology can enhance community resilience. The current understanding of the relationship between digital technology and community resilience is often largely anecdotal and lacks systematic analysis. We still know very little about the underlying processes and mechanisms through which digital technology deployed in a smart community impacts community resilience.

It seems plausible that arguments favouring the positive impacts of digital technology on community outcomes may be motivated in part by the enormous economic benefits that can be derived from building smart communities. According to Wisdom Research Consulting in 2021, as China's urbanization rate increases, old neighbourhoods have started smart transformation, new communities carry out smart enhancement, the smart community market scale will continue to expand, and thus smart community will open up a blue ocean of digital industry value. The technology investment in China's smart cities is projected to reach $38.92 billion by 2023, representing an annual growth rate of over 10%. Furthermore, the market size of China's smart communities is expected to continue its upward trajectory, with an estimated value of $59.9 billion by 2023 (Atha et al., 2020).

The impact of digital technologies on the resilience of communities is expected to be multifaceted. While technologies like IoT devices and artificial intelligence can enhance a community's ability to respond to crises and emergencies, such as the ongoing Covid-19 pandemic, their influence is likely to be complex. For instance, the infrared automated temperature detection systems installed at community entrances can assist managers in identifying individuals with abnormal body temperatures and preventing potentially infected individuals from entering, thereby curbing the spread of the virus within the community. On the other hand, digital technology may also indirectly affect the resilience of communities. For example, communities can build online communities through digital technology, allowing community residents to become more familiar and friendly with each other, reducing psychological barriers and increasing emotional exchanges and communication. Based on this, they can support and care for each other during crisis or danger events, thus receiving spiritual and psychological comfort, which can promote communities' resilience. A more holistic overall examination of how digital technologies influence communities' resilience (Overby et al., 2006).

1.2 Research questions and objectives

Following the arguments presented above, this thesis aims to answer the following overarching questions:

RQ1. To what extent do digital technologies affect urban community resilience?

RQ2. What are the mechanisms through which digital technology impacts community resilience?

More specifically, this thesis aims to:

(1) Examine the direct and indirect effects of digital technologies on the resilience of urban communities.

(2) Investigate the impact of community technological opportunism (i.e.,the organization's ability to recognize and respond to new technologies, and this concept comes from the field of information system, as well as is a neutral concept in this thesis) on the resilience of urban communities.

(3) Propose strategies to enhance the deployment of digital technologies in communities and leverage their potential to enhance community resilience.

1.3 Research contributions

It is hoped that this thesis will contribute to both theory and practice in several ways:

(1) This thesis represents a novel investigation of community resilience through the lens of digital technology, filling a gap in the existing literature. Social and community resilience are essential for societies that confront adverse events like pandemics. The COVID-19 pandemic had a profound impact on communities worldwide, resulting in high rates of mortality and infection as well as significant social and economic upheaval. A comprehensive understanding of the factors that contribute to community resilience is crucial for mitigating the costs of crises like COVID-19. Moreover, greater insight into resilience can lead to the creation of safer, more sustainable communities. Consequently, scholars and practitioners have demonstrated significant interest in the factors that bolster community resilience, given its role in fostering effective recovery. However, to the best of our knowledge, no studies have explored the impact of digital technology on the development of community resilience. Thus, this thesis seeks to contribute to the field by examining the mechanisms through which digital technology enhances community resilience by shaping community capacity. Importantly, our work links tangible physical factors and intangible community capacity, which have traditionally been studied

separately. By integrating these factors, we can gain a deeper understanding of how tangible physical factors (i.e., digital technology) contribute to the development of intangible community capacity and ultimately influence the formation of community resilience. By addressing this knowledge gap, our thesis offers new insights into the field of community resilience.

(2) This thesis reveals the mechanism how digital technology affects community resilience. The deployment of digital technologies in urban communities has been on the rise and has become an integral part of building smart cities and smart communities. However, existing studies do not reveal the intrinsic mechanisms of how digital technology benefits communities. This thesis seeks to elucidate the mechanisms linking digital technology and community resilience, specifically through the lens of social capital and social support. By examining the theoretical underpinnings of this relationship, we aim to shed light on the "black box" of how digital technology impacts community resilience.

(3) The thesis aims to highlight the boundary conditions under which digital technology affects community resilience. Our thesis will investigate community technological opportunism as an important moderating variable. Different levels of digital technology sense-and-respond capacity of community determine the different levels of impact of digital technology on community resilience. Therefore, this thesis hopes to go beyond the focus on the technical level and examine the managerial level factor as well. This has been largely overlooked in previous studies.

(4) Finally, in terms of methodology, this thesis will employ structural equation modelling to examine the overall impact of the independent variables on community resilience. Additionally, qualitative comparative analysis will be used as a complementary method. By combining the results of both approaches, this thesis aims to uncover general patterns and multiple configurations that lead to community resilience. Furthermore, the fuzzy set qualitative comparative analysis will provide information on the necessary and sufficient conditions for achieving high community resilience. Unlike traditional statistical methods which are limited in their ability to account for complex interaction effects, particularly those involving three or more factors (Ganter & Hecker, 2014; Ragin, 1987). FsQCA provides suitable methods to handle complex complementarities and nonlinear relationships between variables (Ganter & Hecker, 2014; Woodside, 2013). The use of fsQCA helps us to differentiate more precisely between necessary and sufficient causal conditions for community resilience (Fiss, 2011).

In addition to the theoretical contributions, it is hoped that the thesis will be helpful for various stakeholders such as government administrators and neighbourhood committees,

companies building smart communities and developers of digital technologies, and community residents. First of all, the government should encourage and support the digital transformation of communities by deploying IoT sensors, artificial intelligence, 5G fast network, and online communities to improve the ability of communities to cope with COVID-19. Neighbourhood committee managers should actively promote digital transformation in communities. They can also identify potential epidemic prevention and control risks in real-time, pay attention to the health and life demands of people in high-risk communities, and improve the level of community administration. On the other hand, digital technology developers can design intelligent monitoring systems to carry out real-time monitoring and early warning of crowd gathering risk points. This way, they can use digital technology to identify, capture, and evaluate potential risks. In addition, developers can integrate a large number of life service portals to provide residents with smarter community services. Finally, residents can play an active role in providing feedback on the use of digital technology in their communities, and explore the full potential of digital technology to mitigate any negative effects.

1.4 Research framework

The dissertation is structured into seven chapters. Chapter 1 gives an overview of research background, research objectives and questions, contributions, and research framework.

Chapter 2 provides a comprehensive literature review focusing on seven research topics, theories, and models.

Chapter 3 presents the research hypotheses and the proposed model. It includes nine hypotheses and the research model.

Chapter 4 provides a detailed overview of the research methodology and data collection process, which is divided into three parts: scale development, questionnaire design, and data collection. The data collection process involves both pre and formal questionnaire surveys, as well as exploratory and confirmatory factor analysis.

Chapter 5 is composed of data analysis process and research results. Specifically, it includes data analysis method and tools, descriptive statistical analysis, reliability analysis, validity analysis, common method bias test, multicollinearity test, structural model, indirect effect analysis, results heterogeneity analysis, importance–performance matrix analysis, and qualitative comparative analysis.

Chapter 6 is a discussion of the results and their implications for digital technology developers, community managers and residents, and the government.

Chapter 7 summarizes the thesis's main findings, discusses the conclusions, limitations, and suggests possible future research directions. Figure 1.3 illustrates the structure of the thesis, which has been organized based on the main content of this study.

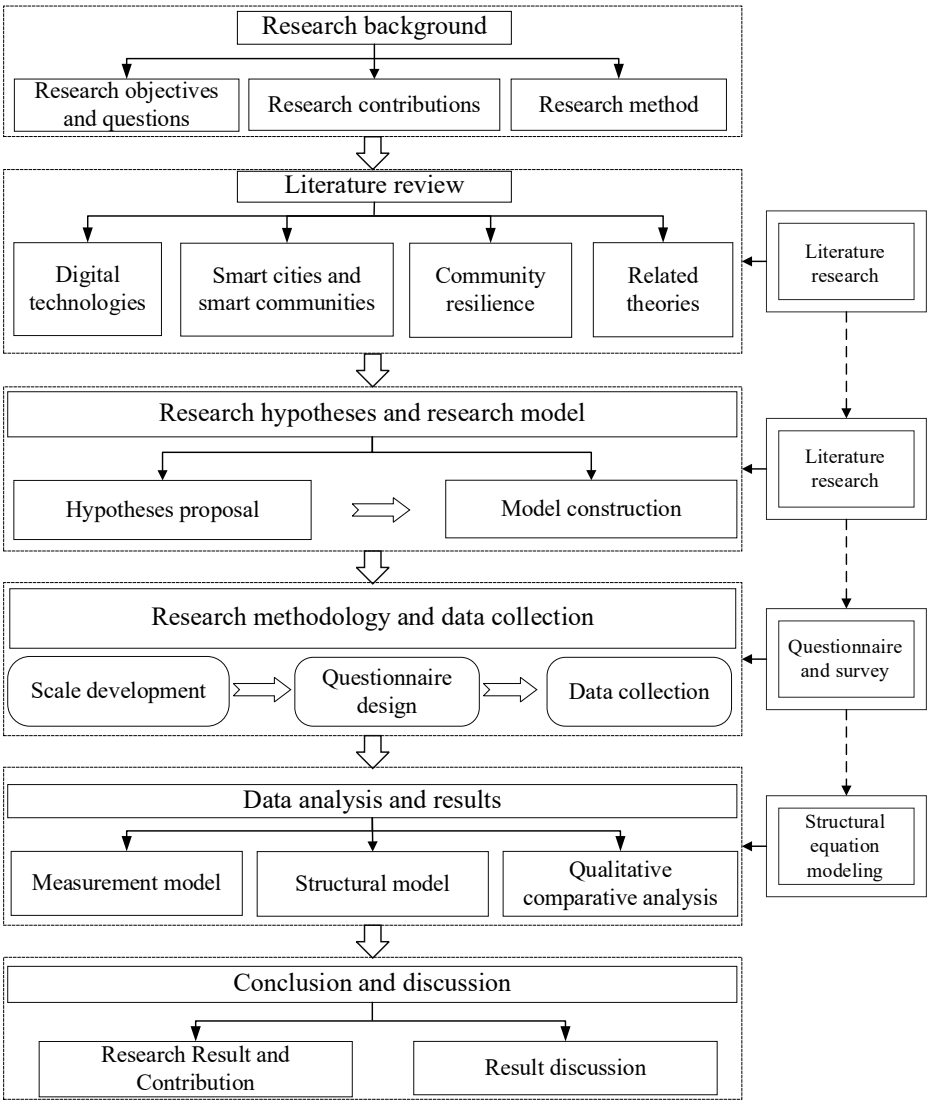


Figure 1.2 Research framework

1.5 Summary

This initial chapter serves as an introduction to the thesis, covering the background and motivation behind the research, as well as outlining the specific objectives and research questions. It also discusses the theoretical and practical contributions of the study. Additionally, the chapter offers a glimpse into the research framework and specific content of each subsequent chapter.

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Chapter 2: Literature Review

2.1 Digital technologies

2.1.1 Concept

Digital technology refers to a set of digital tools and techniques used for the acquisition, storage, and analysis of data. This includes technologies used for the production and processing of digital cultural artifacts, such as internet technology and digital media (Agbatogun, 2013). Similarly, people can use digital technology to encode and decode information, so as to reduce and save the cost of storing, calculating and transmitting data (Goldfarb & Tucker, 2019). Digital technology nowadays is developing and evolving rapidly and has become increasingly mature, such as social media, blockchain, and artificial intelligence (Paschou et al., 2020; Rippa & Secundo, 2019). The development of every organization and enterprise is inseparable from the support of these technical means. In order to maximize the speed of data access and improve operational efficiency, enterprises and institutions in different fields usually integrate different technologies with the help of digital tools (Fuentes et al., 2021). Digital technology has found numerous applications in various fields such as business and entrepreneurship, education, construction industry, green sustainable development, and healthcare.

First of all, the development of digital technology has significantly transformed the business environment and entrepreneurial market. Digital technology has revitalized traditional industries and boosted their growth. However, digitalization of business activities requires support from the entire entrepreneurial ecosystem. Against this background, Zahra et al. (2022) research shows that the development of digital twin ecosystem (that is a system where a digital twin is utilized to connect and integrate various aspects of a physical system, such as machines, products, buildings, or even entire cities) will produce many different types of start-ups, and each enterprise plays a complementary strategic role. For another example, H. L. Li et al. (2021) considered that internal and external relationship management based on digital technology has a direct positive impact on market agility.

Second, in the field of education, digital technology has also been a hot topic discussed by many scholars. For example, the research of Gan et al. (2015) shows that teachers can integrate a variety of digital technologies into the teaching process to enhance students' learning and help

them acquire more knowledge. As a convenient teaching tool, digital technology can take students or teachers as the center of the learning process and help them obtain new teaching information in time. At the same time, teachers' experience and proficiency in using digital technology tools vary from person to person, which is a very interesting feature of research in this field (Sargen, 2018).

Third, the construction, engineering and construction industries are embracing the digital age. The design, construction and operation of construction assets are increasingly affected by technology. Ardolino et al. (2018) investigated the potential of digital technology in converting raw data into valuable information and knowledge to facilitate service transformation in manufacturing. The findings of the study emphasize the significance of the Internet of Things (IoT) in service transformation, highlighting its critical role in enabling efficient data collection and analysis for improved decision-making.

Moreover, digital technology has played a significant role in advancing green sustainable development. Its potential in promoting domestic green development is considerable, as technology spillover effects have a greater impact on emission reduction compared to technological innovation alone. A. P. Wang et al. (2021) found that while technological innovation in the information industry has led to an increase in carbon emissions intensity, cross-industry technology spillovers have been effective in reducing domestic carbon emissions intensity.

Fifth, to date, digital technology has become an indispensable part of the medical field. In the process of fighting the coronavirus disease, starting at the end of 2019, digital non-contact medical treatment has played an irreplaceable role. Through digital technology, doctors can implement telemedicine for patients online, which can greatly reduce the infection risk of medical institutions during epidemics (Golinelli et al., 2020). In addition, in the study of mental health, J. Li and Brar (2022) defined digital technology as electronic tools that can access digital media, such as smartphones, laptops and tablets. Through a systematic literature review on the use of digital technology in this area, the researchers found a strong correlation between the interaction of indigenous people (referring to individuals who have grown up in an era where the internet and digital technologies are ubiquitous and deeply integrated into their daily lives. These individuals are typically born after the mid-1990s and have never known a world without the internet) with digital media and their mental health.

2.1.2 Categories of digital technologies

The rapid development of digital technology has made it an essential component of all aspects of life, manifesting in various forms. According to Nambisan (2017), digital technology comprises three distinct yet interrelated elements: digital artifacts, digital platforms, and digital infrastructure.

2.1.2.1 Digital artifacts

As a part of services, digital artifacts can provide users with new products, applications and media content of specific value (Kallinikos et al., 2013). Digital artifacts mainly include digital storytelling, virtual and augmented reality, and blockchain.

Digital storytelling involves utilizing various digital media tools such as images, audio, and text to narrate stories centered around specific themes (Gurrieri & Drenten, 2019). Rieger et al. (2018) believe that digital storytelling has many different forms of expression. Similarly, digital storytelling is very friendly to the language learning process, which can effectively and accurately improve students' oral foreign language skills (Mirza, 2020).

Virtual reality typically refers to a computer-generated three-dimensional environment that users can immerse themselves in to simulate a realistic experience. Augmented reality uses computer-generated image layers to enhance the real environment, such as 3D objects and text information. To date, virtual and augmented reality have been applied to many industries, including education, medical treatment and media communication(Martín et al., 2017).

The Economist pointed out that "blockchain will redefine the world". Blockchain combines many computer technologies, including distributed storage, dynamic encryption and intelligent consensus mechanism, and is widely used in various fields (Hawlitschek et al., 2018). For example, Lu (2019) believed that blockchain is a revolutionary technology for building distributed energy systems, which can help users achieve bilateral transactions.

2.1.2.2 Digital platforms

A digital platform is an external platform based on software, which is composed of extensible code base of software-based system (Ghazawneh & Henfridsson, 2015). The code base provides core functions shared by modules and interfaces for interoperability with modules. Digital platforms include intelligent applications, social media, big data and data analysis, cloud computing, Mesh app and service architecture etc.

As a kind of digital technology, intelligent applications can simplify the workflow and enable people to work more efficiently (Hoyer et al., 2020). For example, chat robots are

designed to simulate human conversations. Similarly, intelligent voice assistant can achieve similar effects. "Alexa" is a well-known voice only assistant for smartphones and personal computers, users can automatically search for information on the Internet through dialogue with it (Polyakov et al., 2018).

Social media refers to the technology or tool with computer as the media. Users can realize information interaction and information sharing through social media. Social media is applied in various fields, enterprises and individuals can generate huge benefits by using social media to analyze industry data (Bhimani et al., 2019). For example, in the medical field, social media can provide psychological and social support for patients (Smailhodzic et al., 2016). Similarly, in the process of scientific research, scholars can recruit a large number of experimental participants through social media platforms, such as Facebook or M-Turk (Topolovec & Natarajan, 2016).

Today, with data and interaction generated in various forms of human behavior, big data is applied to almost all aspects of life. Big data problems exist in all walks of life, such as medical rehabilitation, geographic transportation and national security (Lv et al., 2017). In addition, in the field of social networks, enterprises can extract users' social behavior rules from unstructured data by analyzing online social networks and spaces (Zhu et al., 2018). Researchers and consultants are trying to study the future of big data to obtain more benefits.

Cloud computing is a form of internet-based computing that offers shared computer processing resources and on-demand data access to various devices (Rippa & Secundo, 2019). Cloud computing can be accessed anytime, anywhere according to user needs. Specifically, at the application level, cloud computing can be combined with big data to provide technical support for problems in Earth Science, social science, astronomy, commerce and other fields (Yang et al., 2017).

Mesh application and service architecture (Masa) refers to things that people regard as applications, such as mobile applications, web applications, desktop and Internet of things applications. From the perspective of transformation between different systems, Masa can connect many back-end servers and provide fast corresponding services (Sangkhapan et al., 2020). Users can connect with Masa through client or mobile electronic devices.

2.1.2.3 Digital infrastructure

Digital infrastructure encompasses the range of digital technology tools and systems that facilitate computing and information interaction capabilities. Such infrastructure encompasses

a wide range of technologies, including but not limited to 3D printing, Internet of Things (IoT), drone technology, artificial intelligence, and digital twins.

3D printing, also referred to as Additive Manufacturing or Rapid Prototyping, involves transforming virtual 3D models created using computer-aided design (CAD) software into tangible structures or objects through a layer-by-layer deposition process (Chang et al., 2019). 3D printing offers several advantages over traditional manufacturing methods, including rapid prototyping, customized design, and one-step production of actuators and sensors with high resolution and complex structures. This technology has thus been increasingly utilized for the production of high-precision and intricate objects across various fields. For instance, in micro robot manufacturing, the use of 3D printing has been shown to facilitate the design of more efficient structures (J. H. Li & Pumera, 2021).

Within the context of the Internet of Things (IoT), various digital devices serve as key users within the IoT ecosystem. These devices are capable of communicating with one another automatically, without centralized control, and can collaborate to collect, share, and forward information using a multi-hop approach (Bello & Zeadally, 2014). In addition, the Internet of things makes the collection of some forms of personal information less difficult than before, such as location and health data. In this context, users will show higher privacy preferences when conducting online activities (Goad et al., 2021).

Drone technology is also known as unmanned autonomous vehicle (UAV), which refers to an aircraft without human pilot. Drone technology is a combination of many technologies, including embedded systems, GPS and sensors. To date, drone technology has been successfully implemented across a range of civilian fields, including agriculture, law enforcement, surveillance, entertainment, and more (Maddikunta et al., 2021; Rippa & Secundo, 2019).

Artificial intelligence (AI) is a combination of many technologies that enable machines to achieve a series of intelligent behaviors similar to human beings (Rippa & Secundo, 2019). Up to now, artificial intelligence has penetrated into many organizational processes, and they can replace people in many organizational activities. Jarrahi (2018) studied that artificial intelligence can expand human cognition in solving complexity.

Digital twins refer to the reconstruction of the state of physical entities in the data space, which can be understood as a digital mapping process (Zhuang et al., 2017). Digital twins are praised as one of the top technologies in the aerospace industry and has been widely used in this field. Similarly, C. L. Wu et al. (2021) proposed a framework for representing digital twins and their attributes, and used this framework to model the digital twins of intelligent vehicles.

To sum up, digital technology has many subdivisions and has been applied to various industries. These disruptive digital technologies are crucial to the development of society.

2.1.3 Adoption behavior of digital technologies in community operation

The community is regarded as the basic unit of a city in China. With the development of smart cities and smart communities, more and more digital technologies appear in the daily operations of communities, such as smart parking, face recognition technology, Internet of things, cloud computing, etc. These technologies are mainly concentrated in community health care, communication between residents and daily work.

Given the significant role that digital technology plays in community healthcare, scholars and community workers have shown great interest in exploring the various applications of digital technology tools within this field. Existing research shows that most long-established communities face pressure to provide support to their elderly residents, which greatly increases the work difficulty of community health care personnel. Therefore, telemedicine combined with digital technology is becoming more and more popular (Jones et al., 2017).

For example, Crilly and Kayyali (2020) studied the adoption of telemedicine and digital technology in community health services. The results show that using digital technology tools to provide telemedicine to community residents by community medical staff is helpful to improve the quality of public health services in the community. Similarly, Tilahun et al. (2021) found that digital health technologies, such as telemedicine and mobile health devices, have the potential to facilitate the identification of patients within a community and promptly alert medical staff for treatment.

In addition, with the epidemic of COVID-19, the medical and health challenges faced by traditional communities increased, and the combination mode of digital technology and emerging medical technology is now becoming more and more popular. D. Liu et al. (2020) indicated that when plasma is combined with nano- and digital technologies, there are many possibilities that can be explored, such as the creation of better nanoparticulate medicines, drug delivery systems, and AI approaches that can enhance plasma-based treatments. Likewise, Shaw et al. (2021) found that virtual medical technology helped community members solve health problems and provide healthy information for patients and medical staff during the epidemic.

Specific to people's daily life, Ramasamy et al. (2018) proposed a smart parking system based on the Internet of things. The system transmits the nearby vacancy information to community residents through mobile applications, which helps community residents find the

nearest parking space as soon as possible, thereby reducing the congestion of community parking.

Likewise, digital technology can help community residents communicate with each other to facilitate people's daily communication. Khanlou et al. (2021) found that the use of digital technology can help young people in the community solve development obstacles. For example, many young people in disadvantaged communities lack access to quality education and training opportunities, which can hinder their personal and professional development. However, digital technology can provide a solution by enabling e-learning platforms that offer flexible, affordable, and accessible education and training. Moreover, mobile applications based on digital technology have been proved to be able to integrate community information and resources, and help community residents maintain family connections, which played an important role during the coronavirus pandemic (Sen et al., 2021).

The significance of digital technology in enhancing work efficiency has drawn the attention of many scholars and community workers to the potential applications of digital technology within community work. For example, Ramírez et al. (2021) studied the use of sensors in smart communities. The results show that the sensor has been applied to many aspects of community work, including the detection of energy, health, water and other resources, as well as safety prevention and control measures such as infrared temperature measurement. Moreover, by introducing cloud computing technology, community workers can use automated processing technology to complete work documents (Cristani et al., 2018).

In conclusion, digital technology has become an integral part of all aspects of community operations, deeply intertwined with the daily lives of community residents and the work responsibilities of community workers. Moreover, digital technology has played an irreplaceable role in the community's prevention and control of COVID-19.

2.2 Smart cities and smart communities

2.2.1 Concept of community

In the early research of the community psychology field, it was proposed that the community evolved in different environments and systems other than traditional residential places (Chavis & Newbrough, 1986). A community can be defined as a group of individuals who are interconnected through social relationships and share a sense of common identity or purpose (Chavis & Newbrough, 1986). After that, the concept of community was applied to different

fields, such as health (Jewkes & Murcott, 1996; K. A. Long et al., 2015; MacQueen et al., 2001; Okamoto, 2013), society (Bjelland, 2016; Chaskin, 1997; Matarrita & Brennan, 2012), organizations sociology (Freeman & Audia, 2006), and information system (H. Wang, 2021).

Specifically, in the health field, community is defined as a coherent unit, and its internal members will cooperate for common purposes, such as expressing health needs. Moreover, community is regarded as a sub-unit between family and country, implying the hierarchical structure of individual, family, community, and country (Jewkes & Murcott, 1996). For other authors, the term community refers to a group of people who share common characteristics, such as geographic location, culture, interests, or values (MacQueen et al., 2001). Specifically, these people are connected through social relations, share common perspectives or beliefs, and engage in collective actions within a particular geographical location or environment (MacQueen et al., 2001). In another study, community was defined as a group of individuals, in different geographical locations, with common experiences (K. A. Long et al., 2015). In the field of neuropsychology, the term community refers to a group of nodes in a network that are closely connected within the group but have fewer connections with nodes outside the group. The community structure is considered a characteristic feature of various biological networks (Okamoto, 2013).

In the society field, community implies connection, such as a combination of shared beliefs, environments, priorities, relationships, and concerns (Chaskin, 1997). Another research suggests that community is defined as a geographic area or locality inhabited by people. It encompasses the resources necessary for the survival and progress of the individuals residing within it and the process by which these individuals participate in the distribution and exchange of these resources to fulfill local needs (Matarrita & Brennan, 2012). Specific to the field of geography, community is defined by international boundaries, which can connect and isolate community (Bjelland, 2016).

In the field of organizational sociology, community is defined as a web of functional interdependence between organizations or categories of organizations. In a more specific context, community can refer to a residential community, such as a region or a city (Freeman & Audia, 2006).

In the information system field, community research focused on virtual community and digital community (H. Wang, 2021; J. H. Xu, 2021). Virtual community refers to a group of individuals who communicate and interact with each other primarily through the Internet, often sharing knowledge and information, and gradually forming a social network (H. Wang, 2021). In another study, digital community refers to the utilization of various information technologies

and methods to integrate community resources and construct a network platform for interactive exchanges and services among government, property services, residents, and intermediary organizations (J. H. Xu, 2021).

Community is regarded as the basic unit of the city, and is the “last kilometer” of urban fine governance (Betancourt & Vivier, 2021). Community is an organization of inhabitants who socialise and live within a certain geographical area, which is managed by the same neighbourhood committee (F. X. Zhang, 2022).

2.2.2 Concept of smart cities and smart communities

The term "smart city" was first coined in the 1990s, and it refers to cities that use technology to improve service delivery and production, enhance the local economy, and enable participatory governance (Spicer et al., 2021). The term of smart cities has a dual meaning (Burns & Welker, 2022). First, smart cities mean the necessity to embed digital technology into urban structures for planning and administration purposes (Burns & Welker, 2022; Kitchin et al., 2015). Second, smart cities mean the rationality to produce the urban to be smart (Burns & Welker, 2022; Marvin & Luque, 2017). Supporters of smart cities advocate for improving urban planning through policy changes that promote the application of information and communication technology (ICT) and modern infrastructure in cities (Albino et al., 2015; Spicer et al., 2021). More importantly, with the development of digital technologies, cities can create various digital opportunities (*e.g.*, economic growth, labor mobility, and medical services increase) for their own development by deploying these technologies (Bahensky et al., 2008; Spicer et al., 2021). It can be seen that the construction of the smart cities cannot do without the effective deployment of digital technologies.

Smart community and smart city are related concepts. Smart city refers to the application of digital technologies and modern infrastructure in cities to improve service production, delivery, and governance. Similarly, smart community also involves the use of digital technologies and infrastructure to improve the lives of residents and groups within a community while enhancing organizational productivity and competitiveness (Lima, 2020). Moreover, the study proposed a model, which is about how organisms (*e.g.*, communities, cities, and organizations) become smarter by using digital technologies across multiple levels, including infrastructure, collaboration networks, smart governance, and so on (Lima, 2020).

To sum up, smart city and smart community are similar concepts, which both highlight the importance of digital technologies. In the context of this dissertation, the term 'smart community' refers to a geographic area that falls under the jurisdiction of the same

neighborhood committee, and utilizes digital technology infrastructure to enhance the quality of life for residents and groups within the community, while also improving organizational productivity and competitiveness (Lima, 2020; F. X. Zhang, 2022).

2.2.3 Characteristics and architecture of smart communities

Smart cities or communities are typically characterized by four main elements, namely sustainability, quality of life (QoL), urbanization, and smartness (Mohanty et al., 2016; Silva et al., 2018). Specifically, the sustainability of smart city or community has been considered as a predominant feature in city or community development. The sustainability includes (1) social, economic, and health, (2) pollution and waste, (3) energy and climate change, (4) infrastructure and governance. The ultimate goal of building a smart city or community is to improve the quality of life of its residents, which includes aspects such as financial and emotional well-being. The characteristic of urbanization focuses on the infrastructure, governance, economics, and technical aspects of transforming a rural area into an urban one. Smartness refers to the desire to improve the economic, social, and environmental benchmarks of the smart city or community, as well as the use of technology to optimize its resources and services for the benefit of its residents. The architecture of a smart city or smart community can be divided into four layers: sensing, transmission, data management, and application (Silva et al., 2018). Specifically, the sensing layer provides various technologies to improve the efficiency of data capturing in various situations, including physical infrastructure and devices (e.g., vehicles and buildings) and sensing components. The transmission layer is the backbone of the smart city or community architecture, which converges different communication networks. It includes the access network and the transmission network. The data management layer performs various tasks, such as data organizing, analyzing, and decision-making support, and is considered the brain of the smart city or community. It includes event management (e.g., data fusion and analysis) and decision-making management (e.g., data processing and storing). The application layer is the top layer of the smart city or community and consists of grid distribution, security and surveillance, transportation management, industrial management, healthcare management, hospitality and recreation, weather forecasting, and community development. Figure 2.1 shows the architecture of the smart city or community.

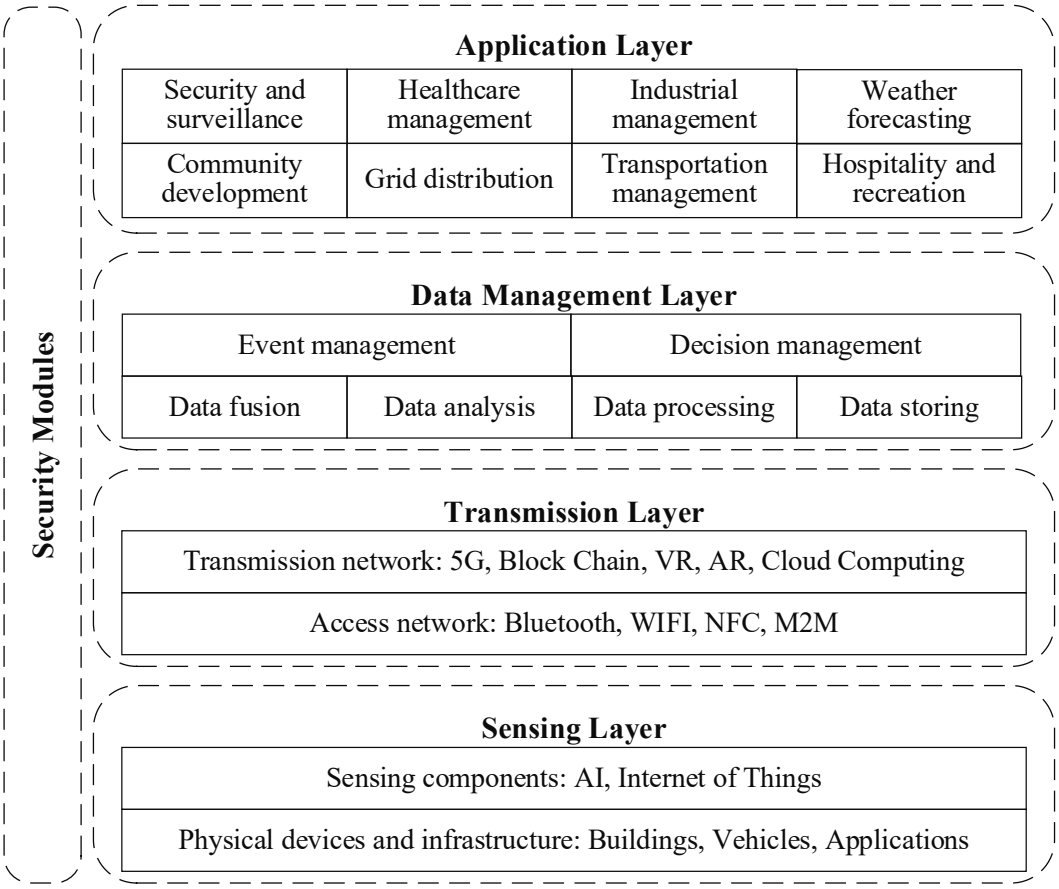


Figure 2.1 The architecture of the smart community

Source: Silva et al. (2018)

2.2.4 Success factors of smart cities and smart communities

The literature on smart community construction suggests that three main factors contribute to successful implementation: (1) technology-oriented factors, which prioritize the development of infrastructure and emphasize the use of different technologies; (2) non-technical factors, such as human capital, creativity, education, and digital skills; and (3) a combination of institutional, human, and technological factors, in which institutional settings, organizations, and communities all play important roles.

A significant portion of the literature on smart cities and communities examines how technology-oriented factors contribute to the successful establishment of such communities. Smart communities are developed through technological advancements, and the continued improvement of Information and Communication Technology (ICT) and other digital technologies offer smart communities great potential for innovation, growth, and prosperity. Infrastructure is highly valued in the development of smart cities and communities, and the

integration of various technologies is central to the discussion. Technological factors include all facilities that support physical intelligence in cities and communities, such as Internet, Web 2.0, IoT, cloud computing, Wi-Fi, etc., to facilitate the successful implementation of smart cities. Zygiaris (2013) mentioned that technology is a fundamental enabler of smart cities. The findings of this study provide technical guidance for smart city planners to avoid unsustainable investments and build socio-technical complementarities during smart city initiatives.

Specifically, the success of smart cities is influenced by several factors, as highlighted by previous research. The quality of information architecture, the services offered by technology, the use of channels, the availability of smart mobility services, and the integration of value networks and services are all important. According to research, the information architecture plays a crucial role in the success of smart cities and communities. The IT infrastructure is considered the foundation of smart cities and communities, and it integrates various information service resources, establishes a unified data and service platform, and interconnects various departments and systems. For instance, the study of Fietkiewicz et al. (2017) revealed that significant differences in the maturity and availability of smart city technologies across the surveyed cities, and revealed that the use of boundary documents, such as detailed information sheets, was not widespread. In terms of communication technology and transaction services, there was room for improvement in the e-government maturity of the surveyed cities. For another example, N. Zhang et al. (2020) proposed that a smart community was a complex assemblage that included information architecture factors and business mode. The findings indicated that the integration of information architecture and business model was crucial for the success of a smart community, and the specific business model depended on the different information architecture elements used. Among the information architecture elements, networks, endpoints, and sensors were frequently employed in the business model.

For the availability of smart mobility services, Ismagilova et al. (2019) constructed a theoretical model for the antecedents of continued smart card usage in smart cities, including privacy and security, functional benefits (usefulness and ease of use), and levels of individual interaction with local services. The study found that usefulness and security were the main preconditions for persistent intent. The effect of sociodemographic variables was not significant, suggesting that smart cards should focus on a broad range of users.

The use of digital technology in the development of intelligent communities in tourism scenarios has been studied, highlighting its important role in enhancing service delivery and contributing to environmental sustainability through the collection and sharing of geospatial data. The research points to the enormous potential of digital technologies in assessing

uniqueness in tourism. The creation of community maps has established a foundational layer of digital infrastructure for smart communities. Additionally, the collection of geospatial data has enabled participatory processes that involve individuals in creating the digital infrastructure of their communities (McNaughton et al., 2020).

In addition, recent studies have also highlighted the importance of integrating value networks and services in order to achieve successful smart cities and communities. One emerging technology trend that has been studied is blockchain, which combines a distributed network and cryptographic blockchain to create a decentralized and distributed peer-to-peer (P2P) network. In a smart community environment, each node in the blockchain has its own distributed ledger for storing transaction history. Blockchain can be used to provide authentication, authorization, accountability, security, integrity, confidentiality, and non-repudiation for real-time applications, which centralized systems may not be able to provide as effectively. Aggarwal et al. (2019) investigated the key components of blockchain applications, and various process models for executing secure transactions were also studied, which was conducive to the development and construction of smart communities.

Second, some studies have emphasized non-technical factors in the successful establishment of smart communities. Technology alone is not sufficient to support the effective implementation of smart cities. Instead, smart cities require the contribution of knowledge, and non-technical factors focus on innovation, learning, and the ability to form urban human capital.

The government's role in improving the quality of smart cities is crucial. In particular, government officials can influence the political environment, political risks, and corruption levels in smart cities. To overcome obstacles to implementing smart cities, policymakers in leadership positions must find ways to reduce path dependence on technology adoption. (Neirotti et al., 2014). The quality of leadership in smart cities is also critical for success, with the CIO (Chief Information Officer) as a key digital leader. The CIOs in the era of smart cities must have the knowledge and skills to effectively utilize ICT to build and manage smart cities. Their leadership plays an influential role in the construction of smart cities, and they must be capable of driving change and innovation in the organization, collaborating with stakeholders, and ensuring the efficient use of technology resources (Washburn et al., 2009). Similarly, Nicolas et al. (2020) found that clusters of non-technical enablers had a significant impact on smart city performance. Specifically, efficient and transparent urban management that promoted the digital transformation of public spaces should be established. Meanwhile, creativity and digital savvy should be fostered talent, and the digital transformation of the economy that should be properly regulated.

As residents are important stakeholders of smart cities and communities, their participation, ideas and views are key success factors for smart cities and communities. To enhance the living environment and quality of life for local residents, it is crucial to involve them in the planning and management of smart city services. As the ultimate beneficiaries of these services, their ideas and perspectives should be given due consideration. Moreover, smart cities can also attract businesses to invest their resources and expertise, further boosting the local economy and job opportunities. Yeh (2017) reported that service quality, innovative ideas, and protection of user privacy were three important factors that affect the development of smart city services. In order to promote residents' acceptance and use of ICT-based smart city services, it is essential to protect their privacy and provide high-quality services. Additionally, recent research has explored the role of government in various areas such as social media, planning processes, open data, public services, sustainable governance, and smart collaboration in the context of smart cities (Ismagilova et al., 2019).

Third, a mix of institutional, human and technological factors, such as regulations and policies, technology implementation, and a high level of citizen interaction and engagement also contribute to smart cities and communities.

Some research aims to determine which factors are critical to implementing a successful smart strategy. For example, Siokas et al. (2021) conceptualized the implementation of smart cities as a complex socio-economic and technological system, comprising institutional and human-centric factors, and highlighted the critical role of resilient socio-economic environments and targeted government policies in promoting sustainable development. The study further revealed that the integration of cloud technologies in the city played a crucial role in accelerating the success of smart city implementation.

Satar et al. (2021) mentioned that the intelligence of a community is driven by information from the environment and its relationship to the physical world, and community empowerment and participation are the primary success factors for smart communities. Furthermore, the study highlighted the importance of creativity and innovation, as these are essential elements for smart communities to build sustainable economies and strong societies.

2.3 Community resilience

2.3.1 Concept

The concept of community resilience originated from physics and biology, referring to the ability of an object to withstand and recover from disturbances. In the 1990s, it was introduced into social science research, leading to the emergence of concepts such as organizational primacy, urban resilience, and community resilience. The research on urban or community resilience focuses on disaster prevention and mitigation, highlighting the importance of internal strength to resist external dangers and shocks. Community resilience is viewed positively, associated with improving local capacity, social support and resources, and reducing risk and miscommunication. As a result, resilience has become a desirable paradigm for communities to cope with uncertainty and prevent disaster risks.

Community resilience has been defined from three different perspectives due to the multidisciplinary nature and diversity of research fields and backgrounds of community studies. First, resilience is viewed as a community outcome, emphasizing the ability of communities to function and recover in the event of a disaster. Second, resilience is seen as a process, focusing on the specific steps by which communities recover and adapt in the event of a disaster. Third, resilience is considered a range of attributes, viewing communities as possessing a set of dynamic capabilities to sustain, adapt, recover, and improve in response to disasters or crises.

Initially, resilience-related research was outcome-oriented and focused on how to recover from disasters and minimize losses in natural and social environments. For instance, Adger (2000) defined community resilience as the ability of a community to respond to external pressures and disturbances caused by political, social, and environmental changes. Similarly, community resilience, a basis of community social dynamics, is the ability to predict disasters and reduce vulnerability, empowering communities to cross institutional boundaries to reduce vulnerability (Wilbanks, 2015). Community resilience is not only about responding and adapting to disasters but also about having the adaptive capabilities to withstand and recover from them. The resilience of a community is reflected not only in the ability to recover physically from disasters but also in the mental and emotional health of its residents, as well as in their ability to maintain high levels of life functions and quality (Meng et al., 2018).

Further, some researchers tend to suppose that resilience is neither outcome nor stability, but the process of linking a community's ability to cope with disruption (Norris et al., 2008), because it is impossible for the community system to return to its original state after

experiencing an event, nor to reach a relatively stable state. On the contrary, the community can purposefully and actively grow into a system adapting to various changes, and have the ability to learn, self-organize, and agility. Based on these views, Magis (2010) defined community resilience as the capacity of community members to work together and effectively utilize local resources to adapt and flourish in an environment of uncertainty, unpredictability, and surprise. More recently, research has highlighted that community resilience is a dynamic process influenced by decisions related to disaster risk reduction, and the resilience process experienced by local communities is directly related to their recovery strategies (Cartier & Taylor, 2020).

Recent studies have proposed that communities are a dynamic set of capabilities that can sustain, adapt, recover, and improve in response to disasters or crises. For example, (Ostadtaghizadeh et al., 2015) defined community resilience as the competence of a system, community, or society to effectively resist, absorb, adapt, and recover from the impact of a hazard to achieve and maintain acceptable levels of operation. Community resilience also encompasses a range of characteristics or attributes, such as community networks, leadership, knowledge and skills, and local connections (Cavaye & Ross, 2019).

Based on the above discussion of existing concepts related to community resilience, the present thesis defines community resilience as the ability of a community to withstand and recover from unexpected dangers or events, as well as to learn and improve in the aftermath of such events.

2.3.2 Dimensions of community resilience

As the concept of community resilience evolves, research discusses the constituent dimensions of community resilience to better develop assessment methods and instruments. The important dimensions of community resilience mainly involve six parts: the resource, society, economy, capital, government and infrastructure of the community (Almutairi et al., 2020; Z. X. Ma et al., 2021).

The resource dimension of community resilience includes both tangible and intangible resources. Tangible resources refer to physical supplies such as food, water, and first aid kits, as well as technical resources like housing, vehicles, and basic machinery. Intangible resources, such as human, financial, and social resources, exist in people's cultures and connections. However, merely having resources is not enough for a community to be resilient. A resilient community must also be capable of effectively utilizing and appropriately distributing these resources within the community (R. K. White et al., 2015).

The social dimension of community resilience relates to the quality and quantity of a

community's social capital, which encompasses the number of social organizations present, the relationships among community members, and their engagement in community activities. Social resilience can be measured by factors such as the age of the community and the presence of social organizations. Young communities may have lower levels of interpersonal communication and weaker community cohesion due to structural heterogeneity, leading to limited authority and mobilization abilities of official community organizations such as neighborhood committees. Social organizations serve as vital platforms for community residents to communicate and interact, fostering social networks with cooperative and trust-based relationships. The greater the number of social organizations, the more resilient the community is likely to be.

The economic dimension of community resilience is closely related to income, employment, and household assets and savings. Economic resilience refers to the ability of a system to recover from severe shocks, including both inherent and adaptive resilience. Inherent resilience describes the ability of an economy to recover under normal conditions by incorporating alternative inputs into those reduced by external events. Adaptive resilience, on the other hand, involves building inner resilience by leveraging one’s ability to make extra effort and creatively increase investment to address losses resulting from a disaster situation (Stewart et al., 2009).

The concept of capital in community resilience can be assessed through various indicators, including public participation, non-profit organizations, voluntary associations, and religious groups. However, the role of capital in enhancing resilience may not always be quantifiable, yet it remains crucial in disaster adaptation. In terms of obtaining help, individuals can receive two types of support: tangible support and perceived support. Tangible support is readily available through formal organizations, while perceived support refers to the help that is expected. When a community has a strong network of relationships, residents are more likely to receive and perceive support, leading to a greater sense of community cohesion (Atreya & Kunreuther, 2020).

The government dimension of community resilience pertains to the level of governance capacity and resources available within the community. This is evident in the completeness of the governance structure, the decision-making and implementation capabilities of the community, and the adequacy of human and institutional resources. An advanced or demonstration community with effective anti-epidemic measures can indicate a higher level of governance resilience. Conversely, residents' complaints to community managers due to poor implementation of measures may suggest a lower level of resilience.

The infrastructure dimension is the carrier and objective component of community

operation, and the material space carrier that supports the daily life and work of community members, including urban road systems, building spaces, emergency shelters, smart services, and monitoring and early warning systems. Redundancy, robustness, and sustainability of infrastructure (buildings, services, manpower, etc.) are critical to disaster prevention and mitigation. The more tightly coupled and interconnected an infrastructure system is, the less resilient it will exhibit. High interdependence reduces resilience as disruptions in one sector (upstream or downstream) cascade to impacts on other sectors (Cantelmi et al., 2021). Figure 2.2 summarizes the dimensions of community resilience.

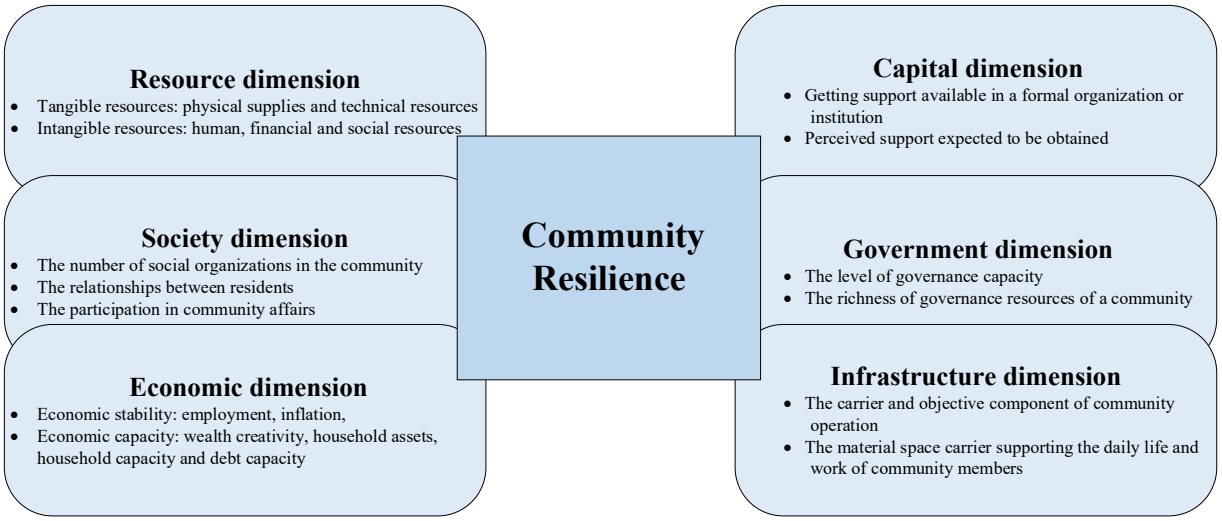


Figure 2.2 The dimensions of community resilience

Source: Almutairi et al. (2020) and Z. X. Ma et al. (2021)

2.3.3 Success factors of community resilience

There are four categories of factors affecting community resilience, namely: government leadership, organizational support, resident engagement, and technological empowerment.

Governments have been seen as more involved and accountable in disaster management and response. Building community resilience requires the support of governments to provide public services to mediate the effects of stressors. On the other hand, the government should coordinate the allocation of resources. For example, Platts and Robinson (2016) found that the government could cut services such as park rangers and libraries, thereby promoting community capacity and resilience.

Moreover, research has highlighted the importance of government not just as a provider of resources, but also as a facilitator that enables individuals to play an active role in enhancing community resilience. However, the effects of this shift may not be evenly distributed across all communities. Markantoni et al. (2019) reported that the successful completion of community

projects can positively influence perceptions of resilience, while incomplete or failed projects can have a negative impact. Therefore, it is important for governments to create opportunities for effective community engagement in project design and implementation. Moreover, government administrators should exercise caution when designing community interventions and have contingency plans in place in case of project failure.

As community resilience is a long-term process, government alone may not be able to foster resilience due to lack of leadership continuity, rigid bureaucracy, lack of financial resources, and difficulties in innovation and transformation. Various studies have begun to explore different stakeholders in promoting community resilience. For instance, the research paid much attention to organizations as prominent players. Hamann et al. (2019) sought to elucidate why and how businesses adopt a strategic and systemic approach to building community resilience. The results indicated that businesses' focused and collaborative practices, as well as their exploration of opportunities, contributed to community resilience by providing a valuable resource for partnerships. If a business possessed resources that could influence key leverage points, it might engage directly with the partnership and contribute those resources.

Buckman and Tremblay (2021) focused on the "Local First" organization aiming to create a resilient community. The study showed that organizations sought to increase investment in local communities to support and promote local businesses, as a way to create greater community cohesion and help communities become more resilient. Community collaboration of this nature created social capital helping maintain social and economic balance in the face of systemic disruption, allowing communities to recover more effectively from disasters.

Similarly, to investigate the role of Australian nonprofit organizations (NPO) actions in building community resilience. Roberts et al. (2021) constructed a research framework of "what matter most". The results showed that nonprofit organizations are effective in motivating volunteers to take action and donate after a disaster. Simultaneously, the social capital of nonprofit organizations fosters trust and facilitates connections among diverse members of the community, enabling them to identify and assist vulnerable individuals who may be unable to advocate for themselves. Moreover, nonprofit organizations have the potential to offer essential psychosocial support that can promote individual mental health and enhance community well-being.

Resident engagement also plays an active role in promoting community resilience. For example, Guo et al. (2018) conducted a study examining the factors that influence residents' perceived resilience in tourist destination communities. The findings indicated that place attachment had a significant positive impact on residents' perceived resilience, and strong

emotional ties to the community fostered knowledge acquisition and enhanced the community's viability. Moreover, residents' identification with the place fostered the development of social capital and collective action, thereby increasing the community's resilience to natural disasters.

Also, Spialek and Houston (2019) explored individual disaster communication activities in response to disasters. The results suggest that increased civic disaster communication is associated with a greater sense of neighborhood belonging and community resilience during and after a disaster. More specifically, communication that corrects disaster rumors and shares stories has a positive impact on residents' sense of belonging, while communication that confirms disaster information and shares positive stories enhances community resilience perceptions.

As technology continues to advance, the role of technological factors in promoting community resilience has gained increased attention in research. Specifically, the integration of social media platforms into crisis response planning through an information fusion framework has emerged as a promising approach. Given their widespread accessibility and usage, social media platforms can not only disseminate risk information but also provide a real-time mapping of disasters, enabling responders to better understand the location and distribution of affected areas. Effective information design also plays a critical role in communicating risks to stakeholders (K. E. Anthony et al., 2019).

Another example, X. C. Zhang and Sung (2021) attempted to reveal how social capital formed by social media use affected users' perceived community resilience. The findings indicated that both online and offline social capital influenced perceptions of community resilience at the outset of the pandemic. However, in the months that followed, only online social capital was significantly associated with perceived community resilience.

Furthermore, a recent study highlighted the value of social media as a coping mechanism and recommended its use as an effective strategy to enhance community resilience during public health crises. The study's findings indicated that active engagement with social media by community members significantly increased perceptions of community resilience, which, in turn, fostered the development of social capital at the individual level and elevated perceived resilience at the collective level (L. L. Xie et al., 2022).

Recognizing that building community resilience is a gradual and ongoing effort, recent research has started to examine the collaborative efforts of diverse stakeholders in advancing this objective. J. S. Chou and Wu (2014) investigated key success factors for improving community preparedness and protection efforts: government promotion, assistance from expert teams, and residents' participation in the establishment of a disaster preparedness organization

system. Specifically, governments needed to provide appropriate funding, support and assistance. At the same time, community residents also should communicate and interact in daily activities, as well as regular contact with expert teams to better carry out disaster prevention education.

A study explored how private sector partners could contribute to community resilience by effectively managing natural resources. The results showed that external actors played a key role in establishing robust bridges that fostered ongoing interactions between internal and external stakeholders. This, in turn, promoted social cohesion by building a network of connections among community members (Musavengane & Kloppers, 2020).

Community capital is increasingly recognized as a tool for building community resilience. A recent study demonstrated that community capital derived from pond aquaculture, pond education, and community service systems could work together to support diversity and linkability. Pond-based social networks played a vital role in mitigating the impact of community challenges such as food security concerns, environmental degradation, and population aging (R. J. Chou & Huang, 2021).

2.4 Dynamic capability theory

2.4.1 Original and concept of dynamic capability

Over the last 25 years, dynamic capability theory has been one of the most productive areas of research in the field of management. Although it has been defined by several scholars before 1997 (Teece et al., 1997), dynamic capabilities are not comprehensive and not universally accepted. Thus, dynamic capability theory can be considered to have its origins in strategic management. Specially, Teece et al. (1997) see dynamic capability as a firm's ability to integrate, build, and reconfigure internal and external competencies to effectively respond to rapidly changing environments. This capability is a key source of competitive advantage for the firm.

Although the original concept and development of dynamic capability were related to strategic management, scholars have attempted to redefine and extend dynamic capability in various contexts and perspectives, including the particular context of the current study (Cepeda & Vera, 2007; Eisenhardt & Martin, 2000; Helfat & Peteraf, 2003, 2009; Helfat & Raubitschek, 2000; Teece, 2007; Zahra et al., 2022; Zollo & Winter, 2002; Zott, 2003).

Some scholars have defined dynamic capability as "the ability of firms." For instance, Adner and Helfat (2003) view dynamic capabilities as the ability of managers to create,

integrate, and reconfigure organizational resources and capabilities. Subsequently, Zahra et al. (2022) define dynamic capabilities as the ability to reconfigure a company's resources and routines in ways that are envisioned and deemed appropriate by key decision-makers. On the other hand, Helfat and Peteraf (2015) consider dynamic capabilities as the ability to perform tasks in minimally acceptable ways.

Dynamic capabilities have been defined in various ways, with some scholars viewing it as the firm's capabilities, while others see it as the processes by which firms use resources to match or create market change. For instance, dynamic capabilities is viewed as the firm's capabilities (Adner & Helfat, 2003; Teece et al., 1997) to create, integrate, and reconfigure organizational resources and capabilities. On the other hand, Griffith and Harvey (2001) see dynamic capabilities as a combination of resources that are difficult to imitate, including effective coordination of inter-organizational relationships. Meanwhile, Pavlou and El Sawy (2010) view dynamic capabilities as a way for firms to address volatile environments by extending, modifying, and reconfiguring existing operational capabilities. However, there is currently no concise and comprehensive definition of dynamic capabilities that is widely accepted.

While the definition of dynamic capability may vary among researchers, a consensus on its core elements has emerged from the initial literature. These include the level of environmental change, organizational processes or routines, resource configuration, managers' decision-making, and learning mechanisms (Albort-Morant et al., 2017; Fukuzawa, 2015). In this study, we propose a definition of community dynamic capability that incorporates these elements and builds on Teece's work. Community dynamic capability (CDC) is defined as the ability of a community to integrate, build, and reconfigure internal and external competencies to address rapidly changing environments.

2.4.2 Dimensions of dynamic capability

As previously mentioned, dynamic capability is a widely researched topic in the field of strategic management that has gained the attention of scholars and practitioners from various fields. As a result, the definitions of dynamic capabilities vary depending on the context of application. A review of the existing literature identifies several key research streams, including.

2.4.2.1 Different dimensions of dynamic capability

In a series of studies by Teece et al. (1997) on strategic management, dynamic capabilities have been classified into different competencies depending on the specific study. They argued that dynamic capabilities are centered around two main aspects: firstly, the changing nature of the

environment, and secondly, the critical role of strategic management in effectively adapting, integrating and reconfiguring the internal and external organizational skills, resources and functional capabilities to suit the changing environment. Consequently, dynamic capabilities can be categorized into three dimensions: adapting, integrating, and reconfiguring. Second, Teece (2007) employed social and behavioral sciences to identify the underlying micro-foundations and nature of dynamic capabilities required for sustaining superior firm performance in an open economy. These micro-foundations, which consist of unique skills, processes, procedures, organizational structures, decision rules, and disciplines, form the basis for the three dimensions of dynamic capabilities, which are perceiving, acquiring, and reconfiguring capabilities at the firm level. The dynamic capabilities framework provides insight into the sources and foundations of a firm's competitive advantage for scholars. Later, Teece (2018), in his study of the relationship between Business models and dynamic capabilities, notes that dynamic capabilities comprise the ability to perceive, acquire, and transform capabilities necessary for designing and implementing business models. These capabilities enable firms to enhance their ordinary capabilities and direct them, along with those of their partners, towards high-return initiatives.

In the relevant literature exploring the formation of competitive advantage facilitated by dynamic capabilities of firms, apart from Teece et al. (1997) and Teece (2007, 2018)who classify three dimensions of dynamic capabilities, still other authors have classified dynamic capabilities into four, five dimensions. For instance, Eisenhardt and Martin (2000) proposed dynamic capabilities can be categorized into four dimensions: gaining, reconfiguring, integrating, and releasing. They propose that dynamic capabilities are comprised of identifiable and specific routines. Some of these routines involve integrating resources. One example of a dynamic capability is the product development process, where managers combine their different skills and functional backgrounds to create revenue-generating products and services (Helfat & Raubitschek, 2000). Another type of dynamic capability is resource reallocation within the firm, which involves transfer processes such as replication and agency procedures used by managers to replicate, transfer, and reorganize resources, particularly knowledge-based resources (B. E. Hansen, 1999; Hargadon & Sutton, 1997). In addition, some studies have suggested that dynamic capability consists of five components: absorption, adaptation, integration, reconfiguration and revitalization (G. O. White et al., 2014).

2.4.2.2 Definition of dynamic capability's dimensions

(1) Sensing capability

Sensing capability is defined as the ability to identify and assess opportunities and threats (Helfat & Peteraf, 2015; Matysiak et al., 2018; Okano et al., 2021; Roy & Khokle, 2016; Teece, 2007, 2018). The identification of opportunities and threats is partly dependent on the capabilities and existing knowledge of an individual, as well as the knowledge and learning capacity of the organization they belong to. This is particularly relevant in relation to existing and new solutions (Teece, 2007, 2018).

(2) Learning capability

Learning is a process that, through repetition and experimentation, leads to better and faster performance of tasks and the identification of new opportunities (Pavlou & El Sawy, 2010; Teece, 2007).

(3) Integrating capability

Integration capability refers to the ability to merge individual knowledge and skills into a cohesive operational capability for a team or organization. Reconfiguration, on the other hand, depends on integrating new resources and capabilities to enhance performance.

(4) Coordinating capability

Coordination capability refers to the ability to organize and deploy tasks, resources, and activities within a new operational capability. This capability is crucial in facilitating reconfiguration, which involves managing tasks, activities, and resources to deploy reconfigured warfighting capabilities. Effective integration and coordination of resources and capabilities within an organization are vital for seizing opportunities or responding to threats. While integration and coordination capabilities are positively correlated due to shared language (Galunic & Eisenhardt, 2001), they remain distinct concepts that are theoretically and empirically separate (Kogut & Zander, 1996).

(5) Reconfiguring/transforming/innovation capability

Reconfiguring and transforming an organization involves managing change by reconfiguring its core and complementary resources and capabilities to enhance its operational capacity on a day-to-day basis. This process of change management involves identifying opportunities for improvement, adapting to new circumstances, and leveraging resources in a way that maximizes effectiveness and efficiency (Matysiak et al., 2018; Okano et al., 2021; Pavlou & El Sawy, 2010; Teece, 2018). Innovation capacity refers to an organization's ability to allocate resources towards the transformation process, with the goal of avoiding stagnation and reactive responses to future changes. This capacity involves an organization's ability to continually innovate and adapt to changing circumstances, while remaining proactive in identifying and pursuing new opportunities (Miguel et al., 2022; Teece, 2007).

2.4.3 Applications of dynamic capability

Dynamic capability theory explains how firms respond to changing environments and originated in strategic management (Souza et al., 2017; Teece et al., 1997). Given the importance of dynamic capability in helping organizations to cope with crises and facilitate effective recovery, their application in enhancing organizational resilience has attracted considerable interest from scholars and practitioners. Some authors base their research on the impact of the overall dynamic capability theory on firms' resilience.

Y. W. Jiang et al. (2019) research has found that an organization's idle resources and capabilities help to keep an organization resilient in the long-term during times of crisis and disaster. Additionally, dynamic capabilities can provide a mechanism in sustaining organizational resilience over time, which leverages idle resources and capabilities and implementing routine transformation, resource allocation, and utilization, organizations can effectively respond to disruptive environmental changes.

Sinha and Ola (2021) emphasized dynamic capability improves business community resilience through continuous learning. The findings suggest that continuous learning generates complex dynamic capabilities through research and innovation, technology implementation, social learning and community knowledge sharing, which highlights the importance of dynamic capabilities in promoting organizational and business community resilience to disasters.

Other authors studied the effect on organizational resilience based on post-decomposition dynamic capabilities, and some relevant studies are listed below.

Y. W. Jiang et al. (2021) decomposed dynamic capabilities into three steps- perceiving, capturing and transforming. The findings show that (1) building situational awareness and reducing vulnerability through sensing dynamic capabilities, (2) improving adaptive capacity and workforce strategies through capturing dynamic capabilities, and (3) transforming dynamic capabilities contribute to disruptive change.

In a study by Akpan et al. (2022), dynamic capability was divided into perceived and reconfigured capabilities. They empirically demonstrate that dynamic capabilities, both perceived and reconfigured, improve the adaptability and agility of manufacturing firms in turbulent environments, ultimately enhancing their resilience.

Wided (2022) examined the application of dynamic capability for sustainable development in tourism. The findings showed that the four main parts of dynamic capability - sensing capability, learning capacity, integrating capacity and coordinating capacity --significantly affect organizational resilience and moderate the relationship between organizational resilience

and sustainable tourism.

While the dynamic capability perspective may not encompass all management strategies for change, it remains the most effective framework for organizations to generate and sustain new value in tumultuous and dynamic settings (Y. N. Lin & Wu, 2014; Teece et al., 1997). In dynamic situations, data centers are able to apply dynamic capabilities to reconfigure existing resources and capacities, thereby increasing organizational resilience (Teece, 2007). As mentioned above, dynamic capability theory has its origins in strategic management and most of the current applications are also focused on strategic management.

2.5 Social capital theory

2.5.1 Original and concept

Social capital was introduced by sociologists such as Bourdieu (1986) and Coleman (1988), and later expanded by political scientist Putnam (1995) and others, so that social capital was more and more widely valued and applied in social disciplines, including community, organizational management, tourism, health and other related disciplines. Social capital can be viewed as an asset at both the individual and collective levels, involving connections among people, groups, institutions, networks, organizations, and communities. (Aldrich, 2012a).

Initially, Hanifan (1916) defined social capital as the kindness, friendship, mutual sympathy, and social interaction between individuals and families within a social unit. The concept has been widely adopted across multiple disciplines, highlighting the positive impact that group participation can have on individuals and communities (Portes, 1998). Bourdieu (1986) categorized social capital as one of four types, along with economic, cultural, and symbolic capital, which determined social life's trajectory. Coleman (1988) used Bourdieu's definition to study its influence on individual outcomes. N. Lin et al. (2001) further linked social capital to networks of relationships, defining them as resources that can be obtained or mobilized through ties in the network.

With the development of practice, scholars have gradually extended the definition of social capital to the collective level. Putnam (1993) provided a broad definition of social capital as the characteristics of social organizations, such as networks, norms, and trust that promote action and mutually beneficial cooperation. Kawachi and Berkman (2000) proposed a broad definition of social capital as an informal norm that fosters cooperation among individuals. Woolcock (2001) argued that social capital refers to the structure of networks and social relations that

facilitate mutual cooperation for benefits, rather than a set of interconnected behavioral tendencies, such as trust, reciprocity, honesty, and institutional measures.

In the context of community resilience, social capital refers to the participation of community members and their willingness and ability to contribute to activities that advance community goals (Magis, 2010). Audretsch and Aldridge (2012) argued that social capital played a crucial role in post-disaster recovery, surpassing factors such as socioeconomic conditions, population density, levels of destruction, or aid levels. Survivors with strong social network connections receive the essential information and support, leading to faster recovery than those without such contacts. Conversely, communities without robust social networks and associated social capital may face a disadvantage. Therefore, this study defines social capital as as features of social life (networks, norms, and trust) that enable participants to act together more effectively to pursue shared objectives (Igalla et al., 2020).”

2.5.2 Dimensions of social capital

Since social capital is a multidimensional concept, it is natural to produce several different classifications of social capital. Classifications are important for understanding complex conceptual definitions of social capital and guiding its measurement.

Nahapiet and Ghoshal (1998) divided social capital (that is the networks of strong, crosscutting personal relationships that develop over time are central to the survival and functioning of city neighborhoods, and these relationships form the basis for trust, cooperation, and collective action within communities) into structure, relationship, and cognitive social capital. Structural social capital referred to the sum of various social connections, focusing on the structural characteristics of social relationship networks, such as the existence of networks, the strength and density of connections, and the convenience these structural characteristics brought to the achievement of organizational goals. Relational social capital referred to the personification elements related to organizational connections, mainly trust and credibility among network members, norms and punishments, obligations and expectations, mutual respect and recognition, etc. Relational social capital focused on how to access relevant resources through interpersonal relationships. Cognitive social capital referred to the cognitive paradigms in the network of organizations, such as language, cultural habits, and commonly recognized knowledge within the organization, including common experiences, common languages, common positions and opinions, common language culture, etc.

Krishna and Shrader (1999) and Harpham et al. (2002) argued that social capital can be categorized into cognitive social capital and structural social capital. Cognitive social capital

relates to awareness of interpersonal trust, mutual respect, and reciprocity, while structural social capital pertains to participation in various social activities. Structural social capital is more behavior-oriented, while cognitive social capital is more related to feelings about social relations.

Social capital can be classified into bonding, bridging, and linking categories (Stern & Putnam, 1992; Szreter & Woolcock, 2004). bonding social capital (Stern & Putnam, 1992) was endogenous, was a more closely related homogeneous group of people, such as family members, old friends, had a tendency to strengthen the unique identity and homogeneity of the group, could promote the mobilization of specific network members and reciprocal relationships. According to (Stern & Putnam, 1992), bridging social capital refers to connections between people who share common interests but are more distant from each other, such as colleagues or members of social groups. These horizontal linkages can help to increase the connection between external resources and populations who may feel disconnected or alienated. Bridging social capital could enable the cooperation of different individuals in a particular social structure. Szreter and Woolcock (2004) added linking social capital to the type of social capital. "Linking social capital refers to the horizontal and vertical connections between individuals or groups across different levels of society.

Community resilience refers to the ability of a neighborhood or defined area to efficiently resume daily life rhythms following shocks by cooperating and dealing with stressors collectively (Aldrich, 2012b). This ability could be well measured by social capital at the "bonding-bridging-linking" level, so we used "bonding-bridging-linking" to measure social capital. This study defined the bonding social capital as “residents have close connections that give a sense of belonging and help them get by”, the bridging social capital is defined as “residents have broad connections that help them expand opportunities”, and the linking social capital is defined as “residents have connections to organizations and systems that help them gain resources and bring about change”.

2.6 Social support theory

2.6.1 Original and concept

The study of social support was first proposed in the 1960s in the field of psychology, to explore the effects of life pressure on physical and mental health. However, the term "social support theory" was not introduced in the psychiatric literature until the 1970s (Cassel, 1976; Cobb,

1976). Social support theory refers to the information that makes people feel cared for, loved, and connected to a social network that holds each other accountable. This definition emphasizes that social support comes from a social network, members of it can acquire emotional support against illness and stress (Cobb, 1976). Since then, social support theory has been widely studied by psychologists, sociologists, epidemiologists' social psychiatrists and other fields. From the psychological perspective, social support studies the experience of individuals in social groups as they are cared for and responded to (Sarason, 1988). Social support is mainly aimed at the completion of treatment for mental illness and providing assistance through social bonding to demonstrate improvements in health and well-being (Bambina, 2007; House et al., 1988; Kaplan et al., 1977). Social isolation and non-supportive interactions harm the immune system, while supportive interactions have a positive effect on immune function and reduce neuroendocrine and cardiovascular activity (Seeman, 1996). From the perspective of social psychiatry, people who lack social support usually lack social relationships, which is often due to personality defects, which in turn may lead to mental diseases (Henderson, 1984). To sum up, researchers have proposed different definitions of social support theory from their own theoretical perspectives. The "social support theory" described is a study based on a sociological perspective, and in the literature described from this perspective, social support theory is usually defined in terms of the following.

(1) Defined in terms of social interaction. Social support is a connection between people that can provide help, both spiritual and material, to individuals facing difficulties or threats. It is also a mediating factor of psychological stress and disorders. Social support, sometimes even the attachment between individuals or between individuals and groups, which is suitable for promoting emotion, providing guidance and providing feedback on one's identity and achievement (Caplan, 1974). Social support can also be summarized as an objectively existing or personally perceived relationship that can communicate with others, be cared for, accepted, loved, recognized, and helped (Sarason, 1988). Therefore, social support involves more than just providing one-way care or help. Instead, it often entails a reciprocal exchange and interaction between individuals (Uehara, 1990).

(2) Defined in terms of the nature of social behavior. Support is an action or process that can promote support, help or support things; while social support is a force or factor that can promote human development in a social environment (Webster, 1999). The social environment contains various factors that contribute to social support, making it a complex concept. There are three levels of relationship between individuals and the environment: overall participation, the source of social support, and the availability of emotional, belonging, informational, or

material assistance (Gottlieb, 1981). That is, individuals can obtain comfort, help or information through formal or informal social connections (Wallston et al., 1983).

(3) Defined in terms of the role of social resources. Social support is often considered as a potential resource for individuals to deal with difficulties in times of stress (Cooke et al., 1988). In this perspective, the concept of social support includes three aspects (Barrera et al., 1981): the source of support, which is the member who provides social support to the supporter; support activities or behaviors, that is, behaviors provided by social supporters to supporters that can meet individual material or spiritual needs; subjective evaluation of support refers to the subjective feeling and evaluation of the support obtained by the supporters.

Social support is a very complex concept, which includes both external environmental factors and individual internal cognitive factors, and can directly reflect the interaction between individuals and others. In the COVID-19 epidemic, social support can play a positive role in clarifying life purpose and enhancing self-confidence (Santoso, 2021), and can improve mental health and reduce loneliness during this period (Pantow et al., 2020). Social support can also bring material comfort (French et al., 2018). Thus, we believe that social support in this study can be defined as the perceived or actual instrumental and/or expressive provision provided by communities, social networks and trusted partners (N. Lin, 1986).

2.6.2 Dimensions of social support

During the decades of development of social support theory, it has evolved into different dimensions: as early as 1977, the division of social support theory from the perspectives of emotional support and instrumental support provides a classical basis for subsequent research (Dean & Lin, 1977; Semmer et al., 2008). Subsequently, discussions on the concept of information support began to rise (Schaefer et al., 1981). Norbeck and Tilden (1983) found that emotional support and instrumental support are distinct dimensions with different effects on mental health. While emotional support aims to provide comfort and empathy, instrumental support serves a different goal: the former aims at changing the implicit performance of the heart, such as mood, attitude or cognitive processing, while the latter aims at directly helping the individual's explicit performance. So, we can further distinguish the emotional and cognitive of emotional support and the practical and informative of instrumental support. At this stage, social support was divided into four categories: emotional support, instrumental support, information support and appraisal (House, 1983). Wherein, the concept of social support includes emotional support, instrumental support (provision of services), informational support (advice), and appraisal support (self-evaluation). This dimension has remained prominent over

time, with most theorists adopting and expanding it to include material or instrumental support (Cohen & Wills, 1985).

Another aspect of social support was divided into four types: emotional/esteem, tangible, informational, and companionship (Sarafino, 1985). Support can be provided in different ways: emotional/esteem support involves showing love, empathy, and encouragement; tangible support refers to practical assistance; informational support entails sharing knowledge and ideas; and companionship support involves informal conversations or social activities. These types of support provide resources to individuals and help them feel valued as part of a group. Until 2002, Caltabiano and Sarafino (2002) identified five types of support: emotional, tangible/instrumental, informational, esteem, and network support. Unlike the classification proposed by Sarafino in 1985, Caltabiano and Sarafino (2002) introduced esteem support as a distinct form of support, focused on self-evaluation, competence, and feelings of worth. This type of support is similar to House's appraisal support. Esteem support thus resembles House's appraisal. Despite the existence of various theoretical dimensions of social support, two main types of support are always the most prominent and comprehensive (Declercq et al., 2007). Information support and emotional support are generally considered as the most common types of social support (Pfeil et al., 2009). Thus, in this thesis, social support is operationalized as a second-order construct using three types commonly defined in the literature as social support dimensions: instrumental support, information support and emotional support. Instrumental (tangible) support refers to involving the provision of material assistance, such as financial assistance or help with daily tasks; Informative (instructional) support provides individuals with relevant information to cope with current difficulties, typically in the form of advice or guidance for personal problems; emotional (non-directive) support is defined as expressing empathy, care, comfort and trust, and providing opportunities for emotional expression and outlet (Cohen, 2004).

2.6.3 Applications of social support

In the daily environment, most scholars' research on social support theory usually focuses on the relatively vulnerable groups such as the patients with disease, the elderly in urban and rural areas and teenagers.

(1) Patients with disease

From the perspective of somatic diseases, (Driscoll, 2016) used constant comparative analysis, and concluded that community and social support could improve cervical cancer screening and reducing the incidence. Isah et al. (2020) used a household survey and key insider

interview process for diagnosis of congenital health problems and determine the determinants, drew a plan for building community that social support is a way to solute the issue of common congenital health, to improve the population health. In terms of mental diseases, by reflecting on what community social support and maternal depression mean for Rwandan women, it has been concluded that among mothers in middle-income countries, providing mothers with the opportunity to share and accept their emotions, along with social support, can reduce common perinatal mental health disorders such as anxiety and depression, including postpartum depression (Hynie et al., 2015).

(2) Urban and rural elderly

Community social networks are one of the social resources to enhance the well-being. In the Gallardo et al. (2018) study, they found that social support to integrate into the community (neighbors) was associated with quality of life. Community services and social activities within the community are very important to improve the social and cultural environment to promote active aging. The social support provided by the senior friendly community can effectively improve the positive attitude of the elderly towards aging (Cheng et al., 2021). The social support theory is mentioned many times in the existing studies on dementia in the elderly. Community social support is a driver of reducing loneliness in the elderly. Obtaining emotional support at the community level may lead to a lower level of dementia in the elderly (C. X. Chen et al., 2017).

(3) Teenagers

Research on children and adolescents has shown that community social support can prevent dental caries (Fontanini et al., 2015; Reynolds et al., 2015). By means of questionnaire survey and interview, the positive effect of community social support on family sleep problems and family relations can be obtained, and the necessity of community publicity and the development of sleep interventions is proposed (C. A. Roberts et al., 2017).From the perspective of adolescent psychology, community social support can provide educational care for the psychological of troubled adolescents so as to make them reintegrate into society (Quijano & López, 2016). In addition, Jenney et al. (2016) used the method of Zagin theory to interview 12 participants and understand their experiences of intimate partner violence in childhood, and concluded that community social support is a major way for adolescents to heal injuries.

This research focuses on the perspective of community resilience. By reviewing the literature on the impact of community social support on community resilience, we summarize the literature in this section as the cases of natural disasters, economic security incidents and public health events.

(1) Natural disasters

Social relations are strongly impacted by disasters, making it the most essential and reliable feature of them all, and social support, as an activity that plays a positive role in social relations, is an important resource to help people cope with natural disasters (Kaniasty, 2020). In the context of the Kannagi Nagar settlement, social support significantly positively impact community resilience (Haas et al., 2021). As a component of community social support, community information support release and share information during crisis (L. L. Xie et al., 2022), so as to enable them to effectively cope with pressure (Duhachek, 2005), and is positively correlated with community resilience perception (X. C. Zhang & Shay, 2019). Therefore, social support can be the core of resilience (H. L. Li et al., 2021; Saltzman et al., 2020; J. P. Xu & Ou, 2014).

(2) Economic security incidents

Papadaki and Kalogeraki (2017)studied Greek communities and explored social support activities based on the community resilience framework. Communities offered various forms of social support to those in need, such as food pantries, clothing distribution, healthcare, and education services. Gregório et al. (2014) found that community social support can help families cope with food insecurity and enhance family resources and well-being in the face of deepening global poverty caused by the economic crisis. The empty-nest syndrome study supports the effectiveness of community-based social support programs. Therefore, governments should prioritize promoting community social support to improve resilience (Bougea et al., 2019).

(3) Public health events

Recent research on social support in public health events has mainly concentrated on the COVID-19 pandemic, which is dramatically altering our daily routines.

Large-scale quarantines proposed by many countries to contain the COVID-19 pandemic can greatly reduce the number of people infected, but there are concerns about the potential negative effects on mental health. Numerous studies have shown significant negative effects of isolation on mental health and well-being(Brooks et al., 2020), such as during the Ebola virus quarantine in West Africa in 2014 (Drazen et al., 2014) and the MERS quarantine in South Korea in 2015 (Jeong et al., 2016). Stress, tension, and anxiety are common among individuals in crisis, but different types of stressors have different effects on people depending on their ability to cope (Byrd & McKinney, 2012). Therefore, scholars have studied the types of stressors that can be controlled during this period and are searching for ways to deal with them.Social support, including interpersonal interactions and communication, can greatly

reduce stress levels and provide emotional functioning during the COVID-19 pandemic. Santika and Purworini (2022)used descriptive quantitative methods to explore the role of communication on self-isolation during the COVID-19 pandemic. The role of communication in the form of social support in the isolation of patients with COVID-19 was concluded by a convenient sampling technique calculated using the Cochrane formula for 96 respondents from the population of Soloraya, Central Java, who were in self-isolation, suffering from COVID-19 epidemics or had recovered. Therefore, during the current COVID-19 pandemic, loneliness needs to be recognized as a key issue, policy makers should promote community social support to examine the emotional state of people living alone (Groarke et al., 2020), and community health workers can effectively engage in community-level psychosocial support (Mistry et al., 2021). As the cornerstone of urban governance, community can promote residents' behavioral dimension and cognitive dimension resilience under stressful conditions by stabilizing residents' emotions in response to public crisis (Zhao et al., 2022).

Researchers investigated the impact of social support and related factors during the COVID-19 epidemic in Iran, the findings suggest that social support plays a crucial role in epidemic control. (Torkian et al., 2020). Also, social support is a protective construct to reduce the negative impact of the COVID-19 pandemic (Nen et al., 2021), and social support is very necessary for resilience (Saleha et al., 2021). Since community provides residents with a shared emotional and psychological identity, its support is crucial in the face of disasters (Kong, 2020). Therefore, in the reconstruction work, full consideration of community social support is an important resilience factor (E. Long et al., 2022).

In conclusion, it can be seen that the social support theory is feasible to apply in the COVID-19 pandemic. Furthermore, the lack of relevant research on the mediating effect of social support in the context of digital technology and community resilience makes the social support theory proposed in this study innovative and valuable.

2.7 Stimulus-Organism-Response model

The need of understanding how digital technologies affecting community resilience leads us to the Stimulus-Organism-Response (*i.e.*, S-O-R) model. S-O-R model claims that environmental cues act as external stimuli can influence individuals' cognitive and affective experiences (*i.e.*, organism), which will then drive them to perform intentions or behaviors as the responses (J. M. Fang et al., 2018; K. Z. Zhang & Benyoucef, 2016). Specifically, the stimulus refers to an influence that can arouse an organism (J. M. Fang et al., 2018), the organism or organism

reaction refers to the internal cognitive and affective processes or states (J. M. Fang et al., 2017; K. Z. Zhang & Benyoucef, 2016), and the response refers to the intention or behaviors of the organism (J. M. Fang et al., 2017).

As a robust model, the S-O-R model are applied to diverse contexts, which include online and offline communities (Carlson et al., 2021; J. J. Hu et al., 2021; Islam & Rahman, 2017; S. P. Jain & Posavac, 2001; Jin et al., 2022; Kamboj et al., 2018; Lyu et al., 2021; Naqvi et al., 2020; Qiao et al., 2021; J. W. Wang et al., 2022; K. Y. Wang et al., 2020; Y. Zhang et al., 2021). Thus, this thesis explore the mechanism of digital technologies on community resilience based on the S-O-R model.

2.7.1 Original of Stimulus-Organism-Response

S-O-R model was originally developed on the Stimulus-Response (*i.e.*, S-R) theory (Mehrabian & Russell, 1974; K. Z. Zhang & Benyoucef, 2016). The S-R theory explains that individual behavior is a learned response to external stimuli, and is questioned of oversimplifying the causes of behavior without taking into account a person's mental state (K. Z. Zhang & Benyoucef, 2016). Thus, Mehrabian and Russell (1974) introduced the concept of organism, which is between stimulus and response to improv the S-O-R model.

In terms of discipline field, the S-O-R model is grounded in environmental psychology (Bigne et al., 2020; Mehrabian & Russell, 1974). Mehrabian and Russell (1974) have attempted to provide a relatively integrated study framework, which presents a broad overview from the environment, and outlines primary variables from most situations.

2.7.2 Concept and definition of Stimulus-Organism-Response

Mehrabian and Russell (1974) proposed the S-O-R model, which suggests that environmental stimuli directly influence a person's emotional state and subsequent behavior. This includes sense modality variables like color and temperature, as well as information rate describing the spatiotemporal relationship between stimulus components (Mehrabian & Russell, 1974). The primary emotional responses (*i.e.*, organism) include pleasure, arousal, and dominance (Mehrabian & Russell, 1974). The behavioral response is the inclination towards approach-avoidance, which can be expressed through physical approach, exploration, performance, as well as verbal and nonverbal communication of preferences (Mehrabian & Russell, 1974). The framework of S-O-R model is shown in Figure 2.3.

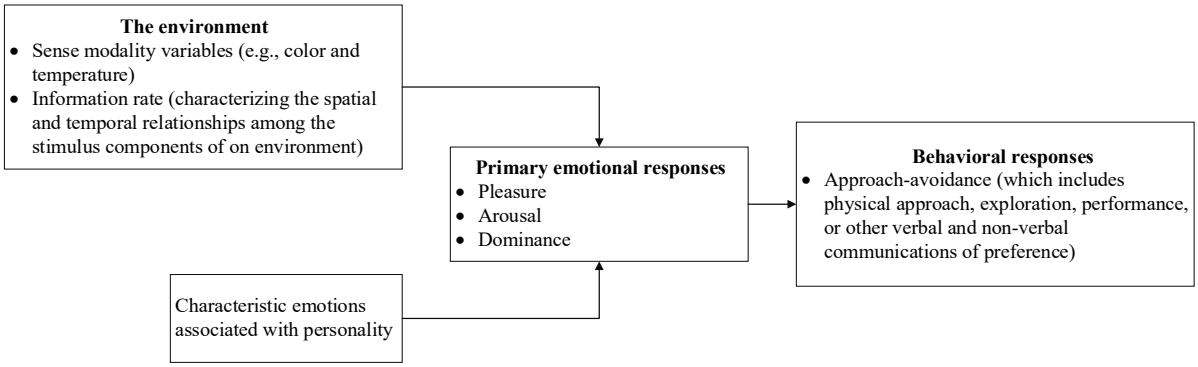


Figure 2.3 Outline of the Mehrabian and Russell proposed S-O-R framework

Source: Mehrabian and Russell (1974)

With the development of research, some studies have used S-O-R model to explore various contexts. These studies will give the specific definition and composition of each component (*i.e.*, stimulus, organism, and response) in S-O-R model, by combining with specific research contexts. The following will elaborate on the definition and composition of each component in S-O-R model, according to the research context, including online communities and offline communities.

(1) Concept and definition of Stimulus-Organism-Response in online communities

Many studies explored online communities based on S-O-R model, such as online brand community (Carlson et al., 2021; Islam & Rahman, 2017; Kamboj et al., 2018; K. Y. Wang et al., 2020), virtual brand community (Qiao et al., 2021), electronic-brand communities (Naqvi et al., 2020), social shopping community (Jin et al., 2022).

In terms of online brand community(Carlson et al., 2021; Islam & Rahman, 2017; Kamboj et al., 2018; K. Y. Wang et al., 2020). For example, Islam and Rahman (2017) used the S-O-R model to investigate customer motivation for engaging in online brand communities. The model includes three components: stimulus, organism, and response. Stimulus refers to factors that influence individuals, such as information quality, system quality, virtual interactivity, and rewards. Organism refers to the cognitive and affective state of customers, with engagement being the focus of the study. Response refers to the outcome of customer behavior, with brand loyalty being the response in this study.

Besides the online brand community, studies also focus on virtual brand community, electronic-brand communities, and social shopping community (Jin et al., 2022; Naqvi et al., 2020; Qiao et al., 2021). For example, Qiao et al. (2021) examined the effect of various virtual brand community experiences on the eWOM behaviors. The stimulus refers to brand experience, and in the virtual brand community, stimuli include affective, interactive, relational, sensory, intellectual, and entertainment experiences. The organism refers to mental processes of

individuals, and, in the virtual brand community, it includes brand and community identification. The response refers to both attitudes and behaviors, and opinion seeking, passing, as well as giving are considered as response in the virtual brand community.

(2) Concept and definition of Stimulus-Organism-Response in offline communities

There are few studies using S-O-R model to explore offline communities, mainly focusing on tourism destination communities (J. J. Hu et al., 2021; Lyu et al., 2021), regional heritage brand communities (S. P. Jain & Posavac, 2001), and urban communities (J. W. Wang et al., 2022; Y. Zhang et al., 2021). The specific content is as follows.

J. J. Hu et al. (2021) focused on short-term tourism destination communities. Specifically, they cited existing definitions of various parts of S-O-R model. First of all, stimulus refer to the physical and social environment perceived by people, and consist of variety parts of residents' environmentally responsible behavior in their proposed model. Second, organism refers to something that is characterized as internal and unobservable process, and includes environmental concern and destination identification of tourists. Third, response refer to the attitudes and behaviors of individuals, and mean green consumption of tourists.

Different from J. J. Hu et al. (2021), Lyu et al. (2021) explored the tourism destination community in long-stay tourism context. Specifically, stimulus refer to a change in the environment, which contains cues, and the stimulus include a set of psychological state, such as excitement, curiosity, anxiety, loneliness, and uncertainty. Organism refers to a living something's internal evaluation, and the organism include a set of response mechanism, such as amenity seeking, novelty seeking, familiarity seeking, social network expansion, and conservative ideology. Response refers to a reaction of the organism, and consist of a set of destination preference, such as amenity, rurality, familiarity, sociability, and reputation.

Besides the tourism destination community, studies also focus on regional heritage brand communities (V. Jain et al., 2021). Specifically, V. Jain et al. (2021) considered the heritage of the regional brand communities as the stimulus. They considered the residents' internal cognitions as the organism, which include symbolic, heritage oriented, nostalgic, and experiential. They considered that the relationship between communities and residents as response, which include high integration of people and place, strong place experience, and positive attitude about the place.

Besides the tourism destination community and regional heritage brand communities, studies also focus on urban communities (J. W. Wang et al., 2022; Y. Zhang et al., 2021). For example, J. W. Wang et al. (2022) used the classic definition of variety components of S-O-R model. The study considered the stimulus, which referred to the impact of external factors on

an individual's state, including the pandemic and leisure environment. The organism, which included an individual's cognitive and affective state, was also examined, specifically in terms of leisure satisfaction and community identity. The response, which pertained to an individual's approach or avoidance behavior, was measured by the subjective well-being of residents.

Moreover, Y. Zhang et al. (2021) studied the relationship between community cultural services and residents' satisfaction in urban areas, and how residents' subjective feelings mediate this relationship. The study identified four types of external cues that stimulate residents: material, spiritual, institutional, and behavioral cultural services. The change process involves three aspects: pleasure, perceived value, and arousal. Finally, the study looked at the behavioral response decision of residents, which was measured as customer satisfaction.

(3) Concept and definition of Stimulus-Organism-Response in this study

In summary, in the context of this thesis, stimulus refer to the characteristics of digital technologies that are used by the community to cope with the epidemic. Specifically, stimulus include the volume, variety, and velocity attributes of digital technologies. Organism refers to the state of capabilities and resources in the community, and includes dynamic capabilities of digital technologies, community social capital, and community social support. More importantly, characteristic of the organism refers to digital adoption trait of community, and operationalizes community technological opportunism, which will have a contingency effect on digital technologies to dynamic capabilities of digital technologies, community social capital, and community social support. Response refers to inclination of the community shown in the Covid-19 pandemic, and operationalizes community resilience.

2.7.3 Applications of Stimulus-Organism-Response

The S-O-R model has been widely used in various research contexts. According to different research contexts, the existing literature using the model is reviewed. Specifically, it will be summarized from online community, and offline community two aspects.

(1) Applications of Stimulus-Organism-Response in online community

There are some studies address questions related to online communities based on the S-O-R mode. For example, Islam and Rahman (2017) reveals that various characteristics positively influences engagement, and customer engagement positively impact loyalty. Moreover, the results reveal the moderation role of gender in the online context. Kamboj et al. (2018) attempt to investigate "how motivations of customers participation in online brand community lead to brand trust, loyalty, and co-creation?". The study found that brand trust plays a mediating role in the relationship between customer participation and brand loyalty within social media brand

communities. K. Y. Wang et al. (2020)investigated “how perceived interactivity influences online brand community relationships?”. The results indicate that social media attitudes mediate the relationship between perceived interactivity and customer relations.

In addition, Qiao et al. (2021) find experiences of virtual brand community have an effect on brand and community identification, which affect the various eWOM. Naqvi et al. (2020) found that community attributes influence both customer engagement and satisfaction. Additionally, they observed that customer satisfaction mediates the relationship between customer engagement and brand loyalty and recommendation. Jin et al. (2022) explored “how cover image features affect users’ willingness in social shopping community?”. The results reveal that image authenticity and aesthetics both positively influences on viewers’ beliefs toward textual content and product.

(2) Applications of Stimulus-Organism-Response in offline community

Only a few studies apply the S-O-R model to address critical questions related to offline communities. For example, J. J. Hu et al. (2021) found environmentally responsible behavior of residents positively influences the green consumption of tourists, and destination identification and environmental concern both perform the mediation role in the relationship. Lyu et al. (2021) investigated “how psychological needs of long-stay tourists, in the tourism destination communities, influence destination attributes and preferences of visitors?”.

V. Jain et al. (2021) pointed out that the resident's aspect of place heritage branding is linked to their life stories, feelings, past experiences, and aspirations. J. W. Wang et al. (2022) reported that leisure satisfaction and community identity mediated the link between pandemic impact, leisure environment, and subjective well-being. Y. Zhang et al. (2021) discovered that community culture's impact on customer satisfaction was mediated by residents' emotions and perceived value.

Inspired by the existing applications of the model, this dissertation drawing upon the S-O-R model, aims to address how digital technologies influence community resilience? Specifically, this dissertation attempts to reveal the mechanism of digital technologies empowering community resilience by combining dynamic capabilities, social support, and social capital theories.

2.8 Summary

In this chapter we reviewed relevant literature which inform this study and provide theoretical foundation for building our own research model. We first review the digital technologies

including concept and connotation, categories of digital technologies and the user adaptation behavior of digital technologies in community operation. Then, we reviewed work of smart cities and smart communities which directly inform our research in this study. We reviewed the concept and connotation of communities, smart cities and smart communities, the characteristics and architecture of smart communities, and the success factors for building smart communities and smart cities. After that, we reviewed the one important variable in our proposed model, that is, communities resilience including definition, dimensions, and success factors of community resilience. The second part of our literature review consists of reviewing four theories applied in our study. We first reviewed the dynamic capacities theory, including original and definition of dynamic capability, the dimensions of dynamic capacities, and the application of dynamic capacities. Then, we reviewed the social capital theory and social support theory. These three theories provided us important theoretical support to figure out the mediation mechanism by which digital technologies use influences community resilience. Finally, we reviewed Stimulus-Organism-Response framework which offers us the overarching theory for building our model proposed in this study.

Chapter 3: Research Hypotheses and Research Model

The research model proposed is built upon the overarching Stimuli–Organism-Response (S-O-R) framework. In the context of this research, this thesis operationalizes the digital technology as stimuli of the environment that may help community organisms shape and accumulate relevant capabilities and resources, including community dynamic capabilities, community social capital, and community social support. These formed capacities and resources ultimately help the community response in the crisis situations, that is community resilience. At the same time, we argue that community technological opportunism might reinforce the effect of the digital technology attributes on community organisms, i.e., community opportunism enhances the relationship between digital technologies and community dynamic capability, community social capital, as well as community social support.

3.1 Research hypotheses

3.1.1 Digital technologies and community dynamic capabilities

Digital technology (DT) is an electronic and digital tool for acquiring, storing and analyzing data. Nambisan (2017) classified the many digital technologies into three related but different elements: digital artifacts, digital platforms and digital infrastructure. Community dynamic capability (CDC) refers to the capacity of a community to effectively integrate, develop, and adapt both internal and external competencies to respond to swiftly changing environments. In the thesis, community dynamic capability is operationalized as a second-order formative construct with five components: sensing, learning, integrating, coordinating, and reconfiguring capability. Next, this thesis will discuss in turn the impact of digital technology on five components of dynamic capability.

Digital technology can enhance a community's sensing capability, which refers to the ability to scan, learn, and interpret opportunities and risks in an epidemic environment. First, digital technology (e.g., App and digital platforms) can quickly integrate and standardize the presentation of information about the external environment. The wealth of information from these applications can help communities fully understand stakeholders' needs (R. Hansen & Sia, 2015). Second, digital technology can help communities achieve a comprehensive and efficient

use of internal and external data. Specifically, communities can quickly and easily complete data collection (e.g., covid testing information collection), data sorting, storage, circulation, analysis and mining by using the digital technology. By processing and analyzing the integrated data information, the community can make predictions about future trends, respond quickly to residents' needs, and can quickly scan, learn and interpret opportunities and threat (Tabrizi et al., 2019). Third, digital technologies and related processes are unconstrained by physical assets and processes (Berger et al., 2021), which can significantly help communities in broadening access to information supply chains, thereby enhancing the diversity and reliability of community-perceived information. Therefore, digital technologies can enhance sensing capability of communities.

Digital technology can boost a community's learning capability – the ability of acquiring and absorbing knowledge and using enough knowledge to facilitate the design and modification of the community in crises. First, in an increasingly symbiotic digital age, boundaries between within the community and between the community and outside society are gradually being broken down. Through digital technologies, communities are constantly gaining new shared knowledge from their stakeholders, including community residents, community-based service providers include government and non-governmental organizations, as well as formal and informal groups within and outside the community, enabling them to quickly connect to external information sources, expand the breadth and depth of information, and achieve interactive learning from external cognition and the external environment (Trantopoulos et al., 2017). Second, when sensing new knowledge, communities can use technology to exploit or update digital tools to better integrate the new knowledge into their working processes. The use of digital technologies allows communities to use new knowledge in their daily operations faster, cheaper and more conveniently, facilitating the reconfiguration and integration of new knowledge with internal and external resources (Appio et al., 2021). Finally, digital technology provides digital solutions that help to see what is not obvious by the unaided eye, providing deviations in a visual way. Digital technology captures the three states of deviation - what, where and why - by identifying deviations, mining the data and assisting in the identification of the root causes of deviations to help communities optimize the use of newly acquired knowledge (Chirumalla, 2021). Therefore, digital technologies can boost communities' learning capability.

Digital technology can also increase a community's integrating capability refers to the ability to incorporate new shared knowledge into the community's operational capacities during an epidemic. First, digital technology (such as big data, cloud computing) can help a community

to assess resources and abilities within and outside of the community and accurately grasp the resources status, so as to better integrate the internal and external resources obtained by the community into the operational capacity. Digital technology can provide a set of mechanisms to connect the traditional IT architecture and various types of data, integrate the old and new models, and integrate the data accumulated. The data service capability provides support for the refined operation of community management and decision-making. Second, communities can optimize internal governance structures, management processes and mechanisms, and use digital technologies to assist or replace inefficient manual operations by introducing digital technologies, thereby meeting stakeholders' needs, reducing internal management costs, and optimizing the integration of internal resources and capabilities (Chowdhury et al., 2022). Third, with the help of digital technology, communities can break through the shackles of traditional element boundaries, help communities output effective information to stakeholders, enable stakeholders to have more adequate information, and promote communities to obtain support from stakeholders (Aben et al., 2021; C. H. Liu et al., 2017). At the same time, from the perspective of stakeholders, they can also gain more opportunities to quickly understand the situation and obtain detailed information about the community, reduce information asymmetry, and provide resources more suitable for relevant communities through digital technologies, that is, the community can make the most of available resources and avoid unnecessary redundancy. This can lead to increased efficiency, better allocation of resources, and reduced waste. Thus, digital technologies can increase the integrating capability of communities.

Digital technologies can enhance a community's ability to coordinate tasks, resources, and activities during an epidemic, thereby improving their overall coordination capabilities. On one hand, the use of digital technology in communities facilitates the flow, sharing and interoperability of data and information throughout the community and across business units. The flow and the feedback loop of data and information have opened up key business links within the community, improved the quality and efficiency of communication between different departments and levels, and enabled collaboration between departments (Klewes et al., 2017). On the other hand, communities can assign data information to different units in a targeted manner, so that corresponding processes, resources and personnel can be coordinated with each other to achieve better results when arranging tasks, allocating resources and organizing activities (Handoko et al., 2015). Thus, digital technologies can improve the coordinating capability of communities.

Digital technology can advance a community's reconfiguring capability-the ability to reorganize their resources base and/or reconfigure new resources to achieve identified

opportunities or withstand sudden-onset risks in an epidemic environment. Digital technology can provide communities with scenario planning, enabling “what-if” scenarios that tell community managers what they need to configure, thereby assisting communities to reimagine unknown and new business processes and improving their ability to reconfigure (Chirumalla, 2021). Furthermore, improvisation is a way of reconfiguring capability (Pavlou & El Sawy, 2010). The extensibility of digital technology can help communities to achieve a higher degree of improvisation than traditional analogue technology (Khurana et al., 2022), thus helping them to reconfigure in a more diverse and innovative way, optimizing their reconfiguration options and increasing their reconfiguration capacity. Therefore, digital technologies can advance the reconfiguring capability of communities.

In addition, prior research has shown that digital technology can enhance the dynamic capabilities of organizations. Two recent empirical studies (Khurana et al., 2022; Shen et al., 2022) have confirmed a positive relationship between digital technology and dynamic capabilities. Khurana et al. (2022) developed a multilevel (i.e., entrepreneur, organizational, and entrepreneurial ecosystem) model of resilience, and explored the process (i.e., the SMEs alternate their focus to highlighting a shifting interplay of dynamic capabilities, including sensing, seizing, and transforming) of helping organizations develop resilience. Digital technologies can enable small and medium enterprises to build these capabilities during a crisis. Shen et al. (2022) proposed a conceptual model, grounded in the resource-capability-performance framework, and examined the role of dynamic capabilities in the textile industry's digital transformation performance. They further explored using a multiple regression model to determine their significance. And, they noted that digital technology positively affects dynamic capabilities.

To sum up, this thesis proposes that digital technology can improve community dynamic capability, (i.e., five abilities, including sensing, learning, integrating, coordinating and reconfiguring capability). Given all the evidence, the thesis propose the hypothesis 1:

H1: Digital technology is positively related to community dynamic capability.

3.1.2 TO as a moderator of the relationship between DT and CDC

Technological opportunism refers to a firm's ability to sense and respond to new technologies, accounting for differences in adoption of radical technologies among firms (C. W. Chen & Lien, 2013; Srinivasan et al., 2002). In this thesis, community technological opportunism is the ability of the community to perceive and react to new technologies, whether they are created externally or internally, and leveraging them to offer new services is a crucial aspect for organizations

(Srinivasan et al., 2002). This thesis proposes that technological opportunism reflects the managerial level of new technologies in the community, and is a typical moderating mechanism for the community to deploy new technologies to obtain capabilities. Therefore, technological opportunism moderates the relationship between digital technology and community dynamic capabilities. The impact of digital technology on community dynamic capabilities varies based on the level of technological opportunism. The specific inference is as follows:

Communities with high levels of technological opportunism have stronger capabilities to sense new digital technologies (C. W. Chen & Lien, 2013), and can improve the impact of digital technology on the dynamic sensing and learning capabilities of a community. Specifically, communities can comprehend and gain knowledge about emerging digital technologies despite their presence, thanks to digital technology (C. W. Chen & Lien, 2013), and this can further improve the ability of the community to scan and interpret opportunities and risks in epidemic (digital technology-enabled sensing capability), and acquire, absorb, and use knowledge by adopting digital technology (digital technology-enabled learning capability). For example, communities with a high level of technological opportunism might take the lead in recognizing that face recognition system may be a more effective epidemic prevention and control technology, and actively search for the knowledge of face recognition system. During the information and knowledge search process, the community can be exposed to other similar intelligent security technologies (such as NFC), and can compare various technologies. Through comparison, the community can determine the overall advantages of face recognition technology, and learn to deploy the technology for community prevention and control management, thus can improve community perception of abnormal situation (digital technology enabled sensing capability), and enhance the community's ability to learn and use new knowledge, thereby better equipping them to handle abnormal situations. Therefore, communities that embrace technological opportunism can amplify the impact of digital technology on their ability to sense and learn dynamically.

Communities with high levels of technological opportunism are better equipped to respond to new technologies (C. W. Chen & Lien, 2013), and by improving use of digital technology can boost the community's dynamic integrating, coordinating, and reconfiguring capabilities. Specifically, in the face of digital technologies, such communities identified with new technologies are willing and able to manage them (C. W. Chen & Lien, 2013), and this enables the community to use and integrate new knowledge and technology to meet community operation and management needs (digital technology enabled integrating capability) (C. W. Chen & Lien, 2013; Eisenhardt & Martin, 2000), and deploy management activities and

reformulate management strategies to leverage the epidemic prevention benefits of digital technologies or mitigate the risks of the outbreak (digital technology enabled coordinating and reconfiguring capability). For example, communities with a high level of technical opportunism, after determining the advantages of face recognition technology and starting to deploy the technology, will promptly formulate new specifications of smart access control management and share knowledge of using them within the security team (digital technology enabled integrating capability). The communities also will adjust or reset the personnel configuration and task scope (digital technology enabled coordinating and reconfiguring capability) of the security team according to the technology. Therefore, communities that embrace technological opportunities can improve their ability to integrate, coordinate, and adapt using digital technology.

The hypothesis was established:

H2: Technological opportunism will positively moderate the relationship between digital technology and community dynamic capabilities.

3.1.3 Community dynamic capability and community resilience

In this thesis, community resilience refers to the ability to handle unexpected dangers or events and subsequently recover from them. Developing dynamic capabilities within a community is crucial for maintaining a competitive edge in a fast-paced environment, particularly when it comes to navigating turbulent conditions and achieving long-term community resilience has received much attention (Y. W. Jiang et al., 2021). We suppose that the five dimensions of community dynamic capabilities can improve community resilience, as discussed in detail below.

First, community's sensing capability can effectively detect fundamental changes in the internal and external environment, thereby providing more time to respond to external shocks (S. P. Jain & Posavac, 2001). The environment is subject to great uncertainty due to the inability to adequately collect and understand information about the community environment. The sensing capability empowered by digital technology to acquire and use information in the environment helps communities to identify new opportunities and potential threats in time, and to respond quickly to environmental changes (Haarhaus & Liening, 2020). Further, community's sensing capability can enable communities to quickly adapt to environmental disturbances and be more resilient (Eastough, 2014). On the other hand, the community's sensing abilities enable a constant response to anticipated alterations in external conditions, stakeholder needs, and technological advances, thereby enhancing agility of communities.

Finally, communities can quickly identify events and trends, and by improving their resilience, communities can respond more effectively to changes in the external environment (Hussain & Malik, 2022).

Second, community's learning capability, using information to create new knowledge, facilitates interpretation, sharing, and storage of information, and translates gathered information to create enhanced processes and strategies for innovation (C. H. Fang et al., 2011). Innovation is a crucial factor for surviving in dynamic, complex, and uncertain environments, leading to resilient behaviors such as adaptability, competitiveness, and worth (Lyng et al., 2021). Specifically, different forms of innovation, such as structural (strategic / administrative) innovation, process innovation, and capability (competence / behavioural) innovation, effectively promote community resilience (Mafabi et al., 2015). For example, redesigning community work programs to improve risk-handling behaviors will ultimately increase community resilience.

Third, community's integrating capability can integrate resources into a unified collective system. Integrating resources involves exchanging knowledge, skills, experience, processes and information through interaction (Sjödin et al., 2016). Communities encourage residents and multi-stakeholder communication and interaction to generate new ideas and drive resource integration. Further, value co-creation, essential for building resilience, is facilitated by collaborative networks, dynamic interactions, and resource integration within the community (Kamalpour et al., 2020). In addition, resilience relies heavily on access to personal, social, and environmental resources. Integrating capability enables resource sharing, reduces social isolation in the community, and leads to increased access to resources, which in turn enhances community resilience (Kamalpour et al., 2021).

Fourth, community's coordinating capability can effectively allocate available resources for tasks, allocate resources to the appropriate individual in a clear and reasonable manner, and effectively improve the efficiency of resource utilization. Coordinating capability as community's dynamic capabilities will positively affect effectiveness of community operations. Further, effectiveness of community operations positively affects the resilience of community (Vanhove et al., 2016). In addition, the community with high coordination capabilities has capability to coordinate limited resources, environmental changes and residents' needs, significantly improving the quality of communication, so that they can apply the coordinating capability to deal with uncertain internal and external environment, and thus prompt community resilience (Gaffar et al., 2022).

Fifth, community's reconfiguring capability restructures internal resources by updating

concepts and understandings, and this refactoring process improves resource flexibility and coordination flexibility (Xin et al., 2018). Resilience's core competency is its flexibility, allowing communities to promptly address problems, reassess their activities and strategies, and more effectively fulfill environmental needs (Karman, 2020). On the other hand, the ability to reconfigure not only maintains adaptability but also escapes the possibility of unfavorable path dependencies (Zhou et al., 2019), thereby driving community to successfully build the resilience (Fazey et al., 2007).

Related research also provides evidence for the relationship between dynamic capabilities and community resilience. For example, Y. W. Jiang et al. (2019) proposed that dynamic capability can form a mechanism whereby tourism organizations utilize previous experience and knowledge to modify operational routines, and integrate novel insights and techniques into current practices for adaptation and transformation, and identify favorable characteristics. Tourism organizations can achieve long-term resilience by routinely converting, allocating and utilizing resources, thereby enabling them to respond to disruptive environmental changes (Y. W. Jiang et al., 2019). Similarly, Kurtz and Varvakis (2016) investigated how external environmental turbulence affects Small and Medium Enterprises (SMEs), this study explored the role of dynamic capabilities in maintaining and adjusting organizational strategies. The findings suggest that by reconfiguring operational capabilities into more suitable ones for the environment, dynamic capabilities can indirectly enhance organizational resilience (Y. W. Jiang et al., 2019; Kurtz & Varvakis, 2016). Accordingly, we propose the hypothesis:

H3：Community dynamic capabilities are positively related to community resilience.

3.1.4 Digital technologies and community social capital

The essence of digital technology is a digital tool, which can help users acquire, store and use data (Agbatogun, 2013). The convenience brought about by digital technology has significantly impacted people's daily lives and work routines (L. Long, 2022). Digital technology has become ubiquitous and is now integrated into every aspect of life and society. Community social capital refers to the capacity of individuals or groups to form connections within the social structure by joining it (Portes, 1998). Social capital can take different forms, such as bonding, bridging, and linking. Bonding social capital involves strong relationships between individuals of similar backgrounds, while bridging social capital refers to weaker ties between individuals of different backgrounds. Finally, linking social capital pertains to connections between individuals and organizations or systems (Hofer & Aubert, 2013; J. Lee, 2020).

Digital technology can enhance the bonding social capital of the same group (such as different residents of a community). First, through digital social tools, the communication between individuals and other individuals will be more frequent and easier, this will help community residents better understand the needs of other residents (for example, there are other residents asking for the necessities of life in the Wechat group about community epidemic prevention and control management) and provide timely feedback to other residents, so as to help individuals acquire resources and strengthen contacts, ultimately, this will be reflected in the growth of bonding social capital (G. H. Xie et al., 2021). Second, by using digital devices to participate in topics and activities on social networks (such as epidemic prevention and control discussions), individuals with communication difficulties may experience a sense of belonging. This sense will improve their mental health level and thus enhance their bonding social capital (Shpigelman, 2018). Third, by logging on social networking sites (such as WeChat), the contacts between different individuals will be strengthened and the willingness to continue using social networking sites will be generated, so that they can establish and maintain bonding social capital at a lower cost, thus obtaining a higher level of bonding social capital (Raza et al., 2017).

For example, Warburton et al. (2013) showed that under the background of incomplete popularization of rural broadband, digital information technology can improve bonding social capital by helping rural areas establish connections. Similarly, Williams (2019)systematically summarized the research on the relationship between virtual communities and bonding social capital, as well as the results show that digital social media can help users establish and improve bonding social capital.

Digital technology can enhance bridging social capital among different groups (such as community residents and managers). Mandryk et al. (2020) believe that residents in different communities will feel relaxed and excited about life by participating in digital activities (such as digital computer games), thus reducing loneliness, improving happiness, and finally showing the growth of bridging social capital. Through digital social media, the communication and contact between individuals and different managers will be more in-depth, which will help managers to obtain information and resources, thus promoting the establishment of relationships between individuals and different organizations (such as communities), and thus improving bridging social capital (C. Smith et al., 2017).

Indeed, the existing research has shown that digital technology can enhance bridging social capital. For example, the research of Pang (2018) shows that in the social interaction field, the use of digital social tools (such as WeChat) can improve people's bridging social capital.

Similarly, in the medical application scenario, digital technologies such as social networks have been proven to enhance the bridging social capital of mental patients and help them recover (Salehi et al., 2019).

Digital technology can enhance the linking social capital of individuals and their affiliated organizations (such as residents and community neighborhood committees). First, residents and community managers can communicate and discuss many community issues (such as community health) in a timely manner through digital social tools, which helps managers make decisions and fulfill the genuine requirements of community inhabitants, thus strengthening the relationship between residents and managers, and promoting linking social capital (Ogden et al., 2014). Second, community residents and medical staff will have a closer relationship by utilizing digital health technology, residents' trust in medical personnel can be increased, and the community will be improved, so as to show better treatment results and enhance the linking social capital (Mason, 2016).

In addition, digital technology has been shown to improve linking social capital in some studies. For example, Park et al. (2015) shows that digital media technology can help people connect and improve their linking social capital in the social field. Similarly, in the medical field, Salehi et al. (2021) have shown that the application of digital technologies (such as digitally-enhanced self-help) will enhance the linking social capital.

In conclusion, it seems likely that digital technology can enhance community social capital, that is, strengthen the different types of social capital: bonding, bridging, and linking. Therefore, Hypothesis 4 is proposed:

H4: Digital technology is positively related to community social capital.

3.1.5 TO as a moderator of the relationship between DT and CSC

In this thesis, community's technological opportunism is the ability of an organization to perceive and be responsive to new technologies, whether originating from external or internal sources, or used by the organization to provide new services (Srinivasan et al., 2002). As mentioned earlier, technological opportunism plays a moderating role in the process of digital technology enabling communities. Therefore, the impact of digital technology on community social capital, and the strength of technological opportunism will affect the community social capital, specifically its bonding, bridging, and linking components.

Communities with high technological opportunism possess greater perception and response capabilities towards emerging technologies (C. W. Chen & Lien, 2013), and can enhance the effect of digital technology on the community social capital. Specifically, in the presence of

digital technology, these communities possess the capacity to acquire and comprehend knowledge regarding the latest digital technologies, as well as the aptitude and willingness to manage them (C. W. Chen & Lien, 2013), and these enhancements can improve the impact of digital technology on social capital, including its effects on bonding, bridging, and linking, as well as on psychological well-being and healthcare. First, in social aspect, communities with high technological opportunism will more actively use various digital technologies (for example, online communities) to promote communication among residents, between residents and managers, and even among residents in different communities, which can promote mutual help among residents, and also facilitate managers to understanding of residents' needs in a timely manner and provide resource support and assistance (C. Smith et al., 2017). Second, in psychological well-being aspect, this kind of community will more actively try to encourage residents to participate in various activities (such as psychological support groups) (Shpigelman, 2018), help reduce residents' loneliness, and increase residents' enthusiasm for life (Mandryk et al., 2020), thereby promoting connections among residents (bonding social capital), among residents and managers or among residents of different communities (bridging social capital). Third, in health care aspect, this kind of community will more actively use various new technologies as much as possible to empower community work processes (such as community health care centers that use self-service consultation) (Mason, 2016). By optimizing the community work process, residents' sense of belonging and trust in the community can be enhanced through improved experiences, and in turn promotes the establishment of strong connection between residents and digital technology or residents and community (linking social capital). Therefore, a high degree of technological opportunism in a community can enhance the positive influence of digital technology on social capital, by promoting social communication, enabling participate in various activities, and empowering community work processes. Technological opportunism moderates the relationships between digital technology and community social capital, encompassing bonding, bridging, and linking social capital, the hypothesis was established:

H5: Technological opportunism will positively moderate the relationship between digital technology and community social capital.

3.1.6 Community social capital and community resilience

The concept of community social capital is frequently utilized in interventions aimed at improving adaptive capacities and resilience. Its application at the community level includes natural hazard management (Babcicky & Seebauer, 2017), economic development (Flora et al.

1997), and collective decision-making participation (Cleaver, 2005). Community social capital is often regarded as a key factor for community resilience (Adger, 2003). At the community level, social capital types reveal differences in relationship strength, network composition, and resulting outcomes for individuals and communities. Therefore, we plan to investigate the correlation between social capital and community resilience across the bonding, bridging, and linking dimensions (Aldrich, 2012a; Kawachi et al., 2008; H. S. Kim et al., 2008; Szreter & Woolcock, 2004).

First, to some extent, bonding social capital is generated by homogeneous networks consisting of individuals with similar characteristics (Coffé & Geys, 2016) and encourages a sense of togetherness that cultivates cohesiveness within groups (Magis, 2010). Thus, bonding social capital can be expected to influences the resilience of communities through intimate social networks between residents. Bonding social capital may be generated at the community level through mutual help among residents, particularly in the aftermath of an emergency. Bonding social capital enhances reactive resilience by improving residents' ability to cope with crises, enhancing psychological and material support through mutual assistance between families and neighbors (intimate social networks) (Birhanu et al., 2017), and as a more effective crisis response strategy (Béné et al., 2016), for the purpose of enhancing the community resilience.

Second, bridging social capital refers to the connections between individuals or groups that are not typically associated with each other, enabling access to resources and networks that might otherwise be out of reach (Aldrich, 2012a; Coffé & Geys, 2016; Magis, 2010), by exposing individuals to diversity, their capacity to collaborate and access to resources are enhanced (Magis, 2010). Social capital operates mainly through local social services, health care, religious organizations, business entities, and other provider groups. Bridging social capital plays a crucial role in emergencies as well as daily life by granting access to new resources through opportunity and information (Hawkins & Maurer, 2010). Besides, J. W. Smith et al. (2012), Birhanu et al. (2017), and Bakker et al. (2019) think that promoting bridging social capital can enhance community-level responsive resilience by granting access to diverse resources, such as physical and financial ones. For example, Hurlbert et al. (2000) and Beggs et al. (1996) found that after Hurricane Andrew, the social community members received increased support. The connectivity fosters community resilience by facilitating collaborations among local and national charitable organizations, businesses, and community members to provide resources and workforce (Airriess et al., 2008).

Third, bonding and bridging social capital refer to horizontal associations, while linking

social capital is derived from vertical associations (Aldrich, 2012a). Linking social capital refers to the relationships between groups or networks that hold influence, power, authority, or control over each other (Aldrich, 2012a; Magis, 2010). J. W. Smith et al. (2012), Birhanu et al. (2017), and Bakker et al. (2019) have demonstrated that social capital, including bridging social capital, enhances responsive resilience within communities by introducing new resources. However, the effectiveness of social capital in guiding action depends on the interplay between different types of social capital. Linking social capital plays a crucial role in enhancing community resilience as it connects affected groups with resources, including those provided by governments, disaster-related organizations, and networks (i.e., the disaster system of care). Furthermore, within the context of community recovery, connecting social capital can broaden access to information, promoting comprehension and availability of diverse state and federal aid programs that aid survivors (e.g., emotional rehabilitation, home reconstruction, and acquisition of commercial loans), ultimately easing community recovery.

In addition, prior research has established a correlation between social capital and community resilience, particularly in complex climate change scenarios (Carmen et al., 2022; Fazey et al., 2007), in the context of natural disasters (Aldrich, 2017; Aldrich & Meyer, 2015), social capital has a significant impact on community resilience and serves as the primary driving force behind community recovery, surpassing factors such as socio-economic conditions, population density, degree of destruction, or aid volume (Aldrich, 2012a). Drawing upon this, the thesis presents the following hypothesis:

H6: Community social capital is positively related to community resilience.

3.1.7 Digital technologies and community social support

Specifically, informational support is the provision of guidance, advice, and information by a community that can aid in problem-solving. Emotional support refers to that community express caring, love, encouragement, and empathy. Instrumental support refers to that community can provide a service to someone or offer goods, such as money or food (Rubenstein, 2015). This thesis proposes that digital technology is positively related to community social support. The specific inference is as follows:

First, digital technology can better help residents connect with specific people, and describe their thoughts and problems (Oldham & Da Silva, 2015), and thus can help residents ask for advice and guidance (informational support), and obtain encouragement and support (emotional support), and even direct help (instrumental support) from specific people (Bocking et al., 2021; Oldham & Da Silva, 2015). For example, the smart security system can monitor the surrounding

environment in real time, respond to and handle residents' alarms, give suggestions on handling abnormal situations (informational support), or provide direct assistance (instrumental support), and return visits to the resident after handling, to understand residents' recovery after experiencing emergencies and provide caring and encouragement (emotional support). Another example is the community's smart medical platform. It can provide COVID-19 daily protection measures and guidance (informational support), provide COVID-19 detection services, and other disease services (instrumental support) during the lockdown, and provide ways to communicate with doctors or psychologists online (emotional support). Thus, digital technology is positively related to community social support by helping residents connect with specific people.

Second, digital technology can enable residents to connect to the network composed of other people (Oldham & Da Silva, 2015), and thus can help residents' access to unique and valuable information (information support), and also increase residents' opportunities to obtain emotional help (emotional support) and resources (instrumental support) from others (H. E. Lee & Cho, 2019; Oldham & Da Silva, 2015). For example, during lockdown, the community can use social media technology to build an online resident community, which can provide online communication (information support) for the residents with limited offline activities, and help the residents to relieve their inner pressure (emotional support) in time. At the same time, it can provide prevention and control and life material purchase channels and methods (informational and instrumental support). Besides the online resident community in same community, there is also online resident community in different communities, covering more residents in a larger scope. In the online community, residents have access to a larger resident network, and thus can better acquire epidemic prevention and risk information, psychological relief and material help. Thus, digital technology is positively related to community social support by enabling residents to connect to the network composed of other people.

Moreover, earlier research has established a positive correlation between digital technology and the social support received by organizational members (Bocking et al., 2021; H. E. Lee & Cho, 2019; Oldham & Da Silva, 2015). Therefore, when the community adopts digital technology, the community can expect residents in the community to have a greater community social support. Empirical studies confirm the positively relationship between digital technologies and social support in the context of organization(Oldham & Da Silva, 2015), online communities (H. E. Lee & Cho, 2019), and health services (Bocking et al., 2021).

Based on the positive relationships between digital technology and social support of community, the hypothesis was established:

H7: Digital technology is positively related to community social support.

3.1.8 TO as a moderator of the relationship between DT and CSS

Technological opportunism allows communities to actively scan the environment and deploy necessary actions (Al-Omari et al., 2022). Communities that are highly technologically opportunistic tend to be more adaptable, allowing for innovative integration of digital technology in community management and services (Lucia et al., 2014).

First, communities exhibiting high levels of technological opportunism possess the ability, skills, and knowledge required to access information on technological opportunities and allocate resources effectively in order to exploit them for driving innovation (Mishra & Agarwal, 2010). Further, innovation enhances the capabilities of social networks and promotes the establishment of social support (Adomako, 2021). Specifically, communities with a high technological opportunism often use digital technology to establish a community relationship network, which promotes the connection and resource sharing between the community and residents and among residents. Ultimately, communities provide residents with financial assistance or help with daily tasks (tool support), provide information to help residents cope with current difficulties (information support), and express empathy, care, comfort, and trust to residents (emotional support).

Second, technological opportunism means that the community is able to acknowledges and acts upon technological discontinuities and changes, effectively reducing the threats and risks of utilizing new technologies (C. W. Chen & Lien, 2013). Communities that exhibit techno-opportunism tend to possess the dual ability to comprehend and adopt new digital technologies, as well as react to them effectively. This capability not only enables communities to perceive less risk when using digital technologies but also promotes their use (Martins et al., 2014). Communities that have a high level of technological opportunism tend to be more accepting of digital technology and use it to integrate and utilize resources, in contrast to those with low technological opportunism. This in turn produces positive outcomes associated with different dimensions of social support. For example, communities can actively provide tool support by forming mutual aid groups to help with shopping, packing and delivering food, fundraising, and more. At the same time, the community can share relevant information with residents during an the epidemic, and use digital technology to remotely provide online consultation for residents, thereby providing information support. In addition, communities can use digital technology to bring together dispersed residents of the community, make neighbors more harmonious, improve residents' well-being, and in turn promote emotional support.

Accordingly, we propose H8:

H8: Technological opportunism positively moderates the relationship between digital technology and community social support.

3.1.9 Community social support and community resilience

The concept of community social support has multidimensional differences. Studies suggest that promoting effective instrumental and/or expressive provision by communities, social networks, and trusting partners can enhance it. Therefore, the thesis aims to investigate the correlation between community social support and community resilience.

First, instrumental support can effectively improve family well-being by providing material assistance (Bougea et al., 2019), and maintain or enhance family well-being in the interim, are more likely to enhance family resilience in crisis and thus community resilience (Prime et al., 2020). For example, environmental resources such as clear geography, private streets, accessible social infrastructure, green spaces, and central gathering spots contribute to fostering social support, improving local health and well-being, and ultimately enhancing community resilience (Houston et al., 2015). Therefore, governments can enhance resilience by promoting community social support (Bougea et al., 2019). Moreover, in the process of enhancing instrumental support, residents feel sufficiently safe in the face of crisis due to gradual material adequacy and a significant reduction in resource uncertainty in the community (Vermote et al., 2022), sufficient to protect and enhance individual self-efficacy, which is an individual's belief in their ability to organize and execute courses of action (Norris et al., 2008), while helping to build collective efficacy to combat adversity(Pecukonis & Wencour, 1994), thereby enhancing their resilience.

Second, emotional support can successfully regulate negative cognitive emotions through care, love, encouragement, and compassion (Sharma et al., 2018), and positive emotional regulation can promote mental aptitude (C. Wu et al., 2020), which is especially important during encounters with unexpected events, as this stable psychological resilience is sufficient to counteract emotional barriers and to improve people's psychological protection and mitigate negative emotions, a buffer can be created (H. S. Kim et al., 2016) and thus shaping psychological resilience (Marzouki et al., 2021). Additionally, emotional support is a vital component of good neighborliness (J. S. Ma & Hoard, 2020), and collective solidarity can be strengthened through emotional communication, while harmonious and friendly neighborhood relations can directly affect residents' subjective well-being (S. Jiang et al., 2020), thus contributing to community resilience (Wilson et al., 2013).

Finally, community information support, as an integral part of community social support, is expected to post and share sufficient information during a crisis by utilizing social media (L. L. Xie et al., 2022), and residents can selectively follow various types of information, process it according to their needs (Greenwald & Leavitt, 1984) and choose the ones that match their preferences for information (Chung & Han, 2013), thus enabling them to respond positively and effectively to stress (Duhachek, 2005), while this information is of great value to community managers, enabling them to develop effective responses (Kalgotra et al., 2021). And this contextual active coping is a factor that promotes post-disaster resilience (Shing et al., 2016), so information support can be one of the main strategies to enhance resilience after hazardous events (Kyngäs et al., 2001). In addition, with the speed of information transfer, information support helps communities to cope with rapidly changing crisis environments, and accessing information support to reduce uncertainty and support communities during a crisis can help them respond to sudden emergencies (H. K. Kim & Niederdeppe, 2013). For example, since the the World Health Organization (WHO) announced that COVID-19 had become a pandemic, the WHO and agencies such as the Centers for Disease Control and Prevention publish outbreak data in real-time and make timely mitigation recommendations to governments and communities (Kalgotra et al., 2021). It is important to reduce risk and provide safety (Tanaka et al., 2011), thereby building community resilience (Council, 2012).

Moreover, previous studies have shown that social support has a significant and positive impact on community resilience, indicating a relationship between the two (Haas et al., 2021; X. C. Zhang & Shay, 2019). Therefore, social support can be central to resilience in times of emergency. Two recent empirical studies (Saleha et al., 2021; Zhao et al., 2022) explored the relationship between social support and community resilience in the context of COVID-19. Based on the evidence, we can observe that various aspects of community social support exert distinct impacts on community resilience, giving rise to the ensuing hypothesis:

H9: Community social support is positively related to community resilience.

3.2 Research model

The stimulus-organism-response (S-O-R) model, originally proposed by Mehrabian and Russell (1974) indicated external stimuli (S) can impact the internal state of an organism (O), resulting in a range of actions and reactions (R). The S-O-R model, which includes the constructs of stimulus, organism, and response, determines the behavioral outcome of a stimulus. Stimulus is an external factor from the environment that serves as input, while an

organism is capable of responding to it (Mehrabian & Russell, 1974), and a response is the action and reaction of an organism to a stimulus. Human beings, as organisms, produce emotional and psychological elements, which include mood, emotions, and attitudes in response to stimuli. This is why the S-O-R model is widely applied in various disciplines, particularly in individual-level studies, to explain consumer behavior as a response to stimuli (Jacoby, 2002). However, it can also be applied in the level of organizational level as organizations as entities that depend on the interdependence of its administrators for its survival. Indeed, in Complex Adaptive System theory, organization is viewed as a living organism in constant flux, where interrelated parts give rise to emergent change (Hartikainen, 2019). Our rationale for using the S-O-R model as our research framework model is based on the idea that a community is not just a space, but an organism, especially as more and more digital technology software and hardware technologies are applied to the community environment and the community has the ability to sense and learn. Just as Kirwan and Fu (2020) claim that an organism is a living entity, and similarly, a city exhibits characteristics akin to a living organism. Certain areas within a city can be likened to organs, such as the legislature and judiciary. Cities have been conceptualized as a living system, a macroscopic organism that is interconnected through collective consciousness, communicative structure, and its relationship to natural resources and cycles (Kirwan & Fu, 2020). Similarly, it has been asserted that communities can be regarded as organisms (Robert, 2014). He claims that communities are living, breathing, complex living things. Complex organisms, including communities, have both visible and less visible components. On one hand, they feature tangible elements such as neighborhoods, streets, businesses, schools, and so forth. On the other hand, there are essential yet less apparent parts, like relationships, family, history, memories, income, and debt flows. Of these, relationships and history stand out as the most crucial.

Taken together, we proposed our research model, and the relationships among the constructs in the proposed framework will be elucidated in the hypotheses section. Figure 3.1 portrays a graphical representation of the hypothesized relationships.

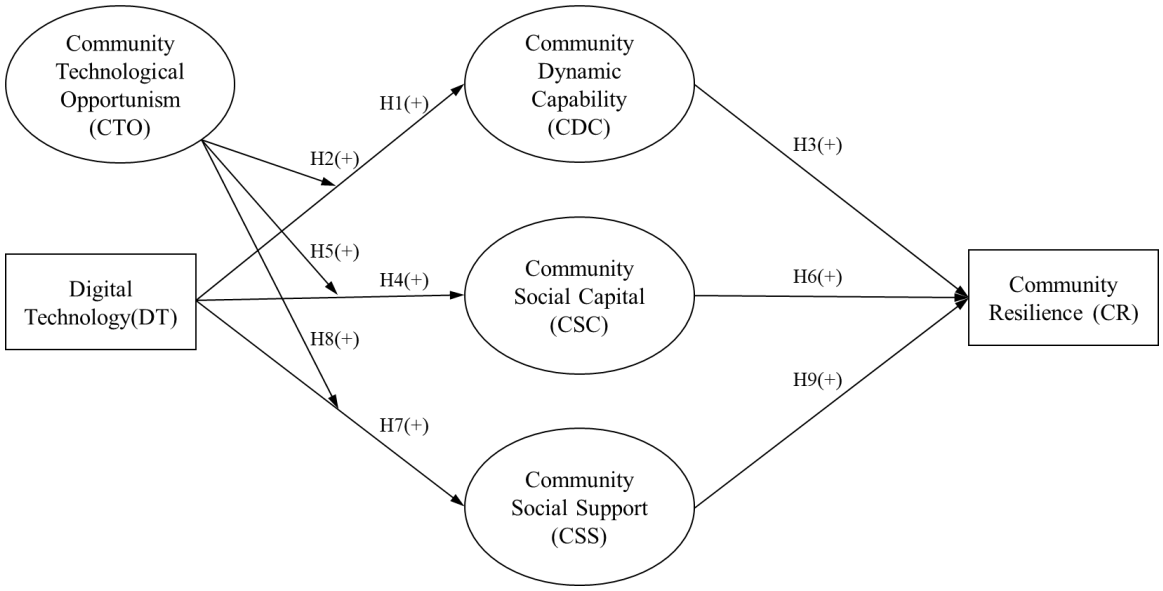


Figure 3.1 Proposed research model

3.3 Summary

In this chapter, we systematically formulate nine research hypotheses based on relevant theoretical and previous empirical findings. We theorize that digital technology in the community, as the independent variable, influences three mediating variables including community dynamic capability, community social support and community social capital. Three mediating variables exert an influence on the dependent variable in the model, *i.e.*, community resilience. We further propose that technological opportunism moderates the effects of digital technology on dynamic capability, social support and social capital based on the mediating model. Based on the hypotheses we propose our research model. This model systematically explains the mechanism of the effect of the use of digital technology in the community on community resilience and opens the black box of this influence process. This thesis is the first to investigate the impact of digital technology on community flexibility. The following chapter will detail our empirical approach, including questionnaire and scale design, data collection, and analysis.

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Chapter 4: Research Methodology and Data Collection

The research project of this thesis involves exploring the processes and the mechanisms inherent in the impact of digital technologies on communities' resilience. In particular, the context of our thesis is the COVID-19 pandemic. Research on COVID-19 pandemic can help to improve healthcare, economic, social well-being and prepare for future outbreaks. This thesis takes a positivist research philosophy that believes in the existence of an objective reality that can be observed through empirical evidence. The study will also use a quantitative research approach by collecting survey data through questionnaires at a particular point in time. Finally, this thesis uses descriptive statistics and factor analysis to analyze the data.

4.1 Questionnaire development

4.1.1 Questionnaire design

Questionnaire research consist in asking people questions to get an idea of how they behave or what they might do in a certain situation. It helps understand and maybe even predict how a group of people might act (Baker, 2003; Tull & Hawkins, 1987). Respondents can provide information based on facts or opinions. The researcher's ability to obtain information depends not only on the respondent's ability and willingness to respond, but also on the content and structure of the questionnaire (Moser & Kalton, 2017). Therefore, this thesis followed the principles and steps to design the questionnaire.

(1) Principles of questionnaire design

This thesis followed the five principles of questionnaire design proposed by existing studies (Baker, 2003) and used sojump.com to make the questionnaire. The first principle is making the questionnaire as clear as possible. For example, questionnaire items can be presented using clear fonts or some space (such as using a font size of at least 12 to ensure that the text is legible, and providing enough space for participants to write their responses comfortably). Second, leave enough space for answers to open-ended questions. Third, descriptions of the thesis topic and confidential information should be as crystal clear and straightforward as possible. Fourth, make sure the options are complete. If the options do not contain all possible answers, the respondents will be confused, resulting in inaccurate information collected. Fifth, reasonably

arrange explanatory information. If the definition is listed separately or placed at the beginning of the questionnaire, it may cause confusion. Meanwhile, the length of the questionnaire, the wording of the questions, and the order of questions are considered. For instance, it is necessary for using clear and concise language that is easy for people to understand and avoiding using jargon, technical terms, or ambiguous language.

(2) Steps of questionnaire design

According to the existing research (Aithal & Aithal, 2020), this thesis mainly followed the following six steps to design the questionnaire. First, design the items. Second, design the questionnaire structure. Third, revise the questionnaire. Fourth, pretest the questionnaire. Fifth, repeatedly revise and test the questionnaire. Sixth, form the questionnaire.

Step 1: Design items. We constructed preliminary questionnaire items by reviewing the existing literature, collating related research on digital technology, technological opportunism, community dynamic capability, community social support, community social capital and community resilience, and collecting existing mature research scales. And then, since this thesis was undertaken in China, the preliminary questionnaire items are translated in both directions to ensure the rationality and validity. Specifically, first, two doctoral students of management and a community management practitioner proficient in English expression were invited to translate the original scale into Chinese combining with this thesis context and subject. Then, two doctoral students majoring in English were asked to translate the Chinese scales into English. Finally, two research assistants compared the original and translated English scales to search differences. For the differences, the expression methods were changed to make the English and Chinese scales more similar, so as to ensure that the Chinese scale used in this thesis could more accurately reflect the meaning of the original.

Step 2: Design the questionnaire structure. The survey has three main parts. The first part includes the thesis introduction, filling instructions, confidentiality commitments, and acknowledgments. The purpose of this section is to introduce the research topic to respondents, the precautions for filling in (e.g., “If there are no special instructions, the items are all single-choice questions.”), the commitment to confidentiality of the filling out, and express gratitude to the respondents. The second part contains the basic personal information. The third part is the specific items of the questionnaire survey. In the current study, this section included items on digital technology, technological opportunism, community dynamics capability, community social support, community social capital, and community resilience. We use a 7-point Likert scale to measure, where "1" indicates "strongly disagree" and "7" indicates "strongly agree".

Step 3: Revise the questionnaire. Specifically, this stage revised the questionnaire based on

expert opinions to make the questionnaire more suitable for China's cultural background and language habits. This thesis drew from prior studies from other countries, but the goal of this thesis was to investigate the enabling mechanism of digital technology on Chinese communities in particular. Therefore, it was necessary to revise the questionnaire according to the Chinese background. Specifically, three experts in the fields of digital technology, public administration, and community management were invited to read and answer the questionnaire. During this process, expert opinion was recorded and expert questions were answered. Finally, the questionnaire was revised according to expert opinions to ensure the content validity.

Step 4: Pretest the questionnaire. At this stage, the questionnaire is mainly tested through the pre-survey. Specifically, we conducted a small-scale survey from community administrators. 20 community administrators were randomly selected. We invited the 20 community administrators and asked them to read and fill in the questionnaire, as well as ask questions they encountered during the filling process. After integrating their questions and comments, the questionnaire was revised. For instance, the mainly problems of improper expression, lack of context, and too academic were solved.

Step 5: Repeatedly revise and test the questionnaire. At this stage, the questionnaire is revised repeatedly through expert opinions and feedback from small-scale of community administrators. First, the questionnaire was revised with reference to the problems encountered during step 4 and the feedback from small-scale of community administrators. Second, the revised questionnaire was handed over to the experts of management again for evaluation, and the revision was continued according to the expert opinions. After the questionnaire is revised, it is fed back to the community administrators who didn't participate in the final data collection for another pre-survey. We repeat this step, and revise the questionnaire for many times until there are no revisions.

Step 6: Form the questionnaire. By referring to mature scales, and through the process of repeated revision and test mentioned above, the questionnaire of this thesis was determined.

4.1.2 Scale development

(1) Variables definition

The conceptual model proposed in this thesis involves six variables - digital technology (DT), community dynamic capability (CDC), community social capital (CSC), community social support (CSS), community resilience (CR) and community technological opportunism (CTO). To effectively measure the variables, this thesis further lists the operational definitions of the six variables in Table 4.1.

Table 4.1 Operational definition of variables

Variables (References)	Operational definition	
Digital technology (DT) (Ghasemaghaei & Calic, 2020)	Digital technology is an electronic and digital tool for acquiring, storing and analyzing data.	
	Digital technology volume	Size of digital technology which is increasing dramatically.
	Digital technology variety	Various types of digital technology.
	Digital technology velocity	The speed and the frequency of processing and integrating data by applying digital technology.
Community dynamic capability (CDC) (Ghasemaghaei & Calic, 2020; Pavlou & El Sawy, 2010; Teece, 2007)	Community dynamic capability refers to the capacity for a community to adapt to and thrive in rapidly changing circumstances by utilizing and adjusting their internal and external strengths. This is broken down into five components, and is measured as a second-order formative construct: sensing, learning, integrating, coordinating, and reconfiguring capacity.	
	Sensing capability	Sensing capability refers to the capacity for a community to scan, learn, and interpret opportunities and risks in an epidemic environment.
	Learning capability	Learning capability refers to the capacity to learn and apply knowledge to improve community design in an epidemic setting.
	Integrating capability	Integrating capability refers to the capacity to integrate novel communal knowledge into fresh operational abilities within the context of an epidemic environment.
	Coordinating capability	Coordinating capability refers to the capacity for communities to orchestrate and implement tasks, resources, and activities during an epidemic situation.
	Reconfiguring capability	Reconfiguring capability refers to the capacity for communities to reorganize their resource base and/or reconfigure new resources to achieve identified opportunities or withstand sudden-onset risks in an epidemic environment.
Community social capital (CSC) (Hofer & Aubert, 2013; J. Lee, 2020)	Community social capital is defined as social networks and the associated behavioral norms of trust and reciprocity. It is formulated as a second-order formative construct comprising three distinct components: bonding, bridging, and linking social capital.	
	Bonding social capital	Bonding social capital is defined as the strong connections that foster unity among similar groups, reflecting the tendency of people to bond with similar people.
	Bridging social capital	Bridging social capital is defined as the weak connections between groups that unite individuals from various social backgrounds.
	Linking social capital	Linking social capital refers to residents have ties to associations and frameworks that assist them in acquiring resources and effecting alterations.
Community social support (CSS) (J. B. Lin et al., 2018; N. Lin, 1986;	Community social support is defined as the tangible and/or emotional aid provided by social networks, partners, and the community at large. It is operationalized as a second-order formative construct with three components: informational, emotional, and instrumental support.	
	Informational support	Community provides valuable guidance, advice, and information that can assist in resolving issues.

Rubenstein, 2015; Shakespeare & Obst, 2011; Sheikh et al., 2019)	Emotional support	Community expresses caring, love, encouragement, and empathy.
	Instrumental support	Community performs a service or offers goods, such as money or food, to someone.
Community resilience (CR) (Sinha & Ola, 2021)	Community resilience refers to the ability to deal with unforeseen dangers or events and recover from them.	
Community technological opportunism (CTO) (Srinivasan et al., 2002)	Community technological opportunism means being able to recognize and adapt to new technologies, whether they are developed externally or internally, or used by the organization to provide new services.	

(2) Scale design

The measurement items used were all adapted from existing mature scales. Specifically, digital technology was measured using the three items from Ghasemaghaei and Calic (2020). The measurement items of community dynamic capability included sensing capability (four items), learning capability (three items), integrating capability (four items), coordinating capability (four items) and reconfiguring capability (three items) (Ghasemaghaei & Calic, 2020; Pavlou & El Sawy, 2010; Teece, 2007).The measurement items of community social capital included bonding (three items), bridging (three items) and linking social capital (three items) (Hofer & Aubert, 2013; J. Lee, 2020; Poortinga, 2012). Community social support included three components: informational (three items), emotional (four items), and instrumental support (three items) (J. B. Lin et al., 2018; N. Lin, 1986; Rubenstein, 2015; Shakespeare & Obst, 2011; Sheikh et al., 2019). Community resilience was measured using the scale of existing researches (Sinha & Ola, 2021; L. L. Xie et al., 2022). Community technological opportunism was measured using the scale of existing researches (C. W. Chen & Lien, 2013; Srinivasan et al., 2002).

4.2 Data collection

4.2.1 Pre-survey

In order to ensure the rationality and rigor of the questionnaire design, we conducted a small-scale preliminary survey in early July 2022. We adopted the method of random sampling for the pre-survey, and distributed questionnaires to community administrators offline. Considering the differences in the use of digital technology in different types of communities, and the need

to ensure that the respondents have a good understanding of the basic situation of the community, we selected the respondents according to the following two criteria: (1) The community where the respondents live was currently applying digital technologies, such as face recognition systems, IoT sensors, 5G, property/community mini-programs; We visited a total of 100 communities, and based on this criteria, a total of 82 communities were retained. (2) Respondents are administrators of higher levels in the community, possessing at least one year of community working experience and having a comprehensive understanding of the basic information of the community. This criterion futhermore excluded 17 samples.

In the end, we collected a total of 65 questionnaires, and the basic information about the community and respondents was shown in the Table 4.2. Specifically, most of the communities have been established for more than one year (97%), and the distribution of sample was relatively balanced. Specifically, The number of residents in the community was concentrated in 1001-8000 (70%), and most of the residents were 41-50 years old (52%). In terms of gender composition of respondents, the distribution of males and females were balanced. Excluding respondents who were unwilling to disclose their age, 45% were men and 40% were women. In terms of age group structure, 18% of the community administrators were 18-30 years old, 40% were 31-40 years old, and the remaining 42% of the respondents were over 40 years old. In terms of education level, most of the respondents possessed degrees of college (46%) and undergraduate (37%). In addition, respondents were mostly employed for 1-5 years (57%).

Table 4.2 The descriptive statistics of pre-survey

Title	Category	Proportion	Title	Category	Proportion
Founded time	Less than 1 year	3%	Gender	Male	45%
	1-3 years	20%		Female	40%
	3-5 years	17%		Choose not to disclose	15%
	5-10 years	23%	Age group of community administrators	18-30 years old	18%
	Over 10 years	37%		31-40 years old	40%
Community scale	Less than 100 residents	2%		41-50 years old	34%
	100-500 residents	8%		51-60 years old	8%
	501-1000 residents	8%	Level of education	Junior high school and below	1%
	1001-3000 residents	34%		High school	14%
	3001-8000 residents	36%		Junior college	46%
	Over 8000 residents	12%		Undergraduate	37%
Age group of residents	18-30 years old	3%		Postgraduate	2%
	31-40 years old	14%	Work experience	1-5 years	57%
	41-50 years old	52%		5-10 years	20%
	51-60 years old	28%		10-20 years	15%
	Over 60 years old	3%		Over 20 years	8%

Next, we discussed the feedback results of the pre-survey step by step from the perspectives

of respondents and experts. First, when the respondents filled out the questionnaire, two research assistants recorded the respondents' feedback at any time, and noted their opinions and suggestions. According to the research notes, we found that the respondents mainly have the following two suggestions: (1) The statement did not conform to the Chinese community context. For example, an original item of instrumental support read: “When residents encounter difficulties, my community gives financial assistance to residents.” Respondents mentioned that communities in China rarely receive financial assistance because of limited funding. The most common instrumental support in the Chinese community is material assistance, such as rice, flour, grain and oil. Therefore, we changed this question to “When residents encounter difficulties, my community gives financial assistance to residents.” (2) The statement lacked contextualization. For example, for the first question on digital technology: “My community uses a great deal of digital technology”, some respondents suggested that the questionnaire should give examples of what digital technologies were in order to understand the concept of digital technology. Therefore, we revised this item to read: “My community uses a great deal of digital technology (such as intelligent access control and facial recognition).” Another example is an item in the instrumental support: “My community can help residents fulfil responsibilities.” Since residents’ responsibilities were too broad, it was necessary to concretize the concept according to the research context. In the context of the COVID-19 pandemic, the responsibilities of residents emphasized more on obeying orders and arrangements, and cooperating with the obligation to do a good job in pandemic prevention and control. Therefore, we revised this item to “When residents cannot obey orders and arrangements, and cooperate in prevention and control, my community can make them.”

Further, after revising the questions proposed by the respondents, we used expert reviews as the questionnaire evaluation method (Ikart, 2019). In the process of selecting experts, we not only selected experts with rich knowledge of theoretical questionnaires, but also selected administrators and researchers who were familiar with the COVID-19 pandemic response and were easy to communicate with as much as possible. We first drew up 5 candidate experts to help to identify potential issues and ensure validity and reliability of questionnaires, and then asked personal opinions one by one. If the candidate experts cannot participate in the discussion, they would be deleted or replaced. We finally invited three experts from the fields of digital technology, public administration and community management, who possessed extensive theoretical and practical experience, and have the abilities and skills to review the questionnaire.

The content of the expert review was mainly to further improve the pre-survey revised questionnaire. Before the discussion, we sent the electronic questionnaire to the experts a few

days in advance via WeChat or Email, so that they could read the questionnaire and choose a common spare time for face-to-face communication. We held a formal expert panel discussion in late July 2022. First, a research assistant briefly introduced the study's basic content, questionnaire design and pre-survey results. Afterwards, the experts had an in-depth discussion lasting 30 minutes on each issue, mainly focusing on the content of the questionnaire. The experts expressed their own views. During this period, other experts could communicate on the issue and form a consensus on the solution to each problem as much as possible. In the discussion, two master students were responsible for recording the speeches of the experts, and at the same time, they recorded the issues and key information that the entire expert group reached a consensus on. In the end, three experts wrote their personal suggestions on the interview questionnaire (there was a space in the questionnaire for experts to write their own opinions).

We organized the interview notes and incorporated feedback from experts to revise them. The expert's revision opinions mainly include the following three points: (1) Improve the appropriateness of the question wording. For example, an item for emotional support: " My community looks for ways to cheer residents up when they are feeling down. " In this sentence, experts believed that the use of the phrase "looking for ways in the community" in this sentence is too strong and may influence the reader's decision-making, despite there being few instances of such expression in Chinese context. They suggested dropping the phrase “looking for ways in the community” to show objectivity. Therefore, we changed this item to “My community cheers residents up when they are feeling down.” (2) Improve the intelligibility of the question wording. For example, in an item on integrating capability: “My community administrators manage to interconnect their daily work in COVID-19 pandemic”, the respondents thought that the word " interconnect " was somewhat abstract, so we revised it to be easier to understand, close to the actual work statement: “My community administrators manage to communicate with each other and have a specific workflow in COVID-19 pandemic”. (3) Add attention items and place them in appropriate positions. We only set one attention item in the pre-survey and placed it in the middle of the scale questions. According to expert suggestions, due to a large number of measurement items of constructs, we should add an additional attention item and placed the two items in the front and back of the questionnaire, so as to better verify the accuracy of the respondents' answers.

Finally, we sent the revised questionnaire to the another academic expert to solicit her opinions and suggestions to conclude the final questionnaire's content. The expert shared her opinions on the questionnaire from the aspects of layout design and question wording.

Specifically, the Part II of our questionnaire is the scale items for constructs. The expert suggested that we put the concept instructions of the constructs before the measurement items of the constructs. We took this suggestion and moved the concept instructions before the scale questions in Part II. In addition, foreign supervisor put forward revision suggestions for some details of statements. For example, we also changed the tense uniformly, changing the action that the community has completed to the simple past tense. Another example was adding a timeline of the COVID-19 pandemic where appropriate, such as "Over the last 2.5 years, my community periodically reviewed the likely effect of changes in the COVID-19 epidemic environment on residents."

Based on the feedback from respondents, experts and foreign supervisor, we obtained valuable information, and revised the questions in the questionnaire three times to determine the final questionnaire. The final questionnaire is shown in the appendix.

4.2.2 Formal survey

We initially discussed the sampling approach employed prior to the official survey. In research and investigation, sampling techniques can be classified into probability sampling and non-probability sampling based on diverse sample selection methods. Probability sampling involves a method in which every participant in the overall survey population has an equal chance of being selected and entering the sample with a known, non-zero probability. This method is based on probability theory and the stochastic principle, and its aim is to obtain a survey sample that can represent the target population. Common probability sampling methods include simple, systematic, stratified, and cluster randomization. It is worth noting that using probability (random) sampling technology reduces the risk of bias in research results, and allows for determining statistical methods such as the best sample size, sampling error, and result accuracy. Probability sampling allows for drawing conclusions and inferences about the target population of the study (Pace, 2021).

The survey data of non-probability sampling is different from the survey data of probability sampling. The sampling used by researchers does not provide each member of the target population to participate in the study. Instead, researchers select participants, or choose to participate in the study by themselves. The implementation methods of non-probability sampling are various, including convenience sampling, quota sampling, snowball sampling, and so on (Etikan & Bala, 2017).

In this thesis, the principles of purpose and convenience are considered in the selection of sampling objects, and the convenience sampling method in non-probability sampling is used.

Convenience sampling is a common form of non-probability sampling in research. It is popular because it is low-cost, simple and fast, unlike other sampling strategies, which are time-consuming and labor-intensive (Farrokhi & Mahmoudi-Hamidabad, 2012). The sampling method of this thesis is a typical convenience sampling method, because the sample is composed of individuals who are convenient to access for the researcher, that is I choose Chengdu communities for the samples. The reason why the sample is selected in the community of Chengdu is that, on the one hand, the community of Chengdu has achieved remarkable results in digitalization, and many community personnel have rich experience in community digitalization, which provides good materials and samples for this thesis. To ensure the accuracy and reliability of the questionnaire used in this thesis's community survey, it is essential to involve individuals who have a thorough understanding of the community. This practical consideration is crucial in facilitating the survey process and ensuring the validity of the results. Therefore, the grass-roots management and staff of the community are better samples. At the same time, we need to ensure that these groups cooperate well, and the researchers and research team have established a good cooperative relationship with the grass-roots management and staff of the community in Chengdu, which provides good conditions for this thesis.

In addition, considering that convenience sampling is affected by various forms of biases, in order to reduce these biases as much as possible, the following measures were carried out to reduce biases.

1. Provide an overview of the demographic traits of the participants and ensure that the sample accurately reflects the intended population.

2. Collect data in diverse ways. In order to improve representation and participation, we use different ways to obtain participants. For instance, existing participants recruit others from their social networks to participate in the thesis. This can be an effective way from multiple sources to reduce biases that may be present in any single source.

3. When using a questionnaire, we used standardized measure to collect data, such as standardized surveys or questionnaires, to minimize the influence of researcher bias or interpretation.

4. We assess participant fatigue through questions or assessments on data consistency.

First, the sampling objects of the formal questionnaire is community administrators and staff who use digital technology to conduct community governance in Chengdu, Sichuan Province. Second, the sample size directly affects the results of the thesis. Large sample size may cause wasted research resources and high costs. On the other hand, if the sample size is too small, the population being investigated is not representative. Therefore, it is crucial to

accurately determine the sample size for a thesis. Typically, the sample size is determined by the number of measurement items in the questionnaire. Generally speaking, one item needs to have 5-10 times the sample size. This thesis uses a total of 49 items. 5 times the sample size, the number of samples must be at least 245 (Norman, 2010).

Accordingly, we conducted a formal questionnaire based on the above questionnaire method. The formal questionnaire survey took one month from early August to early September 2022. We have selected a professional online survey platform based in China (sojump) to make and distribute electronic questionnaires. This questionnaire survey mainly adopted the convenience sampling method, using two different channels to send the questionnaire link to the respondents. The first channel was to contact acquaintances who work in the community, and ask them to help distribute questionnaires in the work community. In this way, we quickly spread the sample range to community workers in various areas of Chengdu, and the distribution areas covered 7 major urban areas: Jinjiang District, Qingyang District, Jinniu District, Wuhou District, Chenghua District, High-tech Zone, Tianfu New Area. This method was relatively easy, and a certain number of questionnaires can be collected quickly. The second channel was to distribute questionnaires from top to bottom with the help of government administrators. These groups of people can easily distribute questionnaires within the scope of work under their jurisdiction, and supplement the samples in a horizontal survey. In the end, we collected a total of 912 questionnaires from 912 communities.

4.3 Preliminary data analysis

4.3.1 Descriptive statistical analysis

(1) Sample descriptive statistical analysis

(a) Regional distribution of the community. After excluding 65 questionnaires that are filled out in less than 3 minutes and 28 questionnaires that failed the attention check, this thesis finally tested the hypotheses by using 819 questionnaires from 819 communities. As shown in the Figure 4.1, this thesis covered most of the main urban areas of Chengdu when the questionnaires were distributed. As the first batch of national-level high-tech development zones, the high-tech zone has a large flow of people and is also a high-incidence area of the new crown pneumonia epidemic in Chengdu. Therefore, the number of questionnaires distributed and collected in this area is the highest. Tianfu New District followed, followed by other major urban areas. The number of valid questionnaires returned from each main urban

area is as follows: 105 in Jinniu District, 124 in Chenghua District, 42 in Qingyang District, 25 in Wuhou District, 37 in Jinjiang District, 286 in High-tech District, and 200 in Tianfu New Area.

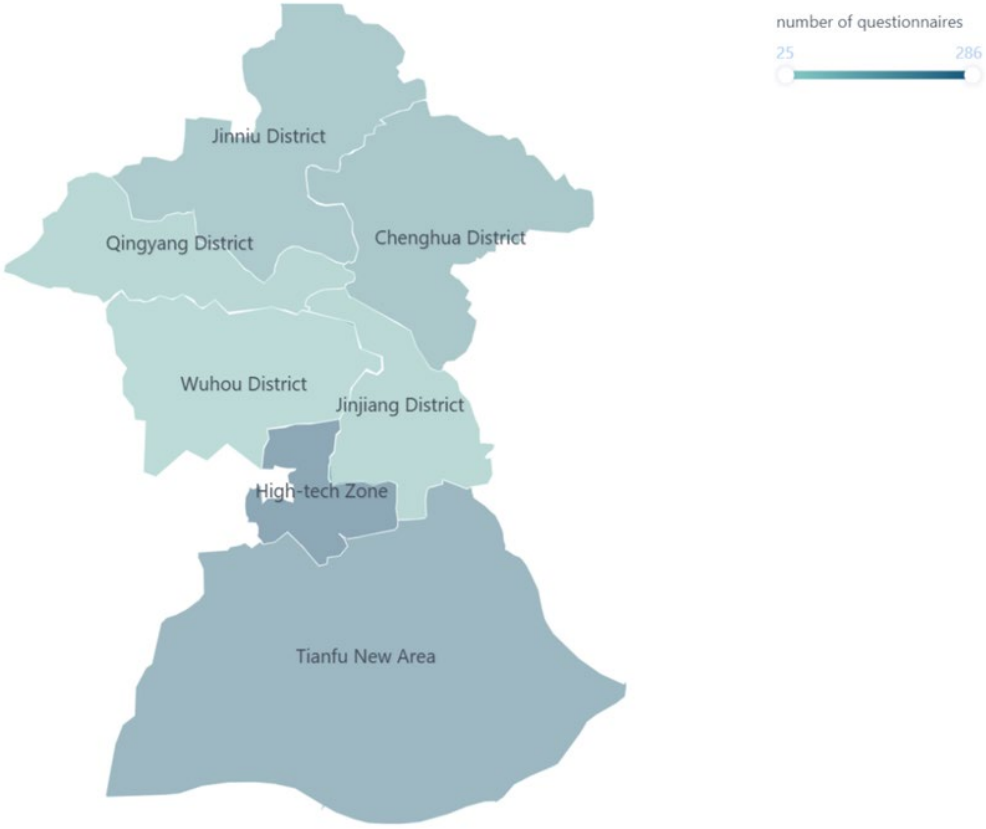


Figure 4.1 Regional distribution of the community

(b) Community and respondent information. Information on communities and respondents was collated for this thesis and summarised in Table 4.3. 476 communities, or 58.11% of the total sample, had more than 8,000 residents. 468 communities established more than 10 years ago, accounting for 57.13% of the total sample. The majority of the communities were commercial housing communities, old wine yard communities and "village to residence" communities. Most of the communities have an average house price of less than $20,000. There were 434 communities with an average property fee of RMB 1-3, accounting for 52.99% of the total sample. The average age of residents was between 41-50 years old in 320 communities, accounting for 39.07% of the sample. The known female respondents accounted for 60.56% of the respondents. In terms of age structure, the largest number of respondents, 46.76%, were in the 31-35 year old range. In terms of education level, the highest percentage of respondents, 48.11%, had tertiary education. In terms of years of work experience, the highest percentage of respondents (44.93%) had worked for 1-5 years. Detailed information is shown in Table 4.3.

Table 4.3 Information for the community and interviewees

Variables	Contents	Number of communities	Percentage (%)
Number of residents in the community	Less than 100	5	0.61%
	100-500	18	2.20%
	501-1000	37	4.52%
	1001-3000	122	14.90%
	3001-8000	161	19.66%
	Over 8000	476	58.11%
When the community was founded	Less than 1 year	3	0.37%
	1-3 years	136	16.61%
	3-5 years	90	10.99%
	5-10 years	122	14.90%
	Over 10 years	468	57.13%
Type of community (multiple choice, as communities will contain multiple types)	Commercial housing communities	416	30.84%
	Unit community	123	9.12%
	Older communities	393	29.13%
	"Village to home" communities	299	22.16%
	Others	118	8.75%
Average community house price	Less than ￥10,000	236	28.82%
	￥10000-￥150000	254	31.01%
	￥15,000 - ￥20,000	239	29.18%
	Over ￥20,000	90	10.99%
Average community property fee (yuan per square metre)	Less than ￥1	292	35.65%
	￥1-￥3	434	52.99%
	￥3-￥5	75	9.16%
	￥5-￥10	14	1.71%
	Over ￥10	4	0.49%
Average age of community residents	18-30 years	34	4.15%
	31-45 years	190	23.20%
	41-50 years	320	39.07%
	51-60 years	196	23.93%
	Over 60 years	79	9.65%
Gender of respondent	Male	191	23.32%
	Female	496	60.56%
	Reluctance to disclose	132	16.12%
Respondents' age group	18-30 years	145	17.70%
	31-45 years	383	46.76%
	41-50 years	236	28.82%
	51-60 years	51	6.23%
	Over 60 years	4	0.49%
Respondents' education level	Junior High School and below	16	1.95%
	Senior High School	146	17.83%
	Tertiary education	394	48.11%
	Undergraduate	252	30.77%
	Postgraduate	11	1.34%
Respondents' years of work experience	Less than 1 year	111	13.55%
	1-5 years	368	44.93%
	5-10 years	195	23.81%
	10-20 years	121	14.77%

	Over 20 years	24	2.94%

(2) Descriptive statistical analysis of measurement items

The descriptive statistical analysis of digital technologies, community dynamic capabilities (sensing, learning, integrating, coordinating and reconfiguring capability), community social capital (bonding, bridging and linking capital), community social support (informational, emotional and instrumental support), community resilience and community technological opportunism by giving the maximum-minimum, mean, standard deviation, skewness and kurtosis provides a preliminary understanding of the level of presence of each variable within the community. The results are shown in Table 4.4.

Table 4.4 Descriptive statistical analysis

Variables	MI	Smallest	Largest	Mean	Std. dev.	Skewness	Kurtosis
Digital technology (DT)	DT1	1	7	5.333333	1.627995	-1.015308	3.380857
	DT2	1	7	5.327228	1.5622	-1.027503	3.532241
	DT3	1	7	5.344322	1.5204	-.9378742	3.487814
Community dynamic capability _ sensing capability (CDC_SC)	SC1	1	7	5.753358	1.358743	-1.308968	4.589973
	SC2	1	7	5.757021	1.301047	-1.289681	4.707012
	SC3	1	7	5.785104	1.293286	-1.353692	5.113505
	SC4	1	7	5.578755	1.371947	-.9890992	3.712448
Community dynamic capability _learning capability (CDC_LC)	LC1	1	7	5.942613	1.10029	-1.31902	5.407983
	LC2	1	7	6.015873	1.062125	-1.409814	5.783443
	LC3	1	7	5.946276	1.109878	-1.418549	5.888291
Community dynamic capability _ integrating capability (CDC_IC)	IC1	1	7	6.159951	.9727626	-1.519967	6.549617
	IC2	1	7	5.967033	1.085642	-1.380082	5.540732
	IC3	1	7	5.907204	1.095081	-1.196263	4.855282
	IC4	1	7	6.009768	1.071937	-1.467388	5.986102
Community dynamic capability _ configuring capability (CDC_RC)	RC1	1	7	5.692308	1.307521	-1.293233	4.828351
	RC2	1	7	5.95116	1.087856	-1.453811	6.132775
	RC3	1	7	5.89011	1.109037	-1.299603	5.43215
Community dynamic capability _ coordinating capability (CDC_CC)	CC1	1	7	5.887668	1.230056	-1.619324	6.036912
	CC2	1	7	6.015873	1.028205	-1.469865	6.464041
	CC3	1	7	5.833944	1.24377	-1.44181	5.433638
	CC4	1	7	5.967033	1.150162	-1.561251	6.138057
Community social capital _ bonding social capital (CSC_BoSC)	BoSC1	1	7	5.905983	1.107742	-1.228557	4.945765
	BoSC2	1	7	5.809542	1.128799	-.9684775	3.962778
	BoSC3	1	7	5.882784	1.08825	-1.082031	4.5393
Community social capital _ bridging social capital (CSC_BrSC)	BrSC1	1	7	5.692308	1.135373	-.9066563	3.991215
	BrSC2	1	7	5.810745	1.045228	-.9534474	4.093888
	BrSC3	1	7	5.969475	.9703658	-.9832481	4.015889
Community social capital _ linking social capital (CSC_LSC)	LSC1	1	7	6.094017	.8926217	-1.072392	4.571009
	LSC2	1	7	5.472527	1.34243	-.9319434	3.534059
	LSC3	1	7	5.543346	1.247595	-.9812748	4.210486
	LSC4	1	7	5.738706	1.116712	-.9642675	4.324905

Community social support _ informational support (CSS_InfS)	InfS1	1	7	6.202686	.8930279	-1.428149	6.115943
	InfS2	1	7	6.153846	.9013813	-1.26895	5.207698
	InfS3	1	7	6.164835	.9014787	-1.151123	4.582675
Community social support _ emotional support (CSS_ES)	ES1	1	7	6.21978	.8889704	-1.425905	5.912284
	ES2	1	7	6.115995	.9144189	-1.104359	4.474487
	ES3	1	7	6.185592	.9062335	-1.241353	4.865132
	ES4	1	7	6.067155	.9823046	-1.141186	4.481667
Community social support _ instrumental support (CSS_InsS)	InsS1	1	7	6.004884	1.031284	-1.294539	5.121065
	InsS2	1	7	5.90232	1.045532	-1.050171	4.166208
	InsS3	1	7	5.95116	1.09346	-1.29547	5.054459
Community resilience (CR)	CR1	1	7	5.98779	1.100054	-1.442438	5.898028
	CR2	1	7	6.020757	1.034046	-1.269507	5.18589
	CR3	1	7	6.095238	.9743479	-1.278233	5.467431
	CR4	1	7	6.030525	1.061805	-1.53834	6.503367
Community technological opportunism (CTO)	CTO1	1	7	5.715507	1.156841	-.9764476	4.156303
	CTO2	1	7	5.698413	1.130002	-.9049894	3.980475
	CTO3	1	7	5.631258	1.214541	-.999659	4.182201
	CTO4	1	7	5.715507	1.194278	-1.088937	4.348522

Note: MI-Measurement items.

4.3.2 Exploratory factor analysis

As mentioned before, there are 3 items to measure digital technology, sensing capability in community dynamic capability involves 4 items, learning capability includes 3 items, integration capability includes 4 items, reconfiguring capability includes 3 items, coordinating capability is measured by 4 items. There are 3 items for linking social capital of community social capital, 3 items for bridging social capital, 4 items for linking social capital, and 3 items for informational support of community social support, there are 4 items for emotional support, 3 items for instrumental support, 4 items for community resilience, and 4 items for community technical opportunism. It can be seen that our questionnaire involves three second-order variables, indicating a complex structure of measure model. To initially explore whether the measurement items of each variable match certain variable, we first performed an exploratory factor analysis.

In this thesis, we used factor analysis to test the unidimensionality of the latent variables. Meanwhile, the factor was extracted based on the eigenvalue greater than 1. The analysis results are shown in Table 4.5. Specifically, all single-factor cumulative variance contribution rates are between 65% and 90%, which are all greater than the 60% criterion, indicating that the single-factor can fully generalize the original items.

Table 4.5 The unidimensionality of the latent variables

Component	Total variance explained					
	Initial Eigenvalues			Extraction sums of squared loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
			DT			
1	2.534	84.455	84.455	2.534	84.455	84.455
2	.289	9.641	94.096			
3	.177	5.904	100.000			
			CDC_SC			
1	3.059	76.484	76.484	3.059	76.484	76.484
2	.427	10.666	87.150			
3	.281	7.024	94.174			
4	.233	5.826	100.000			
			CDC_LC			
1	2.561	85.358	85.358	2.561	85.358	85.358
2	.270	9.008	94.367			
3	.169	5.633	100.000			
			CDC_IC			
1	3.174	79.357	79.357	3.174	79.357	79.357
2	.340	8.488	87.846			
3	.277	6.929	94.775			
4	.209	5.225	100.000			
			CDC_RC			
1	2.467	82.247	82.247	2.467	82.247	82.247
2	.338	11.276	93.522			
3	.194	6.478	100.000			
			CDC_CC			
1	3.084	77.102	77.102	3.084	77.102	77.102
2	.387	9.674	86.777			
3	.300	7.502	94.278			
4	.229	5.722	100.000			
			CSC_BoSC			
1	2.613	87.101	87.101	2.613	87.101	87.101
2	.206	6.868	93.970			
3	.181	6.030	100.000			
			CSC_BrSC			
1	2.410	80.333	80.333	2.410	80.333	80.333
2	.320	10.659	90.992			
3	.270	9.008	100.000			
			CSC_LSC			
1	2.681	67.013	67.013	2.681	67.013	67.013
2	.552	13.808	80.821			
3	.538	13.444	94.265			
4	.229	5.735	100.000			
			CSS_InfS			
1	2.541	84.688	84.688	2.541	84.688	84.688
2	.266	8.856	93.544			
3	.194	6.456	100.000			
			CSS_ES			
1	3.302	82.562	82.562	3.302	82.562	82.562
2	.329	8.224	90.787			

3	.213	5.332	96.118			
4	.155	3.882	100.000			
			CSS_InsS			
1	2.423	80.767	80.767	2.423	80.767	80.767
2	.390	13.015	93.781			
3	.187	6.219	100.000			
			CR			
1	3.391	84.768	84.768	3.391	84.768	84.768
2	.257	6.435	91.203			
3	.205	5.133	96.336			
4	.147	3.664	100.000			
			CTO			
1	3.430	85.756	85.756	3.430	85.756	85.756
2	.240	6.003	91.759			
3	.170	4.259	96.019			
4	.159	3.981	100.000			

In addition, we apply the identical technique to extract common factors from all 49 aforementioned items. The cumulative variance contribution of the six shared factors is 71.91%, suggesting that the extracted six factors are sufficient to generalize the original items entirely.

4.3.3 Confirmatory factor analysis

The purpose of confirmatory factor analysis is to test whether the data conform to a hypothesized measurement model. We firstly test the measurement accuracy of items for each variable. The Figure 4.2 shows the loadings of the measurement items for each construct, all greater than 0.6, indicating an ideal result.

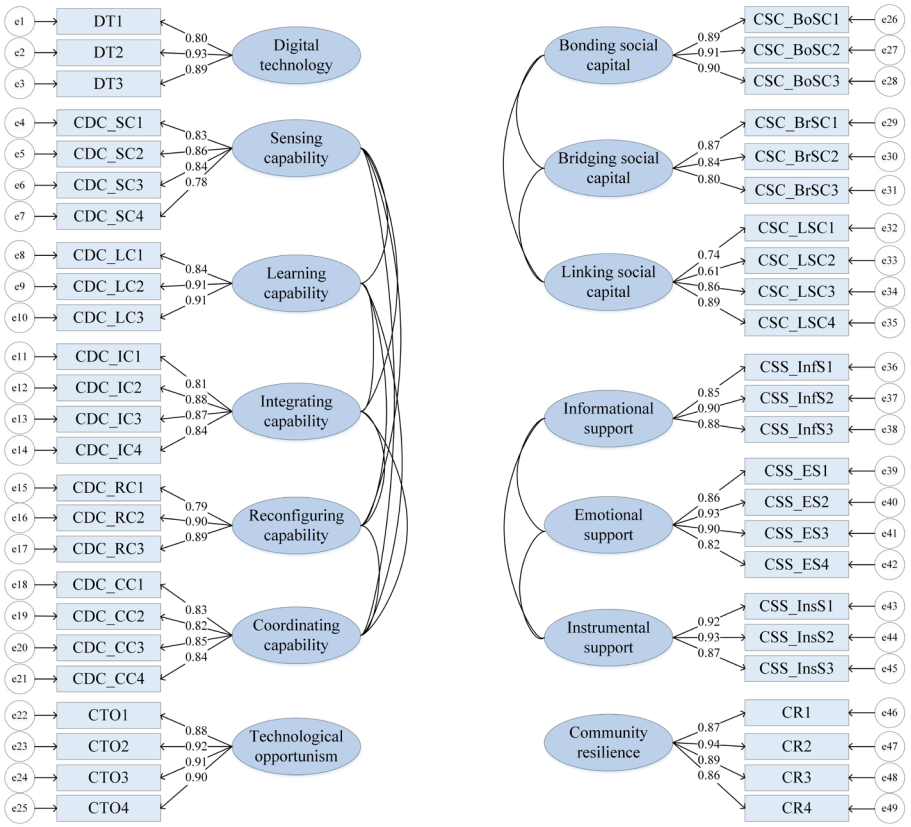


Figure 4.2 The results of factor loading

In addition, we utilized a variety of fit indices to evaluate the goodness-of-fit statistics. The Chi-square index assesses the overall fit as well as the disparity between the sample and fit covariance matrices. A value closer to zero signifies a better fit. The Root Mean Square Error of Approximation (RMSEA) attempts to adjust for systematic trends in a multi-sample chi-square rejection model, with a value near 0 indicating a satisfactory fit, preferably less than 0.08. The Normed Fit Index (NFI) is an incremental measure of the model's goodness of fit. The closer it is to 1, the more appropriate the model's fit. The Goodness of Fit Index (GFI) represents the overall suitability rate of the model, calculated by comparing the residual squares of the predicted model to the actual data. The GFI higher than 0.90 indicates the model tested is of good suitability. The Comparative Fit Index (CFI) is also an incremental conformity index, ranging from 0 to 1, with a value near 1 indicating a good level of conformity. The Relative Fit Index (RFI), also known as the incremental fit, compares the chi-square of the proposed model to a null model, with a value of 1 indicating an excellent fit. As shown in Table 4.6, all the goodness-of-fit statistics fall within the acceptable range, suggesting that the model is a good fit.

Table 4.6 The goodness-of-fit statistics

Variables	χ^2/ df	RMSEA	NFI	GFI	CFI	RFI
Digital technology	4.001	0.061	0.998	0.997	0.998	0.993

Community dynamic capability	4.561	0.066	0.957	0.924	0.966	0.947
Community social capital	4.278	0.063	0.982	0.972	0.986	0.969
Community social support	4.778	0.068	0.983	0.967	0.986	0.972
Community resilience	3.020	0.050	0.999	0.998	0.999	0.994
Community technological opportunism	2.497	0.043	0.998	0.997	0.999	0.995

4.4 Summary

In this chapter, based on the existing definitions and scales, we first designed operational definitions, measurement items and questionnaires for the six variables. Next, we conducted both preliminary and formal investigations in seven areas located in the primary urban region of Chengdu. Afterwards, we proceeded to conduct a preliminary analysis of the gathered data, which involved descriptive statistics, exploratory and confirmatory analyses. In the next chapter, we will analyze the data and report the results, including estimation methods, measurement models, structural models, indirect effects analysis, and more.

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Chapter 5: Data Analysis and Results

5.1 Estimation approach

The PLS-SEM is a method that estimates intricate causal relationships in path models with latent variables, aiming to increase the variance explained in structural models and enhance the interpretation of model relationships. Unlike CB-SEM, PLS-SEM does not suppose that a common factor explains all the covariation between the sets of indicators (Henseler et al., 2015). Weighted combinations of indicator variables are utilized in PLS-SEM to form composite variables, which gives it an advantage over multiple regression that uses summed scores. PLS-SEM comprises two sub-models, namely the measurement model (or internal model) and the structural model (or external model).

Moreover, PLS-SEM has relative to in the following aspects: (1) Conventional covariance-based SEM (CB-SEM) may underestimate standard errors and inflate goodness of fit when evaluating path models with non-normal data, such as the data commonly collected in social science research. However, PLS-SEM is a method that does not assume anything about the underlying data distribution, transforms non-normal data according to the central limit theorem, and has fewer restrictions in dealing with such data. (2) PLS-SEM can be used for smaller sample sizes compared to CB-SEM, even when the model contains numerous constructs and a large number of items. This makes PLS-SEM applicable to small samples and often results in higher statistical power, as sample size affects several aspects of parameter estimation and model fit. (3) It is more flexible handling of models with complex relationships. When the model involves many constructs, indicators and/or model relationships, such as both formative and reflective indicators, PLS-SEM is viewed as an effective method because it avoids the identification problems that often arise when applying CB-SEM. In addition, PLS-SEM has the capability to handle advanced model elements, including but not limited to moderator variables, nonlinear relationships, and hierarchical component models.

5.2 Measurement models

The measurement model can be evaluated by exploratory factor analysis (EFA) and

confirmatory factor analysis (CFA) to represent the connection between observed data and latent variables. Despite both methods being used to comprehend the shared variance of measurement items related to latent variables, EFA and CFA differ conceptually and statistically. EFA assumes that any measurement item is associated with a construct, and identifies a set of potential constructs to determine whether a single factor can explain the variance and covariance between items. The two main analysis methods are principal axis analysis (extracting factors using only common variance) and principal component analysis (extracting factors using total variance). Additionally, the analysis results can indicate the measurement's reliability and validity, and identify irrelevant items that don't align with the proposed construct for removal. CFA's objective is to evaluate the measurement properties of a group of items, verifying the proposed theoretical association between observed items and latent variables. This includes assessing individual indicators' reliability, construct reliability, content validity, convergent validity, discriminant validity, and goodness of fit (Mikalef & Pateli, 2017).

5.2.1 Reliability and validity

(1) Reliability

Reliability is the consistency and stability of the scale, *i.e.*, whether the scale reflects stable and consistent true characteristics of the person being measured (Dijkstra & Henseler, 2015). This thesis assessed the reliability of the variables through Cronbach's Alphas and composite reliability (CR), as shown in Table 5.1. The values of Cronbach's Alphas for all first-order variables are between 0.834 and 0.945, which are above the threshold of 0.700, and the values of CR for all first-order variables are between 0.890 and 0.960, which are above the threshold of 0.700. These results suggest that the variables in this thesis have good reliability (Dijkstra & Henseler, 2015).

Table 5.1 Data reliability indicators

Variables	**Measurement items**	**Cronbach's Alpha > 0.7**	**CR > 0.7**
Digital technology (DT)	DT1 DT2 DT3	0.908	0.942
Community dynamic capability _ sensing capability (CDC_SC)	SC1 SC2 SC3 SC4	0.897	0.929
Community dynamic capability _ learning capability (CDC_LC)	LC1 LC2 LC3	0.914	0.946
Community dynamic capability _ integrating capability	IC1 IC2	0.913	0.939

(CDC_IC)	IC3		
	IC4		
Community dynamic capability _ reconfiguring capability (CDC_RC)	RC1	0.892	0.933
	RC2		
	RC3		
Community dynamic capability _ coordinating capability (CDC_CC)	CC1	0.901	0.931
	CC2		
	CC3		
	CC4		
Community social capital _ bonding social capital (CSC_BoSC)	BoSC1	0.926	0.953
	BoSC2		
	BoSC3		
Community social capital _ bridging social capital (CSC_BrSC)	BrSC1	0.878	0.925
	BrSC2		
	BrSC3		
Community social capital _ linking social capital (CSC_LSC)	LSC1	0.834	0.890
	LSC2		
	LSC3		
	LSC4		
Community social support _ informational support (CSS_InfS)	InfS1	0.910	0.943
	InfS2		
	InfS3		
Community social support _ emotional support (CSS_ES)	ES1	0.929	0.950
	ES2		
	ES3		
	ES4		
Community social support _ instrumental support (CSS_InsS)	InsS1	0.880	0.926
	InsS2		
	InsS3		
Community resilience (CR)	CR1	0.940	0.957
	CR2		
	CR3		
	CR4		
Community technological opportunism (CTO)	CTO1	0.945	0.960
	CTO2		
	CTO3		
	CTO4		

(2) Validity

Validity refers to the truthfulness and accuracy of the results, *i.e.*, the extent to which the results reflect the researcher's intentions. Validity, which includes content validity, convergent validity, and discriminant validity, is a crucial measure of the accuracy of a scale. Content validity assesses the suitability of items for the content being measured. Convergent validity measures how well tests that measure the same characteristics are related to each other. Discriminant validity evaluates the ability to differentiate between observed values when different methods are used to measure different constructs (Fornell & Larcker, 1981).

Firstly, in terms of content validity, all of the measurement items in this thesis were derived from well-established measurement scales. Also, all the variables in this thesis had three or more measurement items, thus, these things increase content validity of this thesis.

Secondly, this thesis evaluated convergent validity using two different methods. The results are shown in Table 5.2.For first-order reflective variables, we assessed Average Variance Extracted values (AVEs) and measurement item loadings. For second-order formative variables, we evaluated weights and significance of the first-order variables on the second-order variables,

Table 5.2 Data validity indicators

Variables	Measurement items	Loading > 0.7	Weights	AVE > 0.5
Digital technology (DT)	DT1	0.926***		0.845
	DT2	0.937***		
	DT3	0.894***		
Community dynamic capability _ sensing capability (CDC_SC)	SC1	0.885***		0.765
	SC2	0.894***		
	SC3	0.85***		
	SC4	0.869***		
Community dynamic capability learning capability (CDC_LC)	LC1	0.939***		0.854
	LC2	0.929***		
	LC3	0.903***		
Community dynamic capability _ integrating capability (CDC_IC)	IC1	0.898***		0.794
	IC2	0.868***		
	IC3	0.88***		
	IC4	0.917***		
Community dynamic capability _ reconfiguring capability (CDC_RC)	RC1	0.922***		0.822
	RC2	0.873***		
	RC3	0.926***		
Community dynamic capability _ coordinating capability (CDC_CC)	CC1	0.867***		0.771
	CC2	0.886***		
	CC3	0.885***		
	CC4	0.873***		
Community dynamic capability (CDC)	SC	--------	0.269***	--------
	LC	--------	0.073*	
	IC	--------	0.174***	
	RC	--------	0.237***	
	CC	--------	0.393***	
Community social capital _ bonding social capital (CSC_BoSC)	BoSC1	0.931***		0.871
	BoSC2	0.938***		
	BoSC3	0.931***		
Community social capital _ bridging social capital (CSC_BrSC)	BrSC1	0.884***		0.803
	BrSC2	0.901***		
	BrSC3	0.904***		
Community social capital _ linking social capital (CSC_LSC)	LSC1	0.89***		0.670
	LSC2	0.863***		
	LSC3	0.747***		
	LSC4	0.765***		
Community social capital (CSC)	BoSC	--------	0.283***	--------
	BrSC	--------	0.254***	
	LSC	--------	0.553***	
Community social support _ informational support (CSS_InfS)	InfS1	0.915***		0.847
	InfS2	0.934***		
	InfS3	0.912***		
Community social support _ emotional support	ES1	0.923***		0.826
	ES2	0.871***		

(CSS_ES)	ES3	0.939***		
	ES4	0.9***		
Community social support _ instrumental support (CSS_InsS)	InsS1	0.929***		0.808
	InsS2	0.903***		
	InsS3	0.863***		
Community social support (CSS)	InfS	--------	0.203***	--------
	ES	--------	0.163**	
	InsS	--------	0.702***	
Community resilience (CR)	CR1	0.929***		0.848
	CR2	0.91***		
	CR3	0.94***		
	CR4	0.904***		
Community technological opportunism (CTO)	CTO1	0.93***		0.858
	CTO2	0.924***		
	CTO3	0.912***		
	CTO4	0.939***		

Note: *p<0.1, **p<0.05, ***p<0.01.

According to Table 5.2, the AVEs for all first-order variables are between 0.670 and 0.871, which are all greater than the criterion of 0.500 (Fornell & Larcker, 1981). Loadings for all measurement items were above 0.700 and significant at the 0.01 level. For the second-order formative variable community dynamic competence (CDC), the weights for each of the first-order variables for this variable were 0.269, 0.073, 0.174, 0.237 and 0.393, respectively, with sensing capability (SC), integrating capability (IC), reconfiguring capability (RC) and coordinating capability (CC) significant at the 0.01 level for CDC and LC for CDC was significant at the 0.1 level. For the second-order formative variable community social capital (CSC), the first-order variables had weights of 0.283 (bonding social capital), 0.254 (bridging social capital) and 0.553 (linking social capital) for this variable respectively, all of which were significant at the 0.01 level for CSC. For the second-order formative variable community social support (CSS), the weights for each of the first-order variables for this variable were 0.203, 0.163 and 0.702, respectively, with InfS and InsS significant at the 0.01 level for CSS and ES significant at the 0.05 level for CSS. Weights values were significant at the 0.05 level. Therefore, these results indicate good convergent validity of this thesis.

Finally, discriminant validity was assessed in three ways, as shown in Table 5.3. Results indicate good discriminant validity for this thesis, as the square root of each variable's AVE was consistently higher than its correlation coefficient with other variables. This finding aligns with existing literature (Fornell & Larcker, 1981). Meanwhile, this thesis demonstrated good discriminant validity by analyzing the cross-loading factors. As in Table 5.4, all items had higher factor loadings on their corresponding variables compared to other variables, indicating strong discriminant validity (Chin, 1998).

Table 5.3 Square roots and correlation coefficients of AVE values

Variables	DT	SC	LC	IC	RC	CC	BoSC	BrSC	LSC	InfS	ES	InsS	CR	CTO
DT	0.919													
SC	0.668	0.875												
LC	0.55	0.746	0.924											
IC	0.533	0.678	0.772	0.891										
RC	0.489	0.615	0.679	0.767	0.907									
CC	0.456	0.56	0.629	0.737	0.791	0.878								
BoSC	0.475	0.535	0.575	0.667	0.657	0.718	0.933							
BrSC	0.434	0.522	0.554	0.643	0.609	0.606	0.713	0.896						
LSC	0.476	0.562	0.57	0.658	0.679	0.669	0.737	0.772	0.819					
InfS	0.365	0.525	0.575	0.634	0.566	0.641	0.628	0.657	0.71	0.92				
ES	0.371	0.5	0.588	0.661	0.569	0.615	0.628	0.663	0.704	0.843	0.909			
InsS	0.439	0.532	0.569	0.645	0.632	0.643	0.641	0.676	0.727	0.722	0.779	0.899		
CR	0.426	0.517	0.588	0.656	0.658	0.687	0.637	0.654	0.7	0.669	0.689	0.751	0.921	
CTO	0.494	0.538	0.538	0.598	0.649	0.65	0.654	0.666	0.732	0.598	0.63	0.707	0.695	0.926

Note: DT-digital technology; SC-sensing capability; LC-learning capability; IC-integrating capability; RC-reconfiguring capability; CC-coordinating capability; BoSC-bonding social capital; BrSC-bridging social capital; LSC-linking social capital; InfS-informational support; ES-emotional support; InsS-instrumental support; CR-community resilience; CTO-community technological opportunism.

Table 5.4 Cross-loading

Items	DT	SC	LC	IC	RC	CC	BoSC	BrSC	LSC	InfS	ES	InsS	CR	CTO
DT1	**0.926**	0.628	0.51	0.485	0.467	0.425	0.443	0.391	0.436	0.336	0.354	0.412	0.389	0.475
DT2	**0.937**	0.635	0.532	0.515	0.462	0.435	0.449	0.418	0.453	0.349	0.348	0.422	0.404	0.484
DT3	**0.894**	0.577	0.472	0.469	0.417	0.397	0.416	0.387	0.422	0.32	0.32	0.375	0.38	0.399
SC1	0.593	**0.885**	0.673	0.623	0.551	0.51	0.467	0.443	0.473	0.454	0.454	0.457	0.438	0.458
SC2	0.556	**0.894**	0.666	0.596	0.524	0.465	0.446	0.443	0.498	0.476	0.428	0.442	0.454	0.461
SC3	0.615	**0.85**	0.614	0.572	0.552	0.506	0.497	0.497	0.517	0.447	0.431	0.519	0.439	0.497
SC4	0.574	**0.869**	0.656	0.581	0.525	0.477	0.463	0.445	0.48	0.46	0.436	0.443	0.479	0.465
LC1	0.506	0.695	**0.939**	0.721	0.623	0.575	0.521	0.489	0.518	0.547	0.55	0.499	0.54	0.481
LC2	0.513	0.698	**0.929**	0.747	0.67	0.603	0.56	0.536	0.548	0.542	0.556	0.566	0.564	0.524
LC3	0.505	0.674	**0.903**	0.67	0.588	0.565	0.512	0.508	0.514	0.501	0.522	0.512	0.524	0.486
IC1	0.5	0.605	0.684	**0.898**	0.718	0.675	0.617	0.588	0.623	0.559	0.604	0.604	0.595	0.58
IC2	0.448	0.592	0.687	**0.868**	0.603	0.632	0.573	0.519	0.524	0.58	0.599	0.552	0.57	0.44
IC3	0.46	0.622	0.695	**0.88**	0.709	0.656	0.59	0.598	0.595	0.553	0.555	0.562	0.581	0.567

IC4	0.491	0.598	0.686	**0.917**	0.7	0.662	0.594	0.583	0.598	0.567	0.597	0.58	0.591	0.54
RC1	0.436	0.575	0.656	0.723	**0.922**	0.744	0.592	0.561	0.611	0.556	0.543	0.573	0.603	0.556
RC2	0.436	0.512	0.559	0.653	**0.873**	0.681	0.616	0.562	0.613	0.45	0.47	0.573	0.604	0.626
RC3	0.459	0.584	0.629	0.709	**0.926**	0.726	0.584	0.535	0.625	0.529	0.532	0.574	0.586	0.588
CC1	0.412	0.531	0.592	0.691	0.685	**0.867**	0.592	0.535	0.574	0.638	0.584	0.583	0.598	0.526
CC2	0.382	0.457	0.522	0.624	0.702	**0.886**	0.646	0.544	0.599	0.517	0.515	0.56	0.612	0.573
CC3	0.41	0.466	0.529	0.64	0.674	**0.885**	0.713	0.551	0.602	0.554	0.561	0.553	0.625	0.563
CC4	0.398	0.509	0.565	0.631	0.718	**0.873**	0.575	0.498	0.576	0.54	0.497	0.56	0.578	0.622
BoSC1	0.444	0.516	0.533	0.617	0.607	0.662	**0.931**	0.691	0.703	0.61	0.61	0.615	0.588	0.617
BoSC2	0.438	0.476	0.528	0.624	0.621	0.673	**0.938**	0.671	0.698	0.582	0.576	0.593	0.601	0.602
BoSC3	0.447	0.507	0.55	0.626	0.613	0.677	**0.931**	0.632	0.66	0.566	0.57	0.585	0.593	0.612
BrSC1	0.386	0.463	0.506	0.584	0.527	0.546	0.604	**0.884**	0.68	0.63	0.621	0.586	0.572	0.538
BrSC2	0.379	0.458	0.474	0.563	0.549	0.55	0.631	**0.901**	0.674	0.578	0.596	0.628	0.599	0.588
BrSC3	0.401	0.482	0.508	0.581	0.56	0.534	0.679	**0.904**	0.721	0.562	0.568	0.604	0.587	0.661
LSC1	0.396	0.447	0.463	0.556	0.593	0.612	0.685	0.656	**0.89**	0.601	0.608	0.62	0.626	0.642
LSC2	0.417	0.471	0.442	0.514	0.557	0.554	0.671	0.648	**0.863**	0.524	0.517	0.594	0.587	0.631
LSC3	0.359	0.42	0.425	0.499	0.538	0.48	0.464	0.573	**0.747**	0.477	0.482	0.562	0.476	0.569
LSC4	0.385	0.506	0.542	0.588	0.537	0.538	0.568	0.649	**0.765**	0.724	0.7	0.608	0.593	0.551
InfS1	0.319	0.486	0.522	0.581	0.518	0.61	0.583	0.618	0.661	**0.915**	0.792	0.69	0.625	0.574
InfS2	0.34	0.494	0.548	0.596	0.532	0.589	0.58	0.606	0.65	**0.934**	0.781	0.668	0.626	0.535
InfS3	0.349	0.469	0.517	0.572	0.512	0.57	0.571	0.591	0.649	**0.912**	0.753	0.633	0.595	0.541
ES1	0.347	0.463	0.546	0.608	0.52	0.564	0.557	0.593	0.637	0.785	**0.923**	0.728	0.63	0.573
ES2	0.335	0.44	0.509	0.589	0.499	0.522	0.554	0.603	0.642	0.698	**0.871**	0.687	0.607	0.577
ES3	0.341	0.457	0.534	0.608	0.531	0.579	0.592	0.626	0.651	0.787	**0.939**	0.731	0.63	0.593
ES4	0.326	0.457	0.546	0.597	0.517	0.568	0.579	0.589	0.631	0.791	**0.9**	0.683	0.636	0.549
InsS1	0.414	0.493	0.525	0.592	0.59	0.592	0.573	0.615	0.652	0.655	0.71	**0.929**	0.658	0.647
InsS2	0.386	0.441	0.49	0.56	0.57	0.567	0.572	0.598	0.644	0.61	0.68	**0.903**	0.697	0.615
InsS3	0.384	0.498	0.519	0.587	0.544	0.573	0.582	0.609	0.664	0.679	0.708	**0.863**	0.668	0.644
CR1	0.388	0.496	0.546	0.631	0.622	0.656	0.611	0.614	0.656	0.655	0.666	0.686	**0.929**	0.643
CR2	0.386	0.477	0.538	0.593	0.6	0.624	0.565	0.6	0.629	0.588	0.624	0.706	**0.91**	0.63
CR3	0.392	0.478	0.553	0.601	0.599	0.62	0.58	0.595	0.651	0.633	0.643	0.68	**0.94**	0.646
CR4	0.402	0.454	0.527	0.589	0.602	0.63	0.589	0.598	0.642	0.587	0.601	0.693	**0.904**	0.641
CTO1	0.469	0.519	0.505	0.548	0.592	0.606	0.612	0.608	0.676	0.537	0.579	0.648	0.625	**0.93**
CTO2	0.446	0.499	0.508	0.566	0.588	0.603	0.594	0.614	0.674	0.547	0.579	0.659	0.65	**0.924**
CTO3	0.46	0.48	0.479	0.525	0.585	0.583	0.595	0.602	0.67	0.553	0.561	0.631	0.637	**0.912**

CTO4	0.455	0.492	0.501	0.576	0.637	0.616	0.621	0.641	0.691	0.576	0.614	0.68	0.663	**0.939**

Note: DT-digital technology; SC-sensing capability; LC-learning capability; IC-integrating capability; RC-reconfiguring capability; CC-coordinating capability; BoSC-bonding social capital; BrSC-bridging social capital; LSC-linking social capital; InfS-informational support; ES-emotional support; InsS-instrumental support; CR-community resilience; CTO-community technological opportunism.

This thesis utilized the Heterotrait-Monotrait ratio (HTMT) to measure the discriminant validity, which is the ratio of between-trait correlation and within-trait correlation (Henseler et al., 2015). This thesis demonstrates good discriminant validity as all HTMT values, presented in Table 5.5, were below the threshold of 0.850.

Table 5.5 Heterotrait–Monotrait (HTMT) ratio

Variables	DT	CDC	CSC	CSS	CR	CTO
DT						
CDC	0.617					
CSC	0.508	0.782				
CSS	0.42	0.737	0.796			
CR	0.426	0.716	0.73	0.757		
CTO	0.494	0.685	0.754	0.694	0.695	

Note: DT-digital technology; CDC-community dynamic capability; CSC-community social capital; CSS-community social support; CR-community resilience; CTO--community technological opportunism.

5.2.2 Common method biases test

In the process of carrying out the questionnaire method, due to the same measurement environment, data sources, and the similarity of the characteristics of the research items themselves, the common method bias refering to the covariation between the independent and dependent variables can occur (Podsakoff et al., 2003). To date, common method bias has been widespread in research in psychology and behavioral sciences. Due to the significant impact of common method bias, a systematic error that can distort research results, it is critical to perform statistical testing on the collected data. Commonly used common method bias testing methods include Harman’s single-factor test and common method latent factor (Tehseen et al., 2017). To ensure effective measurement of bias and the elimination of systematic errors, statistical tests were conducted on the data set using Harman's single-factor test and common method latent variable.

First, this thesis utilized Harman's single-factor test to evaluate the severity of common method bias in the questionnaire data. The test assumes that a strong explanatory power of a factor indicates the presence of severe common method bias. According to the research results, the variance contribution rate of the first factor is 18.309%, which is lower than the standard of 40%. Therefore, the common method bias problem is not serious in this thesis.

Secondly, on the basis of the above test, this thesis also used the common method latent variable to test the bias. This thesis focused on analyzing two models: the latent variable measurement model and the extended measurement model. The latter model includes two latent variables: the one discussed in this thesis and another that represents the unmeasured common method. The common method latent variable is measured by all items of the other latent variable

and is constrained to be orthogonal to it. The results showed that the fit of the two models was not significantly different ($\chi 2(1) = 3.28$, $p > 0.05$), that is, the common method bias problem is not serious in this thesis.

5.2.3 Multicollinearity test

Multicollinearity means that an explanatory variable in the constructed model can be a linear combination of one or several other explanatory variables, that is, there is a high correlation or approximate correlation between the explanatory variables (Lindner et al., 2022). If the data has serious multicollinearity, the test results of the independent variables will be seriously inconsistent with the actual situation. Considering the negative impact of multicollinearity on the results, this thesis utilized the variance inflation factor (VIF) as a measure of multicollinearity severity in the model. VIF indicates the ratio of the regression coefficient estimator's variance to the variance under the assumption of non-linearly correlated independent variables. Generally speaking, if VIF>10, it indicates that the model has a strong collinearity problem (L. Hu et al., 2022). According to the research results shown in Table 5.6, the VIF values of each explanatory variable in this research model are all less than 5, that is, there is no serious multicollinearity problem in this research.

Table 5.6 Latent variable VIF values

Variables	First-order variable	VIF
Digital Technology	--------	1.322
Community dynamic capability	Sensing capability	2.427
	Learning capability	3.264
	Integrating capability	3.743
	Reconfiguring capability	3.464
	Coordinating capability	3.006
	--------	2.886
Community social capital	Bonding social capital	2.456
	Bridging social capital	2.788
	Linking social capital	2.984
	--------	3.647
Community social support	Informational support	3.579
	Emotional support	4.356
	Instrumental support	2.640
	--------	3.046
Community technological opportunism	--------	1.322

5.3 Structural model

Structural model represents relationships between latent variables. Evaluating a structural model requires considering the connection between its predictive ability and underlying

constructs, including the following aspects: (1) To assess multicollinearity. Severe multicollinearity may lead to biased estimates. (2) To test the hypothesized relationships between constructs, and determine the significance and magnitude of the path coefficients. (3) To consider the correlation of structural model relationships. Importance-performance map analysis (IPMA) aids in comprehending how well an exogenous variable performs in elucidating the endogenous variable. (4) The explanatory power of a model can be evaluated by looking at the coefficient of determination (R2), which indicates the degree to which exogenous variables explain variation in endogenous variables. (5) PLS-SEM Multi Group Analysis (MGA) can be used to evaluate the presence of significantly diverse outcomes among distinct groups in order to analyze heterogeneity.

The path coefficient are shown in Figure 5.1.

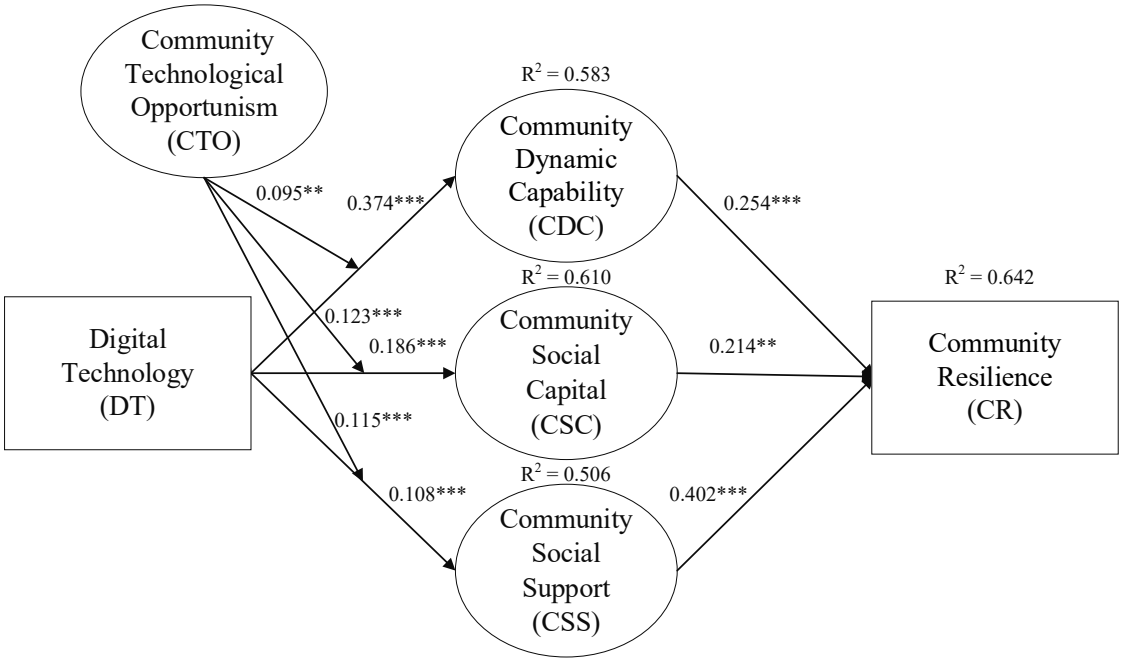


Figure 5.1 The results of path coefficient

It can be seen that digital technology has a significant positive effect on the community dynamic capability (β= 0.374; p<0.01), community social capital (β=0.186; p<0.01) and community social support (β=0.108; p<0.01), indicating that digital technology can improve all of them, supporting H1, H4, and H7. At the same time, the community dynamic capability (β= 0.254; p<0.01), community social capital (β=0.214; p<0.05) and community social support (β=0.402; p<0.01) have significant positive impact on community resilience, indicating that community resilience can be improved by all of them, with effective support for H3, H6 and H9. In addition, community technological opportunism has a moderating role of the relationship between the community dynamic capability, the community social support, and the community social capital. Specifically, community technological opportunism promotes the positive effect

of digital technologies on the community dynamic capability (β = 0.095; p<0.05), community social capital (β=0.123; p<0.01) and community social support (β=0.115; p<0.01). So, H2, H5, H8 are supported.

5.4 Indirect effect analysis

The findings of the indirect effect analysis are presented in Table 5.7. Regarding the part played by digital technology in enhancing community resilience, the study examined the impact of community social capital (β = 0.04; p<0.05), community dynamic capability (β = 0.095; p<0.01) and community social support (β = 0.043; p<0.01) have a positive and significant effect. So digital technology can positively affect community resilience through community dynamic capability, community social capital, and community social support. Secondly, in what pertains to the role of community technological opportunism in community resilience, community social capital (β = 0.15; p<0.05), community dynamic capability (β = 0.135; p<0.01) and community social support (β = 0.272; p <0.01) also have a positive and significant impact. Therefore, community technological opportunism can also positively affect community resilience through community dynamic capability, community social capital, and community social support. In addition, the indirect effect of the interaction between community technological opportunism and digital technology on community resilience through community social capital (β=0.026; p<0.05), community dynamic capability (β=0.024; p<0.01) and community social support (β=0.046; p<0.01) are all significant. The positive impact of community technological opportunism and digital technology on community resilience can be attributed to their interaction, which enhances community dynamic capability, social capital, and social support.

In summary, these indirect effects are highly significant.

Table 5.7 The results of indirect effect analysis

Path	Coefficient	P-value
DT→CDC→CR	0.095***	0.000
DT→CSC→CR	0.040**	0.026
DT→CSS→CR	0.043***	0.005
CTO→CDC→CR	0.135***	0.000
CTO→CSC→CR	0.150**	0.017
CTO→CSS→CR	0.272***	0.000
DT*CTO→CDC→CR	0.024***	0.009
DT*CTO→CSC→CR	0.026**	0.018
DT*CTO→CSS→CR	0.046***	0.006

Note: DT-Digital Technology；CDC-Community Dynamic Capability；CSC-Community Social Capital；CSS-Community Social Support；CR-Community Resilience；CTO-Community Technological Opportunism. *p<0.1; **p<0.05; ***p<0.01.

5.5 Heterogeneity Analysis

Considering that different communities have different resource endowments and experience by using digital technology, the impact mechanism of digital technology on community resilience may vary according to community characteristics. Therefore, this thesis conducts heterogeneity analysis on the six variables involving community characteristics: community size, community establishment time, community average house price, community property fee, community residents' average age, and community type (*i.e.*, commercial housing community and relocation community). Specifically, we divided the variables into two groups according to the median of the variable values. We employed permutation testing to assess the statistical significance of the differences in the group-specific parameter estimates between the two data groups. Table 5.8 shows the results with significant differences in different groups, as follows:

Table 5.8 The result of PLS-MGA

Variables	Paths	Coefficient 1	Coefficient 2	Difference	Permutation value
Community size	CSS→CR	0.596	0.290	0.306	0.017
Community establishment time	DT→CSC	0.243	0.140	0.103	0.050
	CSS→CR	0.260	0.496	-0.236	0.068
Community average house price	DT→CDC	0.283	0.501	-0.218	0.004
Community property fee	DT→CSS	0.035	0.150	-0.115	0.051
Community residents' average age	DT→CSC	0.134	0.271	-0.137	0.010
	CSS→CR	0.486	0.245	0.241	0.092
Commercial housing community	DT→CDC	0.310	0.446	-0.136	0.065
	DT→CSC	0.226	0.135	0.091	0.054
	CDC→CR	0.378	0.169	0.209	0.018
Relocation community	DT→CSS	0.064	0.194	-0.130	0.029
	DT*CTO→CSC	0.164	0.056	0.109	0.054

Note: DT-Digital Technology; CDC-Community Dynamic Capability; CSC- Community Social Capital; CSS-Community Social Support; CR-Community Resilience; CTO-Community Technological Opportunism. *p<0.1; **p<0.05; ***p<0.01.

First, the grouping results of the size of community show the impact paths of community social support on community resilience are 0.596 and 0.290 respectively for the small and large community groups, and there is a significant difference ($p < 0.05$), indicating that in the smaller the communities, there is a greater impact of community social support on resilience.

Second, the impact of digital technology on social capital was significantly greater ($p < 0.10$) for early established communities (0.243) relative to late established communities (0.140). More recent communities are more likely need to promote the impact of digital technology on community social capital. One possible explanation is in late established communities, the relationship between residents is not longer and closer enough. The adoption of digital

technology has limited abled to strengthening relationship, thus may not substantially enhance social capital. Meanwhile, there is a significant difference between the early-established group and the late-established group in the impact of community social support on community resilience, reflecting that the impact of community social support on community resilience was significantly smaller ($p < 0.10$) for early established communities (0.260) relative to late established communities (0.496). One possible explanation is that in early established communities, the emotional assistance, tool assistance and so on among residents are more frequent and stronger, and the additional social support has limited abled to improving community resilience.

Third, the grouping results of the average house price of community show that the impact of digital technology on community dynamic capability was significantly smaller ($p < 0.01$) for communities with low average house price (0.283) relative to communities with high average house price (0.501), indicating that the higher average housing price of the community, the better the use of digital technology to enhance community dynamic capability.

Fourth, the grouping results of community property fees show that the paths of digital technology on community dynamic capability are 0.035 and 0.150, respectively, for groups with low property fees and groups with high property fees, and there is a significant difference ($p<0.10$). Community with higher property fees are more likely to promote the positive impact of digital technology on community social support.

Fifth, the grouping results of community residents' average age show that the impact paths of digital technology on community social capital are 0.134 and 0.271, respectively, and there is a significant difference ($p < 0.05$). Community with older residents are more likely to promote the effect of digital technology on community social capital, considering with the foundation of digital technology is relatively weak in those communities. At the same time, there is a significant difference in the influence of social support on community resilience between the younger resident group and the older resident group ($p<0.10$), and the coefficient of the younger resident group is 0.241 larger than that of the older resident group, reflecting that the younger the community residents, the stronger the positive effect of community social support on community resilience. The young residents value interpersonal help and support more, and thus the social support is more important for improving community resilience.

Sixth, the grouping results of the two different community types (commercial housing community and relocation community) also show differences. Compared with non-commercial housing community, if the community type is a commercial housing community, the impact of digital technology on community dynamic capability is stronger ($\beta=0.446$, $p<0.10$). On the

contrary, compared with commercial housing community, if the community type is non-commercial housing community, the impact of digital technology on community social capital is stronger ($\beta = 0.226$, $p<0.10$), and the impact of community dynamic capability on community resilience is stronger ($\beta = 0.378$, $p <0.05$). In addition, compared with non- relocation community, if the community type is a relocation community, the impact of digital technology on social support is stronger ($\beta = 0.194$, $p<0.05$). Finally, when the community type is a non-relocation community, the moderating effect of technological opportunism in the relationship between digital technology and community social capital is stronger ($\beta=0.164$, $p<0.10$).

5.6 IPMA analysis

To obtain further insights for managerial practice, this thesis utilized Importance-Performance Map Analysis (IPMA), also known as Importance-Performance Matrix Analysis and Impact-Performance Map Analysis, to evaluate the significance and effectiveness of the predictor variables on the endogenous variable. Following Ringle and Sarstedt (2016), we utilized SmartPLS to calculate the importance and performance values (refer to Table 5.9).

Table 5.9 IPMA result

Dimension	Variables	CS (Small/Large)	CTE (Early/Late)	HPC (Low/High)	PCC (Low/High)	RAC (Younger/Older)	CHC (Non/Is)	ReC (Non/Is)
Importance	DT	0.136	0.218	0.158	0.128	0.158	0.192	0.168
		0.202	0.154	0.210	0.219	0.216	0.149	0.195
	CDC	0.189	0.220	0.263	0.197	0.250	0.378	0.286
		0.299	0.287	0.264	0.282	0.289	0.169	0.174
	CSC	0.120	0.354	0.262	0.371	0.147	0.120	0.154
		0.252	0.110	0.117	0.121	0.309	0.299	0.324
	CSS	0.596	0.260	0.339	0.308	0.486	0.393	0.429
		0.290	0.496	0.495	0.461	0.245	0.363	0.369
	CTO	0.603	0.508	0.563	0.620	0.588	0.548	0.558
		0.524	0.587	0.543	0.510	0.497	0.564	0.543
Performance	DT	70.473	73.012	71.107	71.011	73.257	70.362	72.163
		73.539	71.687	73.964	72.944	70.271	74.088	72.413
	CDC	81.122	82.775	81.623	82.076	81.743	80.955	81.821
		82.300	81.081	82.081	81.658	81.933	82.633	81.783
	CSC	76.777	78.286	77.492	77.412	77.722	76.911	77.891
		78.470	77.368	78.162	77.954	77.838	78.584	77.534
	CSS	83.901	85.734	84.869	85.339	85.142	83.909	85.168
		85.887	84.546	85.332	84.898	84.883	86.165	84.858
	CTO	76.718	79.319	77.751	77.876	79.050	76.234	78.386
		79.222	77.315	78.803	78.338	76.440	80.052	77.804

Note: DT-Digital Technology; CDC-Community Dynamic Capability; CSC- Community Social Capital; CSS-Community Social Support; CR-Community Resilience; CTO-Community Technological Opportunism. CS-Community size; CET-Community established time; HPC-House price of community; PCC-Property cost of community; RAC-Residents age of community; CHC-Commercial housing community; ReC-Relocation community.

Moreover, we represent the IPMA results visually through maps, as in Figure 5.2.

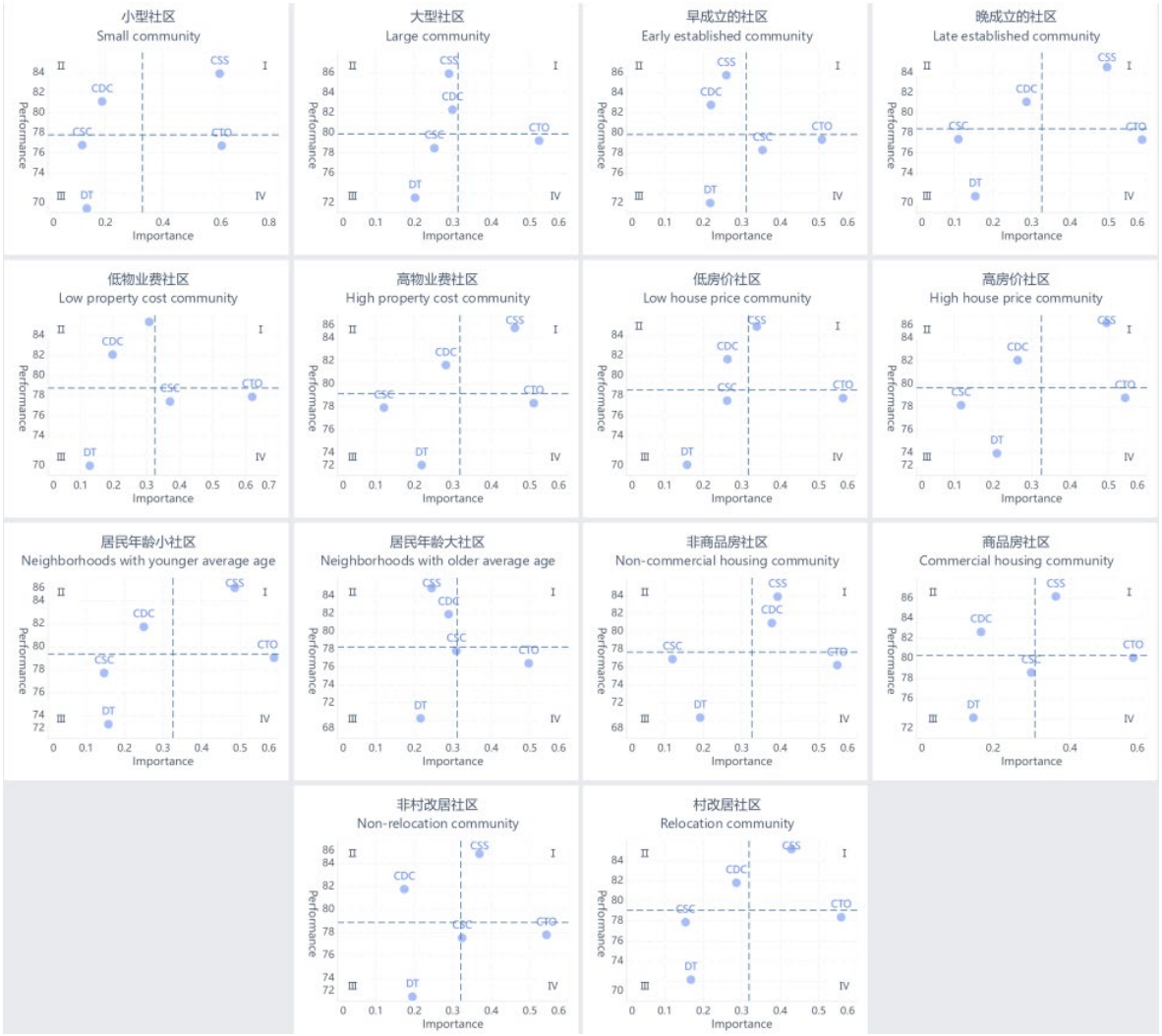


Figure 5.2 Importance-performance maps

Note: DT-Digital Technology; CDC-Community Dynamic Capability; CSC- Community Social Capital; CSS-Community Social Support; CR-Community Resilience; CTO-Community Technological Opportunism.

Specifically, to improve our understanding of the results, we created a four-quadrant matrix that incorporates mean importance and mean performance dash lines. Constructs that fall within Quadrant I are highly evaluated in both importance and performance, indicating that they are critical for gaining or sustaining the endogenous construct at a high level. Constructs that fall into Quadrant II exhibit high performance but low importance, indicating excessive effort or performance for non-important predictor variables. On the other hand, Quadrant III constructs have low performance and importance, suggesting that community resources allocated to relevant areas should be reassigned for more desirable positive outcomes. Lastly, constructs in Quadrant IV demonstrate high importance but low performance, signaling a high priority for intervention to improve the endogenous construct.

Take the community size as an example, community social support (CSS) fell into Quadrant

I for small communities, but was classified into Quadrant II for larger communities. Community dynamic capability (CDC) fell into Quadrant II for both small and large communities. While community social capital (CSC) and digital technology (DT) were classified into Quadrant III for both small and large communities. Community technological opportunism (DTO) fell into Quadrant IV for both small and large communities. The results of the IPMA study showed variations in the impact of digital technology on community resilience across different community sizes. For small communities, community resilience improvements should focus on community dynamic capability (CDC). For big communities, community resilience improvements should focus on community dynamic capability (CDC) and community social support (CSS). Additionally, it is important to improve the ability to apply digital technology and cultivate a more supportive social environment for both small and big community as digital technology becomes more popular, and avoid the negative effects of low levels of community social support. Additionally, refinements of community technological opportunism (CTO) should be prioritized for both small and large community.

5.7 FsQCA analysis

The above analysis, all studies utilizing PLS-SEM have focused on the net effect of each predictor variable on community resilience, while disregarding the role of community characteristics (apart from moderation effects) such as size, resident age, house prices, property cost, and established time, as well as their intricate interplay on community resilience. Conventional approaches like PLS-SEM have limited interpretive power for exploring complex interaction effects that involve three or more factors (Ganter & Hecker, 2014). FsQCA has the ability to uncover intricate complementarities and nonlinear associations among constructs (Ganter & Hecker, 2014). FsQCA seeks to identify various causal conditions that can potentially result in a particular outcome. It operates under the assumption that there is an asymmetry of variables, equifinality of routes, multifinality of identical elements, and conjunctural causation of variables (Ciampi et al., 2021; Woodside, 2013).

This thesis uses Stata for fsQCA analysis. First, this thesis used the standardized rank order transformation method to calibrate the constructs (Ganter & Hecker, 2014). Second, the solutions' acceptable consistency was set at equal to 0.85. Table 5.10 reports the results of the fsQCA, considering the five predictor variables (i.e., digital technology, community technological opportunism, community dynamic capability, community social capital, community social support), for communities with high levels of resilience.

Table 5.10 The configurations leading to the presence of the high level of community resilience

Solution	Causal condition					RC	UC	Co
	DT	CTO	CDC	CSC	CSS			
1			○	●		0.365	0.009	0.873
2			●	○		0.365	0.007	0.884
3		●			●	0.776	0.012	0.954
4	●				●	0.695	0.004	0.939
5	●	●				0.695	0.020	0.915
6				●	●	0.775	0.002	0.945
7			●		●	0.775	0.004	0.949
Solution coverage (>0.5) = 0.901								
Solution consistency (>0.8) = 0.860								

Note: DT-Digital Technology; CDC-Community Dynamic Capability; CSC- Community Social Capital; CSS-Community Social Support; CTO-Community Technological Opportunism. ● indicates the high level of a condition, while ○ indicates the low level of a condition. RC- Raw coverage; UC-Unique coverage; Co-Consistency.

Besides, Table 5.11 reports the results of the fsQCA, considering not only the five predictor variables but also five community characteristics (i.e., community size, community residents age, community house price, community property cost, and community established time).

Table 5.11 The configurations leading to the presence of the high level of community resilience (including community characteristics)

Solution	Configurations										RC	UC	Co
	DT	CTO	CDC	CSC	CSS	Pop	Age	Hou	Pro	Est			
1	○	○	○	○	●	●	○	○	●	●	0.096	0.012	0.925
2		●	●	●	●	●	○	●	●	●	0.187	0.007	0.985
3	●	●	●	●		○	○	○	○	●	0.104	0.003	0.966
4	●	●	●	●	●	○	●		○	●	0.124	0.025	0.982
5	●	●	●	●			○	●	●	○	0.114	0.001	0.978
6	●	●	●	●		●	○		●		0.244	0.004	0.976
7	●	●	●	●	●		○	○			0.314	0.055	0.980
8	●	●	●	●	●		○		●		0.271	0.005	0.984
9	●	●	●	●	●	●			●		0.292	0.047	0.984
10	●	●	●	●	●	○		○		○	0.078	0.012	0.981
Total Coverage (> 0.5) = 0.526													
Solution Consistency (> 0.8) = 0.962													

Note: DT-Digital Technology; CDC-Community Dynamic Capability; CSC- Community Social Capital; CSS-Community Social Support; CTO-Community Technological Opportunism; Pop-community size；Age-community' residents age；Hou-community' house price；Pro-community' property cost；Est-community established time. ● indicates the high level of a condition, while ○ indicates the low level of a condition. RC-Raw coverage; UC-Unique coverage; Co-Consistency.

As shown in Table 5.10, high levels of community resilience can be associated with several equifinal configurations. For community resilience, the fsQCA identified 7 equifinal configurations. These configurations reveal that the combinations of the antecedents (digital technology, community technological opportunism, community dynamic capability, community social capital, community social support) may become the sufficient conditions to have a community with high resilience. As an illustration, solution 3 states that 95.4% of all

communities with a high level of CTO and CSS are members of the set “community having high resilience”.

Using identical thresholds (0.85), multiple equifinal configurations that foster community resilience were uncovered, as presented in Table 5.11. The findings imply that 10 paths can serve as adequate prerequisites for the emergence of a community with high resilience, and that no single antecedent alone is enough to bring about such a community. Solution 1 suggests that 92.5% of communities with high levels of CSS, Pop, Pro, and Est (i.e., community social support, community size, community property cost, and community established time) belong to the set of "communities with high resilience.

5.8 Summary

In this chapter, the impact mechanism of digital technology on community resilience is empirically verified using partial least squares structural equation modeling (PLS-SEM). The thesis follows the standard empirical research paradigm, beginning with a description of the PLS-SEM method and its advantages. The measurement model and structure model are evaluated, and indirect effects are analyzed. The heterogeneity of community is analyzed to explore the difference of the impact mechanism of digital technology on community resilience in different communities, and the results are elaborated in detail using the importance-performance map analysis (IPMA) method. Multiple modes of digital technology enabling community resilience are explored using the fsQCA method with community resilience as the result variable. The results indicate that the application of digital technology is positively related to community dynamic capability, community social capital, and community social support. Community technological opportunism positively moderates the relationship between digital technology and community dynamic capability, community social capital, and community social support. Community dynamic capability, community social capital, and community social support are positively correlated with community resilience. The research results will be discussed in the next chapter.

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Chapter 6: Discussion and Conclusion

This chapter discusses the findings of the data analysis in the previous chapter 5. The theoretical and practical implications of this thesis are described based on the discussion of the findings. Finally, the limitations of the thesis and the potential directions that can be improved in the future are discussed.

6.1 Results discussion

This dissertation investigated the influence of digital technologies on the resilience of communities, as well as the underlying mechanisms driving this impact. Therefore, this thesis conducted research around the following three goals: (1) Uncovering the effects of digital technologies on the resilience of urban communities; (2) Identifying how community technological opportunism influences the impact of digital technologies on urban community resilience; (3) Identifying ways to effectively deploy digital technologies in urban communities and leverage their potential to enhance community resilience. To achieve these goals, this thesis collected 819 community-level questionnaires, and used quantitative research methods to verify the proposed hypotheses. The main research findings are as follows:

Digital technology can effectively enhance dynamic capabilities. This result confirms the previous research to a certain extent. For example, Khurana et al. (2022) proposed that SMEs can build dynamic capability through digital technologies during crises. Similarly, Shen et al. (2022) explored the influence of the dynamic capability of textile enterprises in achieving digital transformation performance, and pointed out digital technology's positive impact on dynamic capability. Unlike these studies that explored digital technology implementation in the enterprise, however, this thesis focused on the community level, and found that when the community applies digital technology to management and services (e.g., the community uses a digital platform for managing community events, dues, and maintenance requests, providing residents with a more convenient and efficient way to engage with the association), the community capabilities (i.e., sensing capability, learning capability, integrating capability, coordinating capability and reconfiguring capability) are significantly improved (e.g., video conferencing and instant messaging can allow residents to communicate and collaborate in real-time, regardless of their location, and this can improve the coordinating capability of

community).

Digital technology was also found to have a positive impact on community social capital, which aligns with previous research demonstrating the ability of digital technology to promote social capital (G. H. Xie et al., 2021). Community social capital refers to the capacity of individuals or groups to engage in social structures and connect with others (Portes, 1998). Through digital social tools, the communication and interactions between residents and community administrators and among residents will be more active, which helps individuals access resources (G. H. Xie et al., 2021). At the same time, digital technologies aid administrators in accessing information and resources, thereby facilitating the building of relationships between individuals and different organizations, such as communities, the managers of communities by making decisions that benefit both individuals and organizations or by providing support to resolve problems (Ogden et al., 2014; C. Smith et al., 2017). This thesis reveals that communities applying digital technologies facilitate information and resource sharing, which enhances community bonding, bridging, and linking social capital (e.g., online forums and social media groups can provide a platform for residents with common interests to discuss and share information, fostering a sense of community and shared identity, and this can enhance the bonding social capital of community).

The results also showed digital technology can improve community social support. Recent studies indicate that digital technologies are associated with increased social support (Bocking et al., 2021; H. E. Lee & Cho, 2019; Oldham & Da Silva, 2015), and this thesis provides empirical evidence for this relationship. For example, when communities adopt digital technologies, these technologies can better help residents connect with specific people, describe their ideas and problems (Oldham & Da Silva, 2015). This thesis expands the research context, pointing out that the community can use digital technology to help residents seek advice and guidance (information support), and provide encouragement and support (emotional support), and even give specific direct help (instrument support). Therefore, this thesis reaffirms the positive correlation between digital technology and community social support.

Moreover, this thesis found community dynamic capability can promote community resilience. Existing studies have reported dynamic capability as a mechanism by which organizations can learn from past experience and generate knowledge to adapt to environmental changes and remain resilient by changing operating practices (Y. W. Jiang et al., 2019; Kurtz & Varvakis, 2016). This thesis reports that dynamic capabilities help communities cope with turbulence and achieve long-term resilience by maintaining a competitive advantage in rapidly changing environments, through community-based construction of dynamic capabilities (e.g.,

a community might create a task force to respond to a natural disaster, with the authority to quickly allocate resources and make decisions to address the immediate needs of affected residents).

The results also showed community social capital can improve community resilience. Previous studies showed that community social capital is the key role in building community resilience, especially in the situation of climate change and natural disasters, where social capital brings external resources and members of social groups receive more support (Aldrich, 2012a; Carmen et al., 2022). In this thesis, the community's capability to cooperate and respond to crises was enhanced by the presence of intimate social networks among family members and neighbors (bonding social capital), loose connections between different groups or networks (bridging social capital), as well as connections between residents and organizations/systems (linking social capital), promoting community resilience.

Similarity, community social support has been found to positively impact community resilience, as research suggests that it can enhance resilience via effective instrumental and/or expressive provision. For example, instrumental support can enhance resources and improve family well-being (Bougea et al., 2019). Emotional support can successfully modulate negative cognitive emotions (Sharma et al., 2018). Information support provides sufficient information (Duhachek, 2005). Consistent with these studies, this thesis demonstrated that social support positively impacts community resilience by helping communities cope with stress effectively.

More importantly, technological opportunism can moderate the effects of digital technologies on community dynamic capability, community social capital, as well as community social support. Technological opportunism is the ability to recognize and react to new technologies within an organization (Srinivasan et al., 2002), and at the community level, it reflects the level of community management of new technologies. Our thesis found that technological opportunism moderates the effect of digital technologies on community dynamic capability, community social capital, and community social support. First, highly technologically opportunistic communities are better equipped to sense, learn, integrate, coordinate, and adopt new digital technologies (C. W. Chen & Lien, 2013), and are more likely to acquire the dynamic capabilities empowered by digital technologies. Second, communities with high technological opportunism are adept at acquiring and comprehending knowledge regarding new digital technologies, and are also willing and capable of handling these novel technologies (C. W. Chen & Lien, 2013). Based on this advantage, prior studies have shown that technology-savvy communities can amplify the effect of digital technologies in building social capital through connecting, bridging, and linking in various regions such as social

communication (C. Smith et al., 2017; G. H. Xie et al., 2021), mental health, and healthcare (Mason, 2016). This thesis confirms that technological opportunism is a typical moderating mechanism for communities to deploy new technologies to gain community social capital. Finally, communities with a high technological opportunism have higher adaptability, and invest a large number of different digital technologies into community management, so that the community can innovate management and service methods (Lucia et al., 2014). Like previous studies, the results of this thesis suggest that communities with high technological opportunism expand the potential of social networks to provide residents with instrumental support, information support, and emotional support, thereby promoting the formation of community social support.

After verifying the proposed hypotheses, this thesis also explored the moderating role of community characteristics (i.e., community size, community establishment time, average community housing price, community property fee, average age of community residents, and community type - commercial housing community and relocation community). First, smaller communities are more able to promote the positive effect of social support on community resilience, because smaller communities can more rapidly build connections between residents, which in turn helps residents access opportunities for informational, emotional and instrumental support, and the result is consistent with the existing study (Birhanu et al., 2017). Second, the results report newer communities are more able to promote the effect of digital technology on community social capital. The possible explanation for this result is that compared with old communities, new communities are confronted with less resistance when implementing digital technologies. On the other hand, the longer the community has been established, the stronger the positive impact of social support on community resilience, because the community is more mature and stable in terms of policy support and community-resident relationships, and stable community emotional and material support can improve the community resilience. Third, the community's average house price significantly impacts the relationship between digital technology and the community's dynamic capabilities. Communities with higher average house prices tend to have better support facilities and advanced management methods. These factors can prompt community administrators to apply digital technology better to promote dynamic capabilities. Fourth, communities with higher property fees tend to have more advanced smart hardware equipment and invest in digital technology, which can better provide residents with better information, emotional and instrumental support. Fifth, the results demonstrate that the younger residents in the community show a stronger positive correlation between social support and community resilience. A reasonable explanation is that the younger residents are more

supportive of digital technology, and community administrators can better integrate the resources needed for community social support, thereby enhancing community resilience. Sixth, the findings also reveal the differences between distinct categories of communities. Compared with non-commercial housing communities, which are mostly low-rent and affordable housing, commercial housing communities are usually more digitalized, and digital technology has a stronger impact on dynamic capabilities. On the other hand, compared with commercial housing communities, if the community type is a non-commercial housing community, the impact of digital technology on social capital is stronger. Because residents of non-commercial housing communities may have similar work backgrounds or social statuses, they have a higher sense of identity and familiarity with each other, which makes the dynamic capability of community construction more stable, thereby having a stronger effect on community resilience. In addition, compared with non-relocation communities, residents in relocation communities are usually acquaintances of old residents, and can better establish social networks and social connections, and digital technology has a stronger effect on social support. In addition, residents in relocation communities have a more traditional lifestyle and relatively less application of emerging technologies, resulting in a relatively weaker community's ability to acquire and understand knowledge about new digital technologies.

6.2 Theoretical implications

This thesis contributes to the literature on community resilience, digital technology, community technological opportunism, as well as community dynamic capabilities, community social capital and social support literature. The theoretical contributions of this thesis in each field are as follows.

6.2.1 Contribution to community resilience

Community resilience is an important part of community administration. Community resilience is also a basic need of societies facing adverse incident events (*e.g.*, COVID-19). At present, research on community resilience focuses on government leadership, organizational support, and resident engagement as the driving factors that affect community resilience (Guo et al., 2018; Hamann et al., 2019; Platts & Robinson, 2016). Existing research indicates that the government should be more responsible in disaster management and should provide resources to improve community resilience (Platts & Robinson, 2016). Different organizations (i.e., various stakeholders) can be the prominent players by contributing more resources and funding

in promoting community resilience (Hamann et al., 2019). Community resilience is positively impacted by resident engagement, including community attachment and identification (Guo et al., 2018). However, these studies focus on the behavior of various organizations, and do not explore the impact of digital technology on community resilience and its underlying theoretical mechanism.

This thesis addresses this important gap by evaluating the effect of digital technology on resilience in the context of the community and by identifying some of the underlying mechanisms through which digital technology affects community resilience.

Therefore, theoretical contribution to the community resilience literature are identified by investigating the digital technology as a driver of community resilience. Specifically, this research will help extend the horizons of community administration, especially community resilience in the context of unforeseen crises. Besides, this thesis extends the studies on the community level empowerment mechanism of digital technology, and lays a foundation for the following more fine-grained community administration research, such as the research on the empowerment mechanism of residents-AI interaction to community resilience.

6.2.2 Contribution to digital technology

Through a review of the relevant literature, this thesis found that in terms of community operations, most previous studies only focus on specific applications of digital technology in the community. A few existing studies investigate the correlation between digital technology and community resilience, and only examined whether digital technology has an impact on community resilience, without revealing the mechanisms of its impact. Therefore, previous studies did not explore the relationship between digital technology and community resilience. Given the potential of digital technologies to empower community resilience, and digital technologies become increasingly important, exploring the relationship between the two is necessary.

This thesis contributes to the existing research related to digital technologies from two aspects by addressing the above gaps. This thesis expands the application contexts of digital technologies and enhances understanding of their impact on community resilience. Specifically, according to the results, digital technologies have a positive effect on community resilience by prompting the capacity and resources of communities. This thesis contributes to our understanding of community dynamic capability, community social capital, community social support and community technological opportunism, by showing the mediating effects of community dynamic capability, social capital, and social support, as well as the moderating

effect of technological opportunism. That is, a community with the high adoption of digital technology will promote dynamic capability, social capital and social support, thereby increasing the resilience of itself.

With regard to digital technology, it contributes to our understanding of the effect of it on community resilience, and thus provides a theoretical basis for research on digital technology in community management (e.g., community resilience).

6.2.3 Contribution to community technological opportunism

Previous research investigating technological opportunism has mainly discussed firm organization (C. W. Chen & Lien, 2013), ignoring the more macro community level. For example, C. W. Chen and Lien (2013) found that technological opportunism positively affects firm performance. Despite existing research mentioning that technological opportunism as organizational resources and capabilities play an active role in realizing digital technology and opportunities, and have a significant impact on a firm's capability to digitize and improve performance (C. W. Chen & Lien, 2013), there is no literature to our best knowledge that investigates technological opportunism at the level of community, and no research that investigates technological opportunism as a moderator of the relationship between digital technology and community dynamic capabilities, social capital and social support.

This thesis highlights the role of community technological opportunism by analyzing its moderating effect in the relationship between digital technology and community dynamic capacity, social capital and social support, thereby adding to the existing research on technological opportunism within communities. Specifically, this thesis proposes that communities have different levels of technological opportunism. Communities with high level of technical opportunism have stronger perception and response capability to new digital technologies (C. W. Chen & Lien, 2013). When a community has a high level of technological opportunism, the positive impacts of digital technology on community dynamic capability, social capital and social support, are stronger.

Therefore, this thesis contributes to the literature on technological opportunism by conceptualizing technological opportunism at the community level and investigating its moderating roles and by providing novel insights into the interplay between digital technology and community characteristic. And, this thesis demonstrates that to leverage the capability, capital and support of digital technology besides the need to focus on the technical level factors, the managerial level factor (i.e., community technological opportunism) is also prominent. This point has been unexplored in previous studies, and thus, this thesis deepens the understanding

of technological opportunism and expands the boundaries of digital technology-enabled community dynamic capability, social capital and social support.

6.2.4 Contribution to community social capital and social support

Community social capital and community social support are two of the mediating variables in this thesis. There are several studies exploring the effect of community social capital and community social support on community resilience (Kyngäs et al., 2001). In terms of community resilience, previous research has investigated the impact of community social capital and social support. Community social capital measures the level of involvement and contribution of community members towards community goals, while community social support measures the perceived or actual support provided by the community, social networks, or trusted partners. Overall, there is a significant amount of research exploring the relationship between community social capital, social support, and community resilience.

However, the current literature lacks research on the factors that influence community social capital and support. Few studies have examined the antecedents of these factors. While some research has explored how institutional and cultural factors affect community social capital, more investigation is needed in this area, and the other research investigated whether physical activity, built environment and landscape configuration (infrastructure, amenities and population density) can promote community social capital. Similarly, for community social support, there is little literature that explores its antecedents. To sum up, no literature has, to the best of our knowledge, examined whether digital technology has an impact on community social capital and social support using digital technology as an antecedent, and no research has explored whether there are boundary conditions in this process and how these factors moderate the effect of digital technology on community social capital and support.

More importantly, no literature has examined how community social capital and social support contribute to the relationship between digital technology and community resilience.

This thesis contributes to the existing literature on social capital and social support in two main theoretical ways. First, this thesis contributes to the theoretical research on the antecedents of community social capital and social support by showing that digital technology has a positive impact on both, and that technological opportunism plays a positive moderating role. Additionally, this study explores the role of community social capital and social support as mediating variables in the mechanisms by which digital technologies affect community resilience. Digital technology has been found to have a positive impact on community resilience through its association with community social capital and social support.

6.3 Practical implications

6.3.1 Developers of digital technologies

Our results show that digital technology developers can utilize digital technology to its full potential by effectively integrating information and applications across various community systems. Moreover, our findings suggest that digital technology developers can promote the construction of a smart community service platform and create a comprehensive online and offline service ecosystem by integrating commercial services. This ecosystem can provide residents with feature-rich, convenient, and practical applications such as security prevention, information services, and property service to meet the diverse life service demands of residents, leading to higher awareness and familiarity with digital technology. Finally, digital technology developers can use these insights (such as digital technology can establish a virtuous circle of digitization between residents and communities through the collection and analysis of residents' needs, resulting in a more dynamic and responsive digital community that better meets the needs of its residents) to create more effective and user-friendly digital tools and services that can improve residents' lives and enhance the development of smart communities.

6.3.2 Government administrators

First, the government should encourage and support the digital transformation of communities to ensure the coordinated advancement of digital construction based on the positive effect of digital technology on community resilience. The government can solve problems and difficulties encountered in the process of strengthening community resilience by deploying IoT sensors, artificial intelligence, 5G fast networks and online communities, to provide a strong guarantee for the construction of the resilient communities, and empower communities to respond to unforeseen crisis.

Second, considering the positive impact of digital technology on community resilience, the government should ensure elements such as providing policy support, strengthening infrastructure construction, and building a talent pool to lay a solid foundation for digital community construction and enhance community resilience. In terms of providing policy support, the government can increase the support of digital construction projects through establishing the special guidance fund. To promote both digital ethics and public health, measures must be taken to protect public privacy and bridge the digital divide. The government can also build a digital platform for crisis management and integrate digital and administration

systems more comprehensively. In terms of constructing a talent pool, the government can establish a cooperation mechanism with major domestic universities or well-known enterprises in the field of digital construction, in order to provide talent guarantee for digital construction.

In addition, the government should adopt agile and adaptive management methods. The measure can enhance community resilience by creating, maintaining and expanding networks. At the same time, the government should improve operational efficiency and transparency to provide a strong guarantee for community resilience.

6.3.3 Community administrators

In general, community administrators should actively promote the digital transformation of communities, especially for old communities, they should build smart communities according to local conditions. For example, digital technology can be utilized to monitor community operations in real-time and gain insights into the community's situation. Digital technology can not only record the dynamic operation data of the community, but also analyze the recorded data. During the process, the results can be integrated into the community management process, thus improving the digital capabilities of communities. In addition, they should protect mental and physical health of residents under unforeseen crisis, identify potential unforeseen crisis prevention, and control risk points in real time. Besides, community administrators should meet residents' demands in high-risk communities, pay attention to the safety management capabilities, and support residents with a greater sense of security and well-being. They should regard big data as the fulcrum, and the social capital and social support as the starting point to give full play to the advantages of social administration efficiency, improving the capability and level of community intelligent administration, and optimize the internal mechanism and external means of data-driven community administration. At the same time, community administrators can improve the community's ability to resist risks, give full play to the community's blocking role in unforeseen crisis prevention and control, and improve effectively the accuracy of decision-making. Based on the above examples, digital technology can ensure the normal life order of residents, which enhance the ability of communities to resist disasters and prevent and control risks effectively.

First, community administrators can endow residents with specific resources and capabilities to motivate and stimulate their participation. For example, administrators can respond to residents' information needs during unforeseen crisis and provide necessary education on the Internet and digital technologies. They can also advocate for young people in the community to play a back-feeding role to overcome the digital technologies' using barriers

of parents and families. In addition, they can strengthen the digital skill training of groups in weaken information knowledge, to improve their digital skills and digital literacy.

Second, administrators should strengthen resources through digital technology. On the one hand, if the human resources in the community are insufficient, digital technology can be used to reduce the stress and the burden. Digital technology can improve the prevention and control efficiency with the efficient and safe transmission; thus, the problem of manpower shortage can be solved. At the same time, administrators can build a community shared database to provide community workers with more convenient and efficient online management. Digital technology improves the coordination of community resources. It can also solve the contradiction between the limited resources and the diverse demands of residents. In the case of community epidemic prevention supplies shortage, digital technology can be used to optimize resource allocation and integrate various communities' administration resources to achieve an efficient allocation of existing public resources.

In addition, the self-improvement of community administrators is crucial. Community workers need to strengthen skills training to improve their ability and professional level of digital technology application. At the same time, a full-time community digital management and maintenance team can be formed, which can not only help community workers solve problems in the usage of digital technology, but also ensure the stable application of digital equipment and system.

Finally, considering the positive impact of digital technology on community resilience, the community administrators will actively deploy digital technology to enhance community resilience. However, the construction of digital technologies may affect the privacy and security of some residents. First, community workers should strengthen information security education to raise awareness of personal information protection. Second, the information security management system should also be established entirely. The security responsibilities in all aspects of personal information that community workers should be clearly assumed, such as collection, aggregation, transmission, disclosure, etc. And they can set up traceability marks or other measures to realize the security of community workers' information operations. It can be traced back and can be held accountable to prevent personal information from being leaked. Third, the community personal information security protection system should be built to increase security protection measures. At the same time, community administrators should improve the technical level and defense capability of community information security management by strengthening information security management and equipping information security professionals.

6.3.4 Community residents

The results suggest that community resilience can be enhanced through the active participation of residents in utilizing and providing feedback on digital technology, as well as exploring its various functions. At the same time, residents should interact and help vulnerable residents with digital skills to improve the participation possibilities. Further, they can play the role of digital technology in information perception, knowledge learning and resource integration, and stimulate digital technology to release more momentum.

Residents should actively participate in digital technology learning, strengthen the sense of "protagonist", and improve digital technology perception and learning ability. Meanwhile, it is important to provide feedback on the usage of digital technology, and provide constructive suggestions on the needs of smart community service platform services and functions. To do this, it is conducive to the deployment of digital technology in the community and thus improves the community resilience.

Residents also can take the initiative to provide support and assistance to vulnerable digital technology users, reduce the cognitive and operational difficulties of vulnerable digital technology users in the process of using the smart community service platform, and also increase social capital and social support, thereby promoting the improvement of community resilience brought about by digital technology.

It is important to note, however, that the construction of digital technology may affect part of the privacy and security of residents. In addition to the community's responsibility to maximize the security of digital devices, residents can also give up part of their privacy within a reasonable range, and actively assist community administrators to better deploy and build digital technologies.

6.4 Limitation and future research

This research has limitations that could inspire future research topic. First, this thesis has limitations on the coverage of data. In order to maintain data authenticity, considering the geographical factors of my work and the time of the survey, the coverage of the questionnaire in this thesis is mainly all the main urban areas of Chengdu, including Jinniu District, Chenghua District, Qingyang District, Wuhou District, Jinjiang District, High-tech Zone and Tianfu New Area. The subsequent model estimation and data analysis work is also conducted on the basis of the survey data. However, Chengdu is only one of cities in China. The use of data from

Chengdu alone cannot guarantee the universality of the conclusions to the communities across the country, and the final results lack some generalizability. In the future research, it is valuable that thesis takes urban communities in the same level of population size and development as Chengdu in China, such as Chongqing, Changsha and Wuhan, as samples. Then, researchers collect data to carry out comparisons the conclusions of this thesis.

Second, due to differing definitions of community in Eastern and Western countries, the applicability of this research conclusion is limited. In China, a community is an integrated whole of family, economy, education, public welfare, social security and other factors. It is a social organization where residents live together and help each other. It is under the unified management of the neighborhood committee. For other countries, the functions and social responsibilities of communities vary from region to region. For example, in the United States, the community committee is democratically elected by residents and serves as the smallest unit in the political system. Typically composed of volunteers, they use their spare time to serve their community. Their management mode is very different from that of Chinese communities. Therefore, the focus of this thesis is the community of Chinese cities, which only takes the neighborhood committee of the community as the unit for research, and does not analyze the community of other countries. Future research may extend the model and analysis method of this thesis to communities in other countries, verify and compare the conclusions of this thesis, and deeply explore the impact mechanism between digital technology and community resilience.

In addition, the impact on community resilience caused by the severity of the epidemic at different times was not considered. The thesis was conducted only in the form of cross-sectional data. Cross sectional data may not be able to infer causality. With respect to the current COVID-19 situation, China has undergone normalized prevention and control. In the past year, the epidemic situation in the main urban areas of Chengdu has gone through many iterations, and the severity of the epidemic situation at different times is not completely consistent with the epidemic prevention efforts of the community. During the period of severe epidemic, the community's epidemic prevention efforts will be greater than usual. The neighborhood committee will take various methods to prevent the spread of the epidemic in the community, such as strictly controlling the access of community residents through digital technology. Therefore, future research can collect data after outbreaks, and then observe the relationship between digital technology and community resilience after adding time variables on the basis of this research model.

The severity of the pandemic is not the same in all communities, and this was not considered

in the current study. In fact, even in the same city, the severity of the epidemic varies from community to community. Taking the communities in the main urban areas of Chengdu as an example, the number of positive people in Tianfu New Area, Hi-tech Zone and Chenghua District is much higher than that in other main urban areas. The severity of the epidemic situation also leads to the need for communities in these areas to make more efforts in epidemic prevention management. To increase the reliability of the conclusions, this thesis has given a large proportion of communities in the above three regions when selecting samples. In future research, the study can explore the variance of any crisis situation, analyze multiple communities according to different groups of epidemic situations, and improve and verify the model in this thesis.

Fourth, this thesis uses non probabilistic sampling to select samples, which limits the representativeness of the sample. The target sample of this thesis covers all the main urban areas of Chengdu. The sample is very large and widely distributed. It is difficult to survey all the community. If the conventional probability sampling method is used, the economic cost and time cost will be very high. Therefore, to conveniently and accurately achieve the purpose of sampling, this thesis used the convenience sampling method to select samples, and the researchers determine samples. Convenience sampling, as a very popular non probabilistic sampling method, is simple and fast and can save costs. Its disadvantage is that the research object is completely determined by the researcher, which may cause selective bias and lead to insufficient sample representation. Therefore, in the future, researchers can optimize the sampling method to compare the conclusions of this thesis. For example, when time permits, the communities in each urban area are counted and stratified, and stratified sampling is used to obtain representative samples. If the overall size of the research object is large and complex, it is difficult to apply the probability sampling for statistics. The method of judgment sampling can also be used to determine the sample collection process by relevant experts and purposefully select representative samples for research, so as to optimize the sample representativeness.

Future research might want to examine additional variables at micro-level, such as network connectivity between different communities, and at meso-level, such as the specific application form and development level of digital technology between different urban areas, as well as at macro-level, such as social policy, national cultural background, etc. (1) Micro-level. The communities selected in this paper have a high level of digitalization and are mature for the application of digital technology. For repeated epidemics, to deal with problems that may be caused by the sudden long-term containment (such as material shortage, personnel tracking inspection), communities often establish a network through digital technology to jointly prevent

epidemics. Therefore, the cooperative relationship between different communities may have impact on the use of digital technology and community resilience. This thesis verified the moderating effect of technological opportunism in community level, but did not consider the impact of cooperation between different communities. In the future, researchers can further improve the model by further exploring missing variables, and also provide the possibility for theoretical innovation in this field. (2) Meso-level. Taking the main urban area of Chengdu as example, most high-tech enterprises are concentrated in the High-tech Zone. Compared with other urban areas, the community of the High-tech Zone will also be more digitized. Therefore, to further enhance the scientific of the model, future research can collect data in urban areas and apply the model to observe whether the research conclusions are applicable to different urban areas. (3) Macro-level. On the one hand, the epidemic prevention policy in different regions will change according to the severity of the epidemic, and the change of the policy will have a great impact on the epidemic prevention work of the communities in the region. On the other hand, based on data from Chengdu in China, there are significant differences in the way epidemic control is carried out between China and other countries. This conclusion is not greatly influenced by the national cultural background. In future research, macro variables related to social policy should be focused and added to the research model to explore whether changes in epidemic prevention policies will affect the conclusions of this paper.

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Annex A: Questionnaire (English Version)

Digital technologies and Communities – Survey

Dear Ms./Mr.,

Greetings! We are conducting a questionnaire survey on digital technologies impact on communities and your kind cooperation will be extremely helpful to our research! There is no right or wrong answer to the question. Please fill in the information based on your own understanding and opinions. We assure you that all information provided by you will be kept strictly confidential and used only for this academic research, and that all responses will be anonymous. We are very much grateful to you for your cooperation! Please make sure you have understood the questionnaire designed to gather information about academic work. Your participation is voluntary, and you are free to withdraw consent at any time and to withdraw any unprocessed data you have previously supplied. Upon completion of the research, all questionnaires will be securely stored.

Digital Operation and Data Mining Laboratory, University of Electronic Science and Technology of China

July

2022

By continuing, you are agreeing to participate.

Part 1: Basic information about the community you work for and individual as the management personnel

Please provide your answers to the questions by marking "√" on the appropriate option and/or filling in the blanks.

1. How many residents are there in your community?

☐<100 ☐100-500 ☐501- 1000 ☐1001-3000 ☐3001-8000 ☐>8000

2. When was your community established?

□ Less than 1 year ago □ 1-3 years ago □ 3-5 years ago □ 5- 10 years ago □ Over 10 years ago

3. Which district does your community belong to?

□ Jinjiang District □ Qingyang District □ Jinniu District □ Wuhou District □ Chenghua District □ Hi-tech Zone □ Tianfu New Area □ Other：_____

4.Which type is your community?

☐ Commercial housing community ☐ Employee residential community ☐ Old community ☐ Relocation community ☐ Other：_____

5.What is the average housing price per square meter in your community?

☐<10,000 RMB ☐10,000 - 15,000 RMB ☐ 15,000-20,000 RMB ☐>20,000 RMB

6. What is the average property management fee in your community? (RMB/per square meter)

☐ 1 RMB ☐ 3 RMB ☐ 5 RMB ☐ 10 RMB ☐Over 10 RMB

7. Which age group is the largest one in your community?

☐ 18–30 years old ☐ 31–40 years old ☐ 41–50 years old ☐ 51–60 years old ☐ Over 60 years old

8. What is the name of the property management company that works for your community? (please list several main companies) _____

9. Please select your gender:

☐ Male ☐ Female ☐ Choose not to disclose

10. Please select your age group:

☐ 18–30 years old ☐ 31–40 years old ☐ 41–50 years old ☐ 51–60 years old ☐ Over 60 years old

11. Please select the highest degree or level of education you have completed:

☐ Junior high school and below ☐ High school ☐Junior college ☐ undergraduate ☐ Postgraduate

12. How many years have you worked in the community?

☐ Less than 1 year ☐ 1-5 years ☐5-10 years ☐10-20 years □ Over 20 years

Part 2: Scale score

"1", "2", "3", "4", "5", "6", and "7" in the following options represent respectively "strongly disagree", "disagree", "somewhat disagree" ", " Neither agree nor disagree", "somewhat agree", "agree" and "strongly agree". Please answer based on your true feelings.

The "Community" in this questionnaire refers to: **Areas under the jurisdiction of the same neighbourhood committee.**

The "Digital technologies" in this questionnaire refer to: **digital technologies such as face recognition system, IoT sensors, 5G, and property/owner apps deployed in smart security, smart medicine, smart fire control, smart parking and other systems for smart community building.**

Items		Strongly disagree <-----> Strongly agree						
		1	2	3	4	5	6	7
Digital technology	My community has used a great deal of digital technology (such as intelligent access control and facial recognition).							
	My community has used several different digital technologies to gain insights into pandemic prevention work.							
	My community is fast in introducing new digital technology.							
Sensing capability	During the COVID-19 pandemic, my community has been continuously looking for new information about potential opportunities and risks of pandemic prevention.							
	Over the last 2.5 years of the pandemic, my community has periodically reviewed the likely effect of changes in the COVID-19 pandemic environment on residents.							
	My community often reviews their service level in the COVID-19 pandemic to ensure they are in line with what the residents want.							
	My community has devoted a lot of time implementing ideas for new services and improving existing services in the COVID-19 pandemic.							
Attention item	Please select "Agree" for this question.							
Learning capability	My community effectively identifies, discusses, and appraises new information and knowledge related to COVID-19 pandemic.							
	My community is effective in transforming existing pandemic prevention facts into new knowledge or skill related to COVID-19 pandemic.							

Items		Strongly disagree <-----> Strongly agree						
		1	2	3	4	5	6	7
	My community is effective in bringing knowledge related to COVID-19 pandemic into the community's new services.							
Integrating capability	My community has a global understanding of community's tasks and responsibilities.							
	My community is applying specialized knowledge and skills (such as pandemic prevention and control) to the COVID-19 pandemic.							
	My community carefully interrelates actions to other communities' actions to meet changing conditions.							
	My community administrators manage to communicate with each other and have a specific workflow in COVID-19 pandemic.							
Reconfiguring capability	Over the past 2.5 years of the pandemic, my community has adjusted and responded to unexpected changes of COVID-19 pandemic easily.							
	Over the past 2.5 years of the pandemic, my community has adjusted work processes in response to shifts in COVID-19 pandemic priorities.							
	My community alters work processes in order to come up with COVID-19 pandemic.							
Coordinating capability	My community ensures that the output of pandemic prevention work is synchronized with its other day-to-day management.							
	My community ensures an appropriate allocation of resources (*e.g.*, information, materials) within community.							
	My community administrators are assigned to tasks commensurate with their relevant knowledge and skills.							
	Overall, my community is well coordinated.							
Bonding social capital	Residents in my community pull together to improve my community.							
	Residents in my community can trust in each other.							
	Residents have a strong sense of belonging to my community.							
Attention item	Please select "Strongly disagree" for this question.							
Bridging social capital	My community is a place where people from different backgrounds (such as nationality, education level, region, income level) get on well together.							
	The residents in my community interact with each other to become acquainted with one another.							

Items		Strongly disagree <-----> Strongly agree						
		1	2	3	4	5	6	7
	My community administrators are willing to spend time to support general community activities.							
Linking social capital	Over the past 2.5 years of the pandemic, residents have contacted my community for help.							
	Residents can influence decisions in my community.							
	Residents trust my community's property center.							
	Residents trust the security personnel in my community.							
Informational support	My community offers suggestions when residents are in need of assistance.							
	When residents are faced with problems, my community gives them information to address problems.							
	When residents encounter difficulties, my community helps them find out why and give advice.							
Emotional support	My community is there to listen to residents' problems.							
	My community cheer residents up when they are feeling down.							
	My community gives residents a sense of comfort in times of need.							
	Residents confide in my community when they have problems.							
Instrumental support	My community can help residents fulfil responsibilities.							
	When residents are sick, my community can help them.							
	My community gives material assistance to residents.							
Community resilience	My community is likely to overcome the current COVID-19 pandemic.							
	My community was organized for emergency situations during the COVID-19 pandemic.							
	My community was well-prepared to handle the COVID-19 pandemic.							
	My community will recover quickly after the COVID-19 pandemic.							
Attention item	Please select "Neither agree nor disagree " for this question.							
Technological opportunism	My community is often one of the first to detect technological developments that may potentially affect community management.							
	My community actively seeks information on technological changes in the environment that are likely to affect community management.							

Items		Strongly disagree <-----> Strongly agree						
		1	2	3	4	5	6	7
	My community reviews the likely effect of changes in technology on community management.							
	My community generally responds very quickly to technological changes.							

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Annex B: Questionnaire (Chinese Version)

数字化技术和社区——调查

尊敬的女士/先生：

您好！我们正在进行一项数字技术对社区影响的研究，您的合作将会对我们的研究提供极大帮助！您的回答没有对错之分，请按您的理解填写即可。**我们保证这些资料会严格保密并仅用于本学术研究，不做其他用途，内容皆为匿名作答**。研究调查为自愿参与，谢谢您的合作！请您在选定的选项上打“√”即可。

电子科技大学数字化运营与数据挖掘实验室

2022 年 07 月

如您继续答题，视作您同意上述声明：

第一部分: 社区基本信息

1.您所管理的社区规模（居民人数）：

☐100 人以下 ☐100-500 人 ☐501-1000 人 ☐1001-3000 人 ☐3001-8000 人 ☐8000 人以上

2.您所管理的社区的成立时间：

☐1 年以下 ☐1-3 年 ☐3-5 年 ☐5-10 年 ☐10 年以上

3.您所管理的社区所在区域：

☐锦江区 ☐青羊区 ☐金牛区 ☐武侯区 ☐成华区 ☐高新区 ☐天府新区 其他：_____

4.您社区所管辖的小区类型（多选题）：

☐商品房社区 ☐单位社区 ☐老旧楼院社区 ☐“村改居”社区 ☐其他：-

_____

5.您所管理的社区的平均房价：

☐1 万元以下 ☐1 万-1.5 万 ☐1.5 万-2 万 ☐2 万元以上

6.您所管理的社区的平均物业费（元/每平米）：

☐1 元以下 ☐1 元-3 元 ☐3 元-5 元 ☐5 元-10 元 ☐10 元以上

7.您所管理的社区的居民年龄集中分布在：

☐ 18-30 岁 ☐ 31-45 岁 ☐ 41-50 岁 ☐ 51-60 岁 ☐ 超过 60 岁

8.您所管理的社区的物业管理公司（请列举主要的几个）：

_____

9. 您的性别：

☐ 男 ☐ 女 ☐ 不方便透露

10. 您的年龄：

☐ 18–30 岁 ☐ 31–45 岁 ☐ 41–50 岁 ☐ 51–60 岁 ☐ 超过 60 岁

11. 您的受教育程度：

☐ 初中及以下 ☐ 高中 ☐ 大专 ☐ 本科 ☐ 研究生

12. 您在社区的工作年限：

☐ 小于 1 年 ☐ 1-5 年 ☐5-10 年 ☐10-20 年 ☐ 超过 20 年

第二部分: 量表评分

下列 1-7 的选项中的“1”、“2”、“3”、“4”、“5”、“6”、“7”分别代表着“非常不同意”、“一般不同意”、“有点不同意”、“中立”、“有点同意”、“一般同意”和“非常同意”。请根据真实感受作答。

本问卷中的社区指：**同一居委会管辖的区域。**数字化技术指：**用于智慧安防、智慧医疗、智慧消防、智慧停车等建设智慧化社区的数字化技术，例如人脸识别系统，物联网传感器，5G，物业/社区小程序等。**

问题列表		非常不同意<----->非常同意						
		1	2	3	4	5	6	7
数字技术	我们社区使用了大量的数字技术（例如，智能门禁、人脸识别）							
	我们社区使用多种不同的数字化技术来提高服务质量							
	我们社区会及时引进最新的数字化技术							
感知能力	我们社区一直在审视环境以识别新冠疫情带来的新的潜在威胁与风险							
	在经历新冠疫情的 2.5 年中，我们社区定期检查新冠疫情防控的环境变化给居民的带来的影响							
	我们社区会经常反思、反馈和开发新服务以更符合居民需求							
	问题列表	**非常不同意<----->非常同意**						
	我们社区将大量的时间用于实施新服务的想法和改善现有的服务							
验证	此题请选择“同意”							
学习能力	我们社区会经常对有关新冠防控的新知识进行讨论和评估							
	我们社区可以有效地学习和获得新冠疫情防控相关的新知识							
	我们社区可以有效地将与新冠疫情防控相关的知识用于改善社区服务							
整合能力	我们社区中的社区工作者对自身的任务和职责有全面的理解							
	我们社区能够充分运用专业技能和知识来应对疫情							
	我们社区与其他社区团体交流合作，以应对不断变化的外部环境							
	我们社区中每个管理人员能相互联系且有具体的工作流程							
重新配置能力	我们社区可以轻松调整和响应新冠疫情所带来的意外变化							
	我们社区会根据新冠疫情的变化来动态调整工作流程							
	我们社区重新配置了服务流程，以应对新冠疫情							
协调能力	我们社区确保防疫工作与其他服务工作同步							
	我们会保障社区内信息的及时共享及物资的适当分配							
	我们社区中工作人员被分配到的工作任务是能够胜任的							
	总体而言，我们社区各项工作协调良好							

问题列表		非常不同意<----->非常同意						
		1	2	3	4	5	6	7
联结社会资本	我们社区中居民能够团结起来改善社区							
	我们社区中居民可以相互信任							
	居民对我们社区有强烈的归属感							
验证	此题请选择“非常不同意”							
桥接社会资本	我们社区中来自不同背景的居民可以融洽相处							
	我们社区的居民相互交流以变得熟络							
	我们社区的居民愿意参与社区举办的活动							
链接社会资本	在经历新冠疫情的 2.5 年中，居民向我们社区寻求帮助							
	居民的观点能够影响我们社区的决策							
	居民信任我们社区的物业中心							
	居民信任我们社区的安保人员							
信息支持	当居民需要帮助时，我们社区会提供建议							
	当居民面临问题时，我们社区会向他们提供信息以解决问题							
	当居民遇到困难时，我们社区会帮助他们找出原因并提供建议							
情感支持	我们社区会倾听居民的问题							
	当居民情绪低落时，我们社区鼓励他们振作起来							
	在居民需要的时候，我们社区会给予安慰							
	居民在遇到问题时，会向我们社区倾诉							
工具支持	当居民无法服从指挥和安排，配合做好防控时，我们社区能帮助他们							
	当居民生病时，我们社区可以帮助他们							
	当居民遇到困难时，我们社区向他们提供物资援助							
社区韧性	我们社区有能力克服当前的新冠疫情							
	我们社区可以快速应对新冠疫情							
	我们社区为应对新冠疫情做好了充分准备							
	我们社区会在新冠疫情之后迅速恢复							
验证	此题请选择“中立”							
技术机会	我们社区可以察觉到影响社区管理的技术变化							
	我们社区积极寻找可能影响社区管理的技术变化的信息							
	我们社区定期审查技术变化可能对社区管理造成的影响							
	我们社区对技术变化能做出迅速的响应							