



RESEARCH REPORT

**FACTORS ENABLING THE DIGITAL CHANGE ON DIGITAL
TRANSFORMATION FOR SMALL AND MEDIUM BUSINESSES**

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ABSTRACT

The purpose of this research is to study how companies can overcome these obstacles and become digital. Moreover, to study whether the digital infrastructure, and digital disruption significantly affect SMEs to the digital change affecting the digital transformation. The research is designed as a quantitative research. Structural equation modeling (SEM) is used to analyze the survey responses. Using SEM is to specify, test, and modify the measurement model. The results of measurement model analysis and path model analysis are presented in this study. The data set of 400 samples are collected and summarized as shown in this study. The results of the EFA show that cross loading items are eliminated and other measurement items are consistent with the construct validity. The results of the CFA show that the sample data are a favorable fit to the measurement model. Hence, the structural model was reasonably acceptable. The results of structural path analysis indicate that two hypotheses are statistically significant and positive.

Keywords: Digital Infrastructure, Digital Disruption, Digital Change, Digital Transformation, Small and Medium Enterprises

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Chapter 1

Introduction

The digital business rises to a number of new business models recently from traditional business to modern advances in technological involvement that have made it possible to conduct many types of business at outstanding greater scale and over longer distances than was previously. The digital business allows the rapid development of new business models; it can also quickly cause existing businesses to become obsolete. These digital technologies are fundamentally re-shaping the traditional business strategy, as modular, distributed, cross-functional, and global business processes, which enable work to be carried out across boundaries of time, distance, and function.

The digitalization of a growing number of new business opportunities, including new types of products and services goods is huge access to crowd-sourced. These players are taking advantage of big data, powerful analytics, artificial intelligence, and other key innovations to drive growth. Check out the industries that are destined for technological disruption. The economic is now no longer local or global market, but it already becomes one-single market. Many local markets are quickly disappearing and giving huge advantages to the best product, service or process in the market. Competition in markets is typically based on innovation rather than price, resulting in high opportunities in the market; with serving quickly being displaced by more successful innovators. The increasing of the digital economy has an impact which is the need of having some physical establishment in a country where business is done. However, operating in the digital economy which is based on electronic services as final products means that they do not any longer need physical establishment in the foreign countries where they are active. Therefore, businesses are operating digital business models as their ultimate effect that they essentially run their business over the internet which essentially is a borderless world.

Digital technology will be a necessity for any business to survive; however, many businesses and industries are being disrupted by digital technology. Since the digital economy provides

business an ability of the transformational effects of new way to use the data as in the fields of information and communication. It gives rise to certain form of new business models, which is important to the business to adapt in the new environments. Moreover, the growths of the technology, especially the digital economy and the revolution of business processes have transformed a new interest in the digital business development and business strategy. While the revolution of digital technology is expected to impact the overall economic landscape, it is clear that these innovations are disrupting ecosystems in most of the industries. However, it may be more challenging for certain sectors than others. Therefore, the study will provide an empirical approach for investigating this phenomenon, while creating knowledge that will contribute to a deeper understanding of digital disruption, digital change, and digital transformation. Furthermore, it may provide a framework for corporate strategic planners with meaningful technological considerations to integrate into their business strategies.

In this chapter, background of the problem and statement of the problem are discussed in the first section. Then, purposes of the proposed study and research questions are presented. Finally, research hypotheses, significance of the study, definition of terms, and limitations of the study are discussed.

Background for This Research and Statement of the Problem

Digital economy has been addressed for a significant method to transform a new way of doing business. Digital economy is generally defined as being the use of digital technologies to transform business operations in order to improve effectiveness, efficiency, productivity, and service delivery (Easley and Kleinberg, 2010). Thai government has established the DE policy to offer citizens and businesses the opportunity to complete a vast array of related transactions through many channels; i.e., Electronic-Procurement (e-Procurement), Electronic-Auction (e-Auction), and Electronic-Taxation system (e-Taxation). These are required the SMEs to change the way of their doing businesses in the adaptive digital economy world. The digital technology has revolutionized the way of doing business, allowing individuals and organizations to overcome the new business model (Simmons, Palmer, & Truong, 2013).

Advances in technology, especially surrounding mobile, data analytics, artificial intelligence, and cloud computing, seemed to flourish overnight and dramatically affected the overhead required for businesses to launch, reach their customers, and collect the data necessary to tailor their new customer-centric business models around existing paradigms (Kollmorgen, 2017). The digital company has been gathering data from its digital shopping experience across all of their platforms since its inception. Artificial intelligence is used to track customer behaviors, and identify exactly where shoppers are on their purchasing journeys and target them with products accordingly. Lastly, the change in consumer expectations is likely a result of advances in technology and data analytics, but it is also the single most powerful influencer of digital disruption. Society quickly learned to value the experiences associated with the purchasing of products and services. In some cases, we have also demonstrated we are willing to pay more for premium experiences and some customer segments, willing to pay for an experience over a product.

Digital disruption is the most discussed topic in this decade that came to change the ways of conducting the business. Digital disruption was possible because of a convergence, or the timely occurrence, of three key factors which are technology, intelligence, and customer expectations. According to Karaman (2018) reported from CA Technologies Research found Thailand to be the most digitally disrupted Market in Asia-Pacific and Japan . 97 percent of Thai respondents state their organizations are equipped to be competitive but only seven percent have fully digitalized their organizations. The banking industry is one of the examples that challenger banks are players that offer financial services through online channels or mobile applications. This enables them to provide services at lower cost, get higher returns, and deliver products that better satisfy consumer needs. Banks offer services through online channels or mobile applications, reducing the need for bank branches.

Therefore, change is involved, and sometimes radical replacements for manufacturing processes, distribution channels, or business models are necessary; but more often than not, transformation means incremental steps to better deliver the core value proposition. Furthermore, digital technology is now applied to almost every part of a company's value chain. To succeed in today's digital economy, business leaders have to be bold in harnessing disruptive technologies such as artificial intelligence, automation, data analytics and microservices, while ensuring that everyone in

the organization is aligned and working collaboratively towards a common goal. In order to achieve a competitive advantage, businesses have to develop and integrate the innovation and applying them into business process and business model. The digital and innovation rise to a number of new business models recently from traditional business to modern business in technological and innovative involvement that have made it possible to conduct many types of business at outstanding greater scale and over longer distances. The digital and innovation allows the rapid development of new business models; it can also quickly cause existing businesses to become obsolete. Furthermore, to encourage digital and innovation in various economic activities, the objective of which is to create equilibrium between the environment and society.

Considering a vital ingredient for creating businesses' competitiveness advantages. SMEs need to pay attention to the development of business opportunities to compete and survive the industry in the long run. Typically, digital technology provides a strategic competitive advantage in the business arena. Although most companies have realized the need to digitize, changes in the business environment cause more uncertainty in SMEs than in large businesses. The response to environmental changes is different in SMEs than in larger businesses. For instance, the firms' resources and strategic formulations limit SMEs because they are required to have information about the business, market, consumer behavior, and industry to develop business strategies. Most of SMEs seem to have some common characteristics. They may have begun with just one idea or one product and expand their product offering from that point onward. The SME owners tend to focus on technical expertise with limited business skills and experience. Either success or failure tends to rely on the owners' business connections and their managerial styles (Boonpattarakan, 2010). These challenges can occur during all four phases of the digital transformation, including insufficient IT structures, lack of technical skills, inadequate business processes and high implementation risks and costs (McAfee, Ferraris, Bonnet, Calmégane, and Westerman, 2011). Furthermore, SMEs need tight requirements to increase the diffuse and adopt of digital technology, so that the digital gap between large and small enterprises as well as regional difference can be avoided. Therefore, one of the main purposes of this research is to seek the answer on how companies can overcome these obstacles and become digital. Moreover, to

study whether the digital infrastructure, and digital disruption significantly affect SMEs to the digital change affecting the digital transformation.

Objectives

The objectives of the research are:

1. To explore the extent of digital transformation of small and medium businesses.
2. To focus on the factors affecting the digital transformation of small and medium businesses.
3. To have better understanding of factors influencing the digital transformation.

Research Questions

1. Whether or not the digital infrastructure influences the digital change of the Thai small and medium businesses?
2. Whether or not the digital disruption influences the digital change of the Thai small and medium businesses?
3. Whether or not the digital change influences the intent of digital transformation of the Thai small and medium businesses?

Hypotheses

1. Hypothesis 1: Digital infrastructure is positively associated with the digital change of the Thai small and medium businesses.
2. Hypothesis 2: Digital disruption is positively associated with the digital change of the Thai small and medium businesses.
3. Hypothesis 3: Digital change is positively associated with the digital transformation of the Thai small and medium businesses.

Research Framework

The study concentrated on examining whether digital business transformation significantly affect business performance.

1. Research Variables

1.1 Latent Variables

- 1) Digital infrastructure
- 2) Digital disruption
- 3) Digital transformation

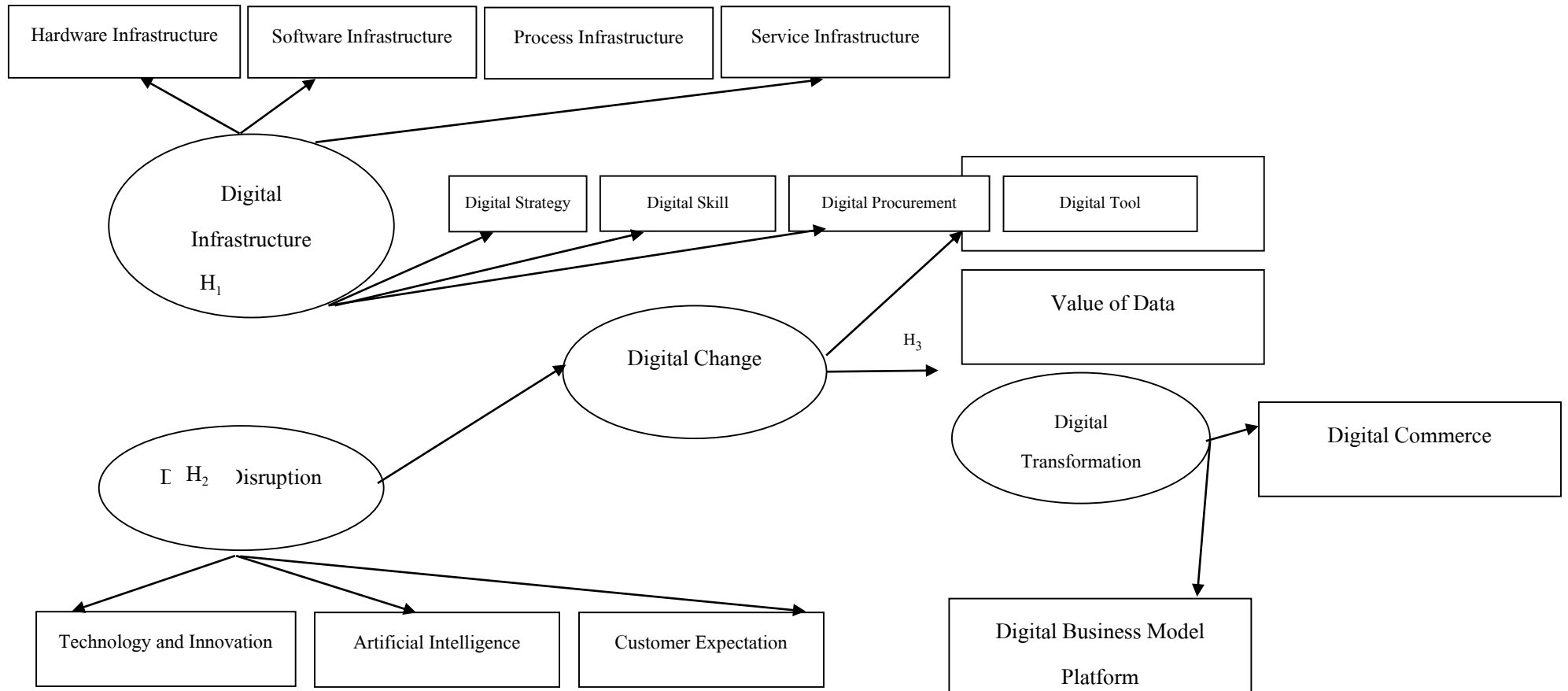
1.2 Mediator Variable

- 1) Digital change

1.3 Observed Variable

- 1) Hardware infrastructure
- 2) Software infrastructure
- 3) Process infrastructure
- 4) Service infrastructure
- 5) Technology and innovation
- 6) Artificial intelligence
- 7) Customer expectation
- 8) Digital strategy
- 9) Digital skill
- 10) Digital procurement
- 11) Digital tools
- 12) Mobility
- 13) Value of data
- 14) Digital commerce
- 15) Digital business model platform

Figure 1: Research Framwwork



Scope of Research

Small and medium enterprises (SMEs) are dominant form of business in all countries worldwide. They exert a strong influence on the economy of all countries, particularly in today's fast-changing and increasingly competitive global market (Aharoni, 1994; Drilhon & Estime, 1993). The definition of small and medium enterprises (SMEs) varies because the diversity of small business is subject to criticism. A small business in Thailand, according to the Bureau of Industrial Promotion Policy and Planning, is defined as any business that has fixed assets of less than 20 million Baht or any company with fewer than 50 employees, while a medium business size is a business with fixed assets of between 20 and 100 million Bath or any business with employees between 50 and 200 (Norlaphoompipat, 2008). Moreover, the small and medium businesses are divided according to three main categories: production sector which are 1) agriculture processing, manufacturing and mining; 2) trading sector which are wholesale and retail, and 3) service sector (The Office of Small and Medium Enterprises Promotion, 2012).

Typically, most SMEs have similar characteristics. SMEs have simple organizational structures and highly centralized structures (Lees & Lees, 1987). Although they are limited by constraints on financial resources, human resources and management perspectives (Gable, 1991; Lees & Lees, 1987; Montazemi, 1988), SMEs exert a strong influence on the economy of all countries, particularly in the fast-changing and increasingly competitive global market (Aharoni, 1994; Drilhon & Estime, 1993).

Thai SMEs have a significant effect on the economic development. They are considered to be the largest provider of employment. Thai SMEs are increasingly seen as creator of new jobs. Additionally, SMEs contribute their share in output and value added in Thailand's industrial sector (Huang, 2003). According to the Office of SMEs Promotion (2018), Thai SMEs accounted for 7,073,142 of all establishments in all sizes of businesses. This study will emphasize on SME owners who pay attention to the development of business capabilities especially through digital business transformation to compete and improve their business performance.

Operational Definition

Digital infrastructure: digital infrastructure is to provide enhanced transformation opportunities to businesses which, by utilizing front and back-end supports for improving these new capabilities, can provide value-added services to their customers, including hardware infrastructure, software infrastructure, process infrastructure, and service infrastructure.

Digital disruption: the certainly powerful force driving innovation across all sectors. It changes with emerging technologies such as artificial intelligence (AI), and customer expectation.

Digital change: is a form of strategic management and a business answer or response to an adaptive environment, require strategy, skill, procurement, and tool.

Digital transformation: an organizational change that arises from the tremendous development and application of digital technology in business.

Digital business: digital business is executed by leveraging digital resources to create differential value, leading to destructive innovations which change the competitive environment as a result of the emergence of new dynamically developing companies.

Small and Medium Enterprises (SMEs): any business that has the fixed asset of less than 100 million Baht and numbers of fewer than 200 employees.

Limitations of the Study

This research study focuses only on small and medium businesses, generalized to specific sampling in the areas of Bangkok. Furthermore, the results may not be generalized to larger businesses. Furthermore, the sampling technique used in this study is the convenience sampling instead of random sampling; hence, there is no guarantee that the behaviors of these people represent the behavior of the population. Therefore, the bias of participants in the study may be presented since some participants who are already involved or have technology literacy may have a positive attitude toward the digital business transformation, and more likely to respond to the questionnaires. On the other hands, participants who have a bias against the digital technology might not pay close attention to each question of the questionnaire that may affect the validity and reliability of the study.

Benefits of Research

This study attempts to investigate into this area will provide an empirical approach for investigating this phenomenon, while creating knowledge that will contribute to a deeper understanding of social media in the business. Furthermore, it may provide a framework for corporate strategic planners with meaningful technological considerations to integrate into their business strategies for new business model. It will provide an understanding on the level of readiness in digitalization of Thai SMEs, allowing the data for benchmarking and progress to be measured over time. Moreover, it will contain data from many diverse firms, aiding in pioneering an understanding of how digital disruption might impact relationship digital change and digital transformation. Lastly, the finding may provide an insight into the area's businesses that may require extra support to improve their adoption and exploitation for digital economy in accordance with the Thailand 4.0 policy.

Chapter 2

Literature Review

The purpose of this research study is to study the factors enabling the digital change on digital transformation for small and medium businesses. To develop a solid theoretical research framework, this chapter presents the related literature as follows : to introduce digital business, digital infrastructure, digital disruption, digital change, and digital transformation.

Digital Business

Digital economy specifically helps businesses mitigate the isolation inherent to most online data analysis activities. Furthermore, it is an online community-based e-commerce platform that brings together products from a vast array of stores into one digital platform. The types of business expand to several varieties of e-commerce, app stores, online advertising, cloud computing, participative networked platforms, high speed trading, and online payment services.

One of the most significant changes occurring in today business is the increasing digital enablement of exchange between business (Richard and Devinney 2005). Digital enablement is the ability to perform business processes using information technology (Smolander 2003). Moreover, digital technology is used by business to improve processes as a central catalyst in the acceleration of competition across industries (McAfee and Brynjolfsson 2008).

The digital and innovation allows the rapid development of new business models; it can also quickly cause existing businesses to become obsolete. It becomes digital business which is the creation of new business designs by blurring the digital and physical world. The digital and innovation rises to a number of new business models recently from traditional business to modern advances in technological and innovative involvement that have made it possible to conduct many types of business at outstanding greater scale and over longer distances than was previously. Especially, the digitalization is revolutionizing the way business is conducted in industry throughout value chains.

Digital Infrastructure

Typically, the digital economy involves five parts of infrastructure, including hardware infrastructure, software infrastructure, service infrastructure, promotion and innovation, and society and knowledge (Boonnoon, 2014). Hardware infrastructure refers to information-technology infrastructure that is used to support a digital economy such as high speed broadband Internet, and digital gateways. Software infrastructure refers to online channels, online transactions such as verification systems to identify individuals online and cyber-security in order to boost up e-Commerce transactions. Service infrastructure would create a platform to support the private sector, while the promotion and innovation part is the developing the digital skills of entrepreneurs to improve their productivity and workflow process efficiency through the supply chain, which will utilize digital tools and go along with banking system, services and manufacturing. Society and knowledge refers to the universal access ability, which allows people various online channels with an affordable price. The integration of activities at various levels generates the value that make specific business models profitable (Boonnoon, 2014).

The increasing recognition of the role of digital economy, which enables the interactions among consumers, and suppliers as an important co-value creation has derived the implications of these interactions in numerous settings, including online activities. Digital economy is growing rapidly and frequently features comments about brands and products. Moreover, consumers increasingly rely on and are interested in collaborations (Cheong & Morrison, 2008). New business models have emerged demonstrating common features – mobility, use of data to generate value and network effects.

Hardware Infrastructure

Hardware infrastructure refers to information-technology infrastructure that is used to support a digital economy such as high speed broadband Internet, and digital gateways. The business must evolve to an infrastructure that supports business innovation through agility. Integrated infrastructure are combinations of server, storage and network infrastructure, sold with management

software that facilitates the provisioning and management of the combined unit (Moore, 2016). A majority of integrated hardware infrastructure replace existing infrastructure. This is great for cost and consolidation of IT and efficiency metrics. However, when implementing this as part of a digital business initiative digital businesses must look at how the potential savings of those costs. For example, to operate a private cloud, determine which deployment environment best suits a particular workload, what management tools to use and which cloud providers and partners are best equipped to assist.

Software Infrastructure

Software infrastructure refers to online channels, online transactions such as verification systems to identify individuals online and cyber-security in order to boost up business transactions. The infrastructure would create a platform to support the private sector, while the promotion and innovation part is the developing the digital skills of entrepreneurs to improve their productivity and workflow process efficiency through the supply chain, which will utilize digital tools and go along with banking system, services and manufacturing. The universal access ability allows business various online channels with an affordable price. The integration of activities at various levels generates the value that make specific business models profitable. In the near future, almost every business will have software development expertise at its core (Bourne, 2016).

Process Infrastructure

Digital Technology typically provides the ability for collaboration at increased operation process speeds. This empowers employees to share and receive ideas on improved business effectiveness. As we could say that the human resource function has also been transformed by digital technology, which is related to internal business processes perspective. On the other hand, it entails the procedures that an organization must develop and master to be successful. Many organizations will concentrate on such elements as order processing, delivery, manufacturing, and product development as examples.

The focal point of this perspective is related to the customer perspective because to keep customers satisfied, an organization will need to focus on the components of the organization

important to them. If target customers are dissatisfied when delivery is late, an organization must concentrate on the internal process of developing a more efficient delivery system or refining the system currently used (Levy, 1998).

Service Infrastructure

Services are an important feature of many businesses in the digital economy. Digital business platforms create a new service offering that integrates social and mobile data with analytics to provide real time business intelligence (Kane *et al.*, 2015). New digital trends in service such as cloud computing, mobile web service, social media, eco-system, co-creation, and so forth, are thoroughly changing the way of doing business from traditional business models to digital business models (service innovation). For example, UBER, a car (taxi) ride service, uses mapping data and the global positioning system (GPS) to capitalize on drivers and customers to connect them to share the ride. This sample can be applied to other businesses since the importance for digital economy is to build the platform or model rather than to build a product (McKenna, 2015).

Along with the service infrastructure, the businesses can use the data to improve their business platform. Digitally maturing companies are in a position to recognize the benefits from collaboration (Kane *et al.*, 2015). The value of the ability to obtain and analyze data, and big data in digital economy environment is increasingly well documented by market researchers. Such data business can use it to analyze variability in performance and understand their consumers' behaviors, and to segment their market target in order to customize their products and service categories, to use as a supportive decision making with the automated algorithms in the ecosystem (OECD, 2014).

Digital Disruption

Digital disruption was possible because of a convergence, or the timely occurrence, of three key factors which are technology, intelligence, and customer expectations. Digital disruption is ubiquitous and has changed both the way businesses operate and the way people live. Disruption caused by innovation affects firms across multiple industries (Choi & Ozkan, 2019)z. Digital

transformation is to respond to disruption. The business requires a fundamental shift in business model, impacting everything from customer experience and operations to marketing and culture. Advances in technology, especially surrounding mobile, data analytics, and Cloud computing, seemed to flourish overnight and dramatically affected the overhead required for businesses to launch, reach their customers, and collect the data necessary to tailor their new customer-centric business models around existing paradigms (Kollmorgen, 2017). The digital company has been gathering data from its digital shopping experience across all of their platforms since its inception. Artificial intelligence is used to track customer behaviors, and identify exactly where shoppers are on their purchasing journeys and target them with products accordingly. Lastly, the change in consumer expectations is likely a result of advances in technology and data analytics, but it is also the single most powerful influencer of digital disruption. Society quickly learned to value the experiences associated with the purchasing of products and services. In some cases, we have also demonstrated we are willing to pay more for premium experiences and some customer segments, namely Millennials, appear willing to pay for an experience over a product. The biggest challenges for businesses is in how to respond quickly, but appropriately to the disruption occurring around them so that they are able to bring out the opportunities.

Technology and Innovation

In order to achieve a competitive advantage, businesses have to develop and integrate the innovation and applying them into business process a business model. The digital and innovation rises to a number of new business models recently from traditional business to modern advances in technological and innovative involvement that have made it possible to conduct many types of business at outstanding greater scale and over longer distances than was previously. The digital and innovation allows the rapid development of new business models; it can also quickly cause existing businesses to become obsolete. Furthermore, to encourage digital and innovation in various economic activities, the objective of which is to create equilibrium between the environment and society.

Additionally, the adoption of technologies plays an important role across digital transformations. The organizations with successful transformations use more sophisticated

technologies, such as artificial intelligence, the Internet of Things, and advanced neural machine-learning techniques.

Artificial Intelligence

Many business leaders are desperate to implement this new shiny development in order to increase innovation, productivity and growth. scholars hear more and more about artificial intelligence (AI), big data, machine learning, blockchain, and fintech as examples of contemporary manifestations of disruptive technology that will profoundly influence disciplines beyond business and finance, such as law, health care and government. Global extensions of these technologies and innovations challenge the efficacy and boundaries of law. Indeed, disruptive innovations potentially change the way we consider the future as humans versus some super artificial intelligence (Choi & Ozkan, 2019). Businesses need to understand how digital technology and data science can shape their organizations and those of their competitors, be vigilant to the ever-increasing risk from cybercrime, while still retaining the foundations of traditional leadership in terms of displaying emotional intelligence, a sense of purpose and realizing the art of the possible (Underwood, 2019).

The increasing capabilities of artificial intelligence (AI) are changing the way organizations operate and interact with users both internally and externally. The impact of AI and machine learning provide the potential to transform everything from business operations to the customer experience. Typically, AI can support three important business needs: automating business processes, gaining insight through data analysis, and engaging with customers and employees (Davenport & Ronanki, 2018).

Using robotic process automation technologies typically brings a quick and high return on investment. It is particularly well suited to working across multiple back-end systems. Davenport & Ronanki (2018) mentioned that robotic process automation would quickly put people out of work, replacing administrative employees was neither the primary objective nor a common outcome.

For analytical machine is varied used to analyze warranty data to identify safety or quality problems in automobiles and other manufactured products. They are usually much more data-intensive and detailed, the models typically are trained on some part of the data set, and the models get

better—that is, their ability to use new data to make predictions or put things into categories improves over time (Davenport & Ronanki, 2018).

The AI that is used for engaging with customers and employees are seen as processing chatbots, intelligent agents, and machine learning, helping its customer service staff answer frequently asked questions. That may change as firms become more comfortable turning customer interactions over to machines. It is used eventually to allow customers to engage with the cognitive agent directly, rather than with the human customer-service agents.

In sum, AI technologies can help companies achieve their objectives, whether the projects are moon shoots or business-process enhancements. Businesses must understand which technologies perform what types of tasks, and the strengths and limitations of each.

Customer Expectation

The customer centric view (Sheth, 2007) has emerged as an important management practice for achieving success in competitive industries. Adopting a customer centric view can improve firm performance according to research in related conceptual areas such as market segmentation (Mentzer et al. 2004), customer equity (Rust, Moreman, and Bhalla, 2010), and customer portfolio theory (Johnson and Selnes 2004).

One of the crucial reasons that business need to focus on customer expectation is that their expectation reflects in business revenue. Consumers today that attend to their emotional needs, for example, may be strongly influenced by a perceived status attained from purchasing a particular product brand, convenience, and recommendations from others via online platform.

There are two key performance indicators in business to customer exchange which are customer perceptions of service quality and customer satisfaction. Both of these indicators are influenced by customer perceptions in the context of the exchange relationship (Crosby et al. 1990). Service quality has been increasing in importance for industrial sellers because of competitive pressures that heighten the salience of market factors such as customer retention rates (Parasuraman 1998). Customer satisfaction is a popular performance metric not only because of its relevance to the customer experience, but also because of its links to financial outcomes. Customer satisfaction has been shown

to be a statistically significant indicator of a business's performance (Ittner and Larcker 1998). Furthermore, digitalization improves the business's ability to gather customer information that is pertinent to increasing customer satisfaction (Rust, Moreman, and Bhalla, 2010).

Digital Change

Participating in the digital revolution requires change; acquiring new skills and knowledge; new systems and processes; new partnerships; new forms of collaboration and investment in new digital strategies, people skill, business procurement and digital tools. Change on this scale can create uncertainty, doubt and many other real or perceived barriers to progress. The elements with the greatest influence on success are clear targets for organizations' key performance indicators and clear communication of the transformation's timeline. These categories suggest where and how companies can start to improve their chances of successfully making digital changes to their business.

Digital Strategy

Digital business strategy is to formulate and execute by leveraging digital resources to create differential value, thereby elevating the performance implications of business strategy beyond efficiency and productivity metrics to those that drive competitive advantage and strategic differentiation. Additionally, digital business transformation is the result of blending the power of technology with a rapidly adaptable culture that understands not only what technology can do for its business. Organizational transformations succeed at improving a company's performance and sustaining those gains, the latest results find that the success rate of digital transformations is lower. These characteristics fall into five categories: leadership, capability building, empowering workers, upgrading tools, and communication. To develop talent and skills throughout the organization is a fundamental action for traditional transformations which is one of the most important factors for success in a digital change effort. Another key is giving employees a say on where digitization could and should be adopted. Then employees generate their own ideas about where digitization might support the business. Furthermore, digitizing tools and processes can support success.

Digital Skill

Since the change of technologies and widespread diffusion of the digital economy, it led to innovation in business models, which in turn allows consumers and businesses to connect around the world any time (Harris & Rae, 2009). The digital economy provides business an ability of the transformational effects of new way to use the data as in the fields of information and communication. It gives rise to certain form of new business models, which is important to the business to adapt in the new environments. Thailand attempts transforming nations through creativity and innovation, also known as Thailand 4.0. Thailand 4.0 is a new economic policy to develop Thailand into a valued-based economy or digital-based economy. However, Thailand is confronting many challenges, such as a labor shortage and an aging society. Thai labor is still lagging behind in terms of manufacturing technology. New businesses in Thailand still lack the ability to find new sources of investment. Therefore, Thailand is attempting to change the country from traditional farming to smart farming, traditional business to digital business, and traditional services to high-value services. It is envisioned to change the country's traditional farming to smart farming, traditional SMEs to smart enterprises, and traditional services to high-value services.

Digital skills has been among the most popular expressions featuring in the curricula of the last few years (Dani, 2013; Jukes, McCain & Crockett, 2010). The information literacy concept has been adapted to include ICT. The American Library Association defines information literacy as the ability to recognize when information is needed and to be able to locate, evaluate, and use it effectively (Mutch, 1997). Digital literacy is information literacy in a digital environment. Digital literacy refers to the technical, cognitive, and sociological skills that people need to perform efficiently in a digital environment (Eshet-Alkalai, 2004). It seems reasonable to assume that, due to the lack of digital literacy, it might also lack the skills required to transform business to the digital business efficiently in a digital environment. According to Huerta and Almazan (2007), the digital literacy is based on five skills, including photovisual, reproduction, branching, information, and socioemotional.

Photovisual

The photovisual skill refers to the ability to use graphical user interfaces. This skill also includes the user's ability to understand information delivered through different sensory channels.

This skill is specific to the digital environment; it describes the ability to use computer and digital devices.

Reproduction

The reproduction skill refers to the ability to synthesize and analyze the information gathered to create an original piece of work. The analytical skill is used to examine the big data, gathered from online and offline sources, by reproducing and manipulating preexisting digital text, visuals, and audio pieces.

Branching

The branching skill refers to the ability to navigate in a nonlinear environment to find the desired information. This skill is specific to the digital environment through knowledge domains, such as in the Internet and other hypermedia environments.

Information

The information skill refers to the ability to assess the quality of the information retrieved. The reproduction and information skills are not unique to the digital environment but they are increasingly relevant to this environment because of the great deal of information available. The skill is to consume information critically and sort out false and biased information.

Socioemotional

The socioemotional skill refers to the ability to interact with other people on the Internet. A user with socioemotional ability must be familiar with the rules of interaction on the Internet, being able to communicate effectively in online communication platforms such as discussion groups and chatrooms. The socioemotional skill reflects the fact that ICT access is not only used as a means for gathering information.

Therefore, to transform business to the digital business, the digital skill is described in literature as the skill to employ a wide range of cognitive and emotional skills in using digital technologies which is one of the crucial factors that business need to pay close attention, and prepare for the digital change.

Digital Procurement

Businesses that have succeeded in digitally change in their procurement within organization, between business-to-business such as suppliers and customers illustrate its potential benefits such as reduced cost of operations, improved operational performance, and increased revenue. Typically, digital change in digital procurement enables digital activities that replace or enhance associated physical activities. digital activity can be performed at a different time, at a different location, and by different employees than its associated physical activity. Separating digital and physical flows facilitates more comprehensive process improvements by permitting each type of flow to be optimized separately, utilizing design methods that are more appropriate for each (Mason-Jones and Towill, 1999).

Digital economy has been addressed for a significant method to transform a new way of doing business. Digital economy is generally defined as being the use of digital technologies to transform business operations in order to improve effectiveness, efficiency, productivity, and service delivery (Easley and Kleinberg, 2010). Thai government has established the DE policy to offer citizens and businesses the opportunity to complete a vast array of related transactions through many channels; i.e., Electronic-Procurement (e-Procurement), Electronic-Auction (e-Auction), and Electronic-Taxation system (e-Taxation).

Digital Tool

Digital tool fills a basic desire for interaction and decision support. Digital economy specifically helps businesses mitigate the isolation inherent to most online data analysis activities. Furthermore, it is an online community-based e-commerce platform that brings together products from a vast array of stores into one digital platform. The types of business expand to several varieties of e-commerce, app stores, online advertising, cloud computing, participative networked platforms, high speed trading, and online payment services.

In sum, digital change need the resources around digital business strategy, viewed relatively broadly. Digital change and its capabilities are the digital infrastructure consists of institutions, practices, and protocols that together organize and deliver the increasing power of digital

technology to business and society (Deloitte, 2009). Thus, to be ready in the Infrastructure to enable the digital business providers is to control and optimize the flow of big data between businesses and their customers and partners.

Digital Transformation

Digitalization has typically moved businesses beyond the traditional ways, segments of society, and people daily routine. The first moving of digital transformation occurred in manufacturing from labor forces to automation, the process of production, and coordinate goods and value creation via information exchanges. The second moving of digital transformation occurred after the introduction of the Internet such as World Wide Web, which connects everyone and everything through networks. Such a network economy has grown in an exponential way that transforms the traditional ways of doing business and interactions among businesses and customers. The third moving of digital transformation is featured as massively collecting, monitoring, analyzing human behaviors through digitization, which serve to understand human nature and pose both opportunities and challenges for businesses, public policies, and individuals' lives. All entities in the society, businesses, governments, individuals, are now involved in this great transformation.

There are two main causes of changing of digital transformation. One is the expanding boundary of digitalization, from a transformation within organizations, through innovations in interactions between businesses and customers, and to the societal changes at large. The other is the shifting focus of digitalization, from digitizing production and delivery of goods and services, to digitizing all aspects of our everyday life, and market segment. The nature and impact of digitalization has changed in response to the changes in the logic of digital transformation.

As this linkage between firm performance and digital transformation, it becomes increasingly important to understand how digital technology can be successfully utilized in this context. In a digitally business environments, businesses operate in business ecosystems, integrating the alliances, partnerships, and competitors. Furthermore, the use of digital platforms enables firms to break traditional industry boundaries and to operate in new business model through the digital resources (D'Adherio 2001; Klein and Rai 2009; Rai et al. 2012; and Saraf et al. 2007).

To identify the main factors motivating and influencing the digital business transformation in the business, they should understand the concept, benefits, and challenges of the digital business, its' impact on business performance and future perspective. Especially, the idea of seeing a business model as a system, made up of subsystems each with inputs, transformation processes and outputs. Inputs, transformation processes, and outputs involve the acquisition and consumption of resources such as money, labor, materials, equipment, buildings, land, administration and management. How value chain activities are carried out determines costs and affects profits.

Van, et al (2014) pointed out that the direct impact that technology investment had on growth and having the indirect impact on both information technology and commerce in terms of competitive advantage. The vast progress in digitalizing processes allows businesses in transmitting information to decentralize many functions in distant locations based on their advantages. Therefore, digital technologies increase competitive advantage for the economy; this is likely to be global in scale, given that geographical barriers are becoming increasingly irrelevant. Therefore, the businesses that are embracing the digital business trend to craft their transformation stages are required to focus and develop the key business transformations as a digital transformation strategy, which are mobility, value of data, social commerce effect, and new business model (Harvard Business Review Analytic Services, 2015).

1. Mobility - mobile is enabling new business scenarios (Harvard Business Review Analytic Services, 2015). The development of a core contributor to value creation and economic growth for companies in the digital economy. Businesses are increasingly able to carry on commercial activities remotely while traveling across borders, removing geographically from both the locations in which the operations are carried out and the locations in which their suppliers or customers are located. Furthermore, Harvard Business Review Analytic Services (2015) found that putting mobile functionality in the hands of employees is now a key requirement to increase productivity.

2. Value of Data – there is a report showing that there is over 2.5 Exabyte's (billions of gigabytes) of data every day (OECD, 2013). The big data effect is a crucial part on the value of the data-driven marketing economy and the revenues generated for the economy. Big data is helping

companies innovate (Harvard Business Review Analytic Services, 2015). The business uses the big data to obtain and analyze data, and big data in particular, is increasingly well documented by market observers. Additionally, leading companies are not only integrating more data into their analyses, but they are using the results to develop new products and services (Harvard Business Review Analytic Services, 2015).

3. Digital Commerce - social shopping allows people browse through product specifically for them that are filled with products posted or made popular by other users. Social channels are transforming core business processes (Harvard Business Review Analytic Services, 2015). Social media is becoming a core aspect of modern digital marketing strategies, and they see potential for it to radically transform the marketing function. This helps to confirm and increase their purchase decisions. It is more likely to have friend collaborative buying experience. When shopping information or an experience is communicated to one's friends and acquaintances, the comments or opinions made by these significant others influence the consumer's consumption related self-confidence (Gordon, 2007).

4. New Business Models – data input and resources such as customer information, and customers' online behavior allow businesses gaining an asset in business models where the different sides of the market can be created then dynamically adapted based on evolving technology, the latest expression of consumer demand, and a firm's position on the market, resulting in innovative new business models, products, and services (Harvard Business Review Analytic Services, 2015). Uber, for example, uses power of tech innovation to create a new way of calling a taxi.

Therefore, the digital business transformation is the process involving the design of products and services, interoperability with other complementary business platforms, and deployment as products and services by taking advantage of digital resources. Many firms are beginning to see the power of digital resources to create new digital technology capabilities and create new strategies around new products and services (Rai et al. 2012; Sambamurthy et al. 2003).

Summary

The literature reviews begin with the digital business, followed by digital disruption. The theoretical framework focuses on digital infrastructure. Additionally, this chapter presents digital change, and digital business transformation, which many people find that it is very important to the business, especially in business transformation.

Chapter 3

Research Methodology

This chapter discusses the methodology used to study the factors enabling the digital change on digital transformation for small and medium businesses. The purpose of this chapter is to describe the details of the research methodology, including research questions, research design, hypotheses, population, sampling, instrumentation, data collection techniques, validity and reliability and questionnaire.

Research Questions

This study attempts to examine the factors enabling the digital change on digital transformation for small and medium businesses. The literatures are reviewed to aid in the development of the research questions. This study emphasizes three main research questions.

1. Whether or not the digital infrastructure influences the digital change of the Thai small and medium businesses?
1. Whether or not the digital disruption influences the digital change of the Thai small and medium businesses?
2. Whether or not the digital change influences the intent of digital transformation of the Thai small and medium businesses?

Type of Research

The researcher will conduct quantitative research to examine Thai SMEs perceptions towards the digital change on digital transformation. The research design is drawn from quantitative research methodology, which was designed to use in this study. This quantitative research is used to explore the factors enabling the digital change on digital transformation for small and medium businesses. Furthermore, in order to answer the research questions and research hypotheses, the survey approach is used to gather the data in this study. This design is appropriate because it allows the

researcher to gather the data from a large sample size in a cost-effective manner (Chatterjee & Machler, 1997).

Research Hypotheses

1. Hypothesis 1: Digital infrastructure is positively associated with the digital change of the Thai small and medium businesses.
2. Hypothesis 2: Digital disruption is positively associated with the digital change of the Thai small and medium businesses.
3. Hypothesis 3: Digital change is positively associated with the digital transformation of the Thai small and medium businesses.

Selection of Subjects

Every researcher intends to conduct researches that cover the whole population in order to provide the accurate results; however, for reasons of size, time, cost, or accessibility, the researcher cannot conduct research in its entirety. Hence, this research study is conducted based on a sample representative of the target population. The samples of this study consisted of 400 SMEs from which the participants in this study are voluntary and anonymity. A completely self-administered survey will be taken, and the survey will be done at business seminars attended by small business men and women. These seminars are regularly scheduled by the Office of Small and Medium Enterprises Promotion of Thailand.

Population and Sampling

According to Small and Medium Enterprises Promotion (2018), it shows that the number of known enterprises in Thailand totaled 7,073,142 enterprises, indicated as manufacturers for 1,593,608 wholesalers and retailers for 1,596,517 and service for 3,883,017. The researcher uses Yamane's formula to calculate sample size for 5% precision levels where confidence level is 95%, resulting in a sample size of 400 respondents. Furthermore, the researcher attempts to use structural equation modeling (SEM) to analyze the data, which requires a large sample technique.

According to Hair, Anderson, Tatham and Black (1998), the sample size required is somewhat dependent on model complexity, the estimation method used, and the distributional characteristics of observed variables. The sample size should be at least 20 times of the observed variables. Therefore, the minimum of sample size is 260 respondents, which is derived from 13 variables multiplied by 20 times. However, SEM usually requires the sample size at least 200 respondents. Therefore, the usable number of respondents is 400 according to Yamane's formula, which is more than the minimum of sample size.

The sampling technique used in this study is a convenient sampling to ensure that each individual of the population has the same probability of being chosen (Best & Kahn, 1998). In this study, the target population of this study is the SMEs located in Bangkok and perimeter in Thailand. The participants in this study are voluntary and anonymous. The survey is expected to be responded by top management level because they are most likely to be the one who involves in business planning, and makes the final decisions about implementation in the business.

Instrumentation

A survey approach is used because a survey provides a basis for generalization of the results to the whole population. Survey also allows researchers to collect large amounts of data from different groups of people and in a relatively limited of time. Since survey is a flexible tool, survey research easily explores a wide range of topics requiring different types of data, including demographic, attitudinal, behavioral, and so forth, comparing, and measuring across factors. Therefore, a survey as a data collection instrument is used to gather the data in this study because the intent is to sample for 400 participants who work in small and medium businesses in Bangkok, Thailand in a cost-effective manner.

The questionnaire is divided into six sections. The first section contains questions designed to gather demographic information and business information about the respondents such as gender, age, education, marital status, position title, business industry. The second section is designed to investigate the readiness of digital infrastructure (hardware infrastructure, software infrastructure, process infrastructure, service infrastructure). The third section is designed to investigate the factors

impact the digital disruption (technology and innovation, artificial intelligence, customer expectation). The fourth section is designed to investigate the perception of digital change (digital strategy, digital skill, digital procurement, digital tools). The fifth section is designed to investigate the outcome of digital transformation (mobility, value of data, digital commerce, digital business model platform). Responses in these sections are based on 5-point scale: 1 means “strongly disagree”; 2 means “disagree”; 3 means “neutral”; 4 means “agree”; and 5 means “strongly agree”.

Table 1 : *Questionnaire Items Used to Measure Key Variables and Their Sources in the Literatures*

Constructs / Dimensions	Items	Source of measure
Digital Infrastructure – Hardware Infrastructure	<ul style="list-style-type: none"> - Your business has high speed broadband Internet, and digital gateways. - Your business has server, storage and network infrastructure. - Your business has private cloud system. - Your business provides employees the standardize hardware for working such as desktop and laptop. - Your business provides employees the mobile devices for working remotely. 	<p>Leipzig, Gamp, Manz, Schöttle, Ohlhausen, Oosthuizen, Palm, and Leipzig (2017) Bourne (2016)</p>
Digital Infrastructure – Software Infrastructure	<ul style="list-style-type: none"> - Your business provides up to date software, needed for employees to work. - Your business has security software and updated patch. - Your business has enterprise resource planning software to keep recording and tracking data. - Your business uses business intelligence software. 	<p>Leipzig, Gamp, Manz, Schöttle, Ohlhausen, Oosthuizen, Palm, and Leipzig (2017) Boonnoon (2014) Bourne (2016)</p>

	- Your business has real time analytics software and alert.	
Digital Infrastructure – Process Infrastructure	<ul style="list-style-type: none"> - Keep tracking and managing customers' complaints. - To quickly escalate and resolve the issue. - To facilitate strategic decision making and enhances efficiency. - To share resources and procurement creating value chain. - To improve the operation process. 	<p>Leipzig, Gamp, Manz, Schöttle, Ohlhausen, Oosthuizen, Palm, and Leipzig (2017) Boonnoon (2014) Bourne (2016) Levy (1998)</p>
Digital Infrastructure – Service Infrastructure	<ul style="list-style-type: none"> - Having ecosystem platform to integrated vendors and customers. - Having chatbot used to communicate with your customers. - Customers are able to manage their orders or account by themselves. - The service infrastructure increases mobility of employees. - Your business uses cloud service provided for allocating storage resources. 	<p>Leipzig, Gamp, Manz, Schöttle, Ohlhausen, Oosthuizen, Palm, and Leipzig (2017) Boonnoon (2014) Bourne (2016) Kane <i>et al.</i>, (2015) OECD, (2014)</p>
Digital Disruption – Technology and Innovation	<ul style="list-style-type: none"> - Digital technology is to create barrier the meaningful of human touch. - Digital technology requires businesses to respond to the change more quickly. - Digital technology is to discourage customers to stay loyal. - Digital technology makes business shorter life span. 	<p>Choi & Ozkan (2019) Underwood (2019) Davenport & Ronanki (2018) Sheth (2007) Mentzer et al. (2004) Rust, Moreman, and Bhalla (2010)</p>

	- Digital technology provides competitive advantages than competitive disadvantages.	Johnson and Selnes (2004) Crosby et al. (1990) Parasuraman (1998) Ittner and Larcker (1998) Rust, Moreman, and Bhalla (2010)
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Digital Disruption – Artificial Intelligence	- Automation has driven disruption in the workforce. - AI will transform the nature of work and the workplace itself. - AI will be able to carry out more of the tasks done by humans. - All occupations will be affected by automation. - AI-driven automation would have to fully obsolete current roles.	Choi & Ozkan (2019) Underwood (2019) Davenport & Ronanki (2018) Sheth (2007) Mentzer et al. (2004) Rust, Moreman, and Bhalla (2010) Johnson and Selnes (2004) Crosby et al. (1990) Parasuraman (1998) Ittner and Larcker (1998) Rust, Moreman, and Bhalla (2010)
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Digital Disruption – Customer Expectation	- Digital transformation has triggered many trends in customer expectations. - Customer expectations reflect business in terms of business strategy.	Choi & Ozkan (2019) Underwood (2019) Davenport & Ronanki (2018)
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	- Personalization is the most important to focus on customer expectation.	Sheth (2007) Mentzer et al. (2004)
	- Multiple partners across multiple channels all working together to provide service value to the same shared customer.	Rust, Moreman, and Bhalla (2010) Johnson and Selnes (2004)
	- Service partners in complex systems collaborate to make work for the real customer.	Crosby et al. (1990) Parasuraman (1998) Ittner and Larcker (1998) Rust, Moreman, and Bhalla (2010)

Digital Change – Digital Strategy	- Your business aligns digital technology plan into business plan. - Using digital technology is stated in the business plan in order to increase a business performance. - Digital technology is one of the crucial factors used to develop a business opportunity. - Your business acknowledges the employees to understand the transformation process. - Your business has a new business model on digital platform.	Leipzig, Gamp, Manz, Schöttle, Ohlhausen, Oosthuizen, Palm, and Leipzig (2017) Boonnoon (2014) Eshet-Alkalai (2004)
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Digital Change – Digital Skill	- Digital technology is the main channel used to communicate, exchange, and share information in the company.	Harris & Rae (2009) Dani, 2013; Jukes, McCain & Crockett (2010)
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	<ul style="list-style-type: none"> - Your employees are required to train up-to-date digital skill. - Your business prefers to recruit tech savvy. - You understand and know how to protect and secure your technology devices. - Digital skill is a basic and functional skill for your company. 	<p>Mutch (1997) Eshet-Alkalai (2004) Huerta and Almazan (2007)</p>
<p>Digital Change – Digital Procurement</p>	<ul style="list-style-type: none"> - You are using advanced analytics and data-driven. - You are using digital platform in value-chain interactions. - You are using dash board to track business process. - You are using digital platform for cross-functional collaboration and exchange. - Digital procurement is used to enhance the procurement function. 	<p>Mason-Jones and Towill (1999) Easley and Kleinberg (2010)</p>
<p>Digital Change – Digital Tools</p>	<ul style="list-style-type: none"> - You are using software tools to computerize business operations. - You are using social media for business marketing. - You are using data driven to optimize your online business. - You are using digital tool to communicate within the business. - You are seeking for new digital tool to improve your business efficiency. 	<p>Deloitte (2009)</p>

Digital Transformation – Mobility	<ul style="list-style-type: none"> - Workers have an ability to work outside the office. - Your business has virtual private network (VPN) to access the company’s data and information. - You can monitor the business operation in real time. 	Van, et al (2014), Harvard Business Review Analytic Services (2015)
Digital Transformation – Value of Data	<ul style="list-style-type: none"> - Your business has software to integrate traditional data sources and new big data. - You can leverage the business opportunities in big data. - You have an ability to evaluate new analytic algorithms. 	Van, et al (2014), Harvard Business Review Analytic Services (2015)
Digital Transformation – Digital Commerce	<ul style="list-style-type: none"> - Your business has online selling and payment system. - Your business has online marketing budget separated from traditional marketing budget. - You have digital business strategies for the business. 	Van, et al (2014), Harvard Business Review Analytic Services (2015)
Digital Transformation – Digital Business Model Platform	<ul style="list-style-type: none"> - Your business runs under new business platform. - You are using ecosystem to collaborate the business and their partners. - You are focusing on building an application to serve the customers. 	Van, et al (2014), Harvard Business Review Analytic Services (2015)

Procedures and Data Collection

By studying the previous research and reviewing the literatures, carried out to aid in the development of the research questions and the hypotheses. Additionally, related literatures assist the researcher in developing and designing instruments, developing the questionnaire, as well as structuring the questionnaire, to conduct an effective research (Figure 2).

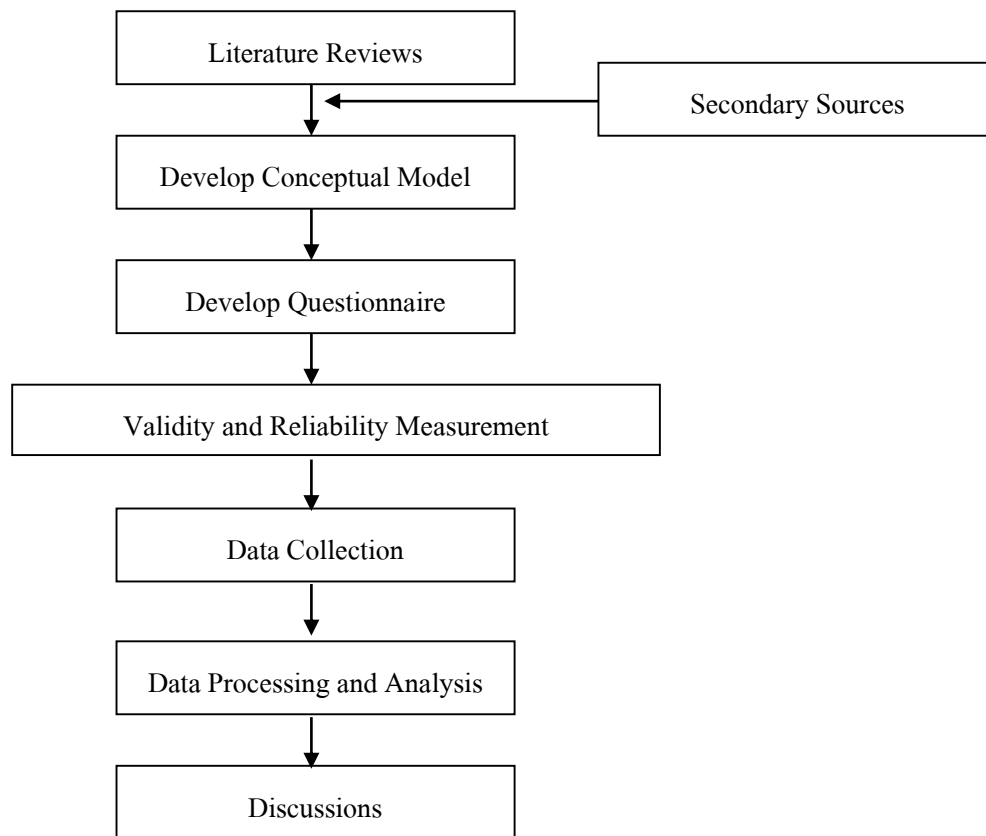


Figure 2. Procedures and data collection.

Development of the Questionnaire

The questionnaire is designed to gather the information involving the factors enabling the digital change on digital transformation for small and medium businesses. The questionnaire questions are adapted from previously validated instruments of similar field of study. Content validity or expert validity is used to measure the content of the questionnaire samples whether or not an appropriate professional consensus exists.

Therefore, the questionnaire is reviewed by experts in the area. Further, the previous research and recommendations and comments from research committees and faculty of business administration members from academic professionals are incorporated as modifications to the survey instrument to establish the content validity of the research.

The questionnaire for this study includes a five point Likert scale, multiple choice items, and rank-order assessment. Items on the survey are scored on a five-point Likert scale. The scale ranges from one through five, with a response of one meaning strongly disagree, two meaning disagree, three meaning neutral, four meaning agree, and five meaning strongly agree.

The questionnaire has five parts with a total of 75 items. Part A in the questionnaire uses multiple-response items, involving the information about the participants' business background, business industry, and numbers of employees, approximate company's revenue. This section of the survey is used to provide the demographics of the types of organizations and their numbers of employees, but it is also used to indicate the validity of the respondents to ensure that they are in the SME industry according to the definition used in this study.

Part B in the questionnaire is a five point Likert scale, representing a range from strongly disagree to strongly agree, and from never to always. This part is designed to investigate the readiness of digital infrastructure (hardware infrastructure, software infrastructure, process infrastructure, service infrastructure).

Part C in the questionnaire is a five point Likert scale, representing a range from strongly disagree to strongly agree, and from never to always. This part is designed to investigate the factors impact the digital disruption (technology and innovation, artificial intelligence, customer expectation).

Part D in the questionnaire is a five point Likert scale, representing a range from strongly disagree to strongly agree, and from never to always. This part is designed to investigate the perception of digital change (digital strategy, digital skill, digital procurement, digital tools).

Part E in the questionnaire is a five point Likert scale, representing a range from strongly disagree to strongly agree, and from never to always. This part is designed to investigate the

outcome of digital transformation (mobility, value of data, digital commerce, digital business model platform).

Validity and Reliability

The measuring instruments used must be valid and reliable. Thus, the validated instruments are guided from reviewing prior studies, and theoretical frameworks. Some of the variables are adapted from previously used scales. Furthermore, the questionnaire questions are adapted from previously validated instruments of similar field of study.

The English version of the questionnaire needs to be translated into the Thai language. The pilot testing is done on both the English and Thai versions of the questionnaire. The translation is conducted by a qualified lecturer of the faculty of liberal arts. The review in the area of the research is to validate the reliability and validity of the research. Once the English version of the questionnaire is created and sent to a lecturer in the Faculty of Liberal Arts for review, the English version of the questionnaire needs to be translated into the Thai language. The questionnaire is reviewed involved in the area of the research in order to validate the research. Additionally, the feedback from the respondents is used to correct any misinterpretation.

Furthermore, in terms of content validity or expert validity, the previous research and recommendations from five faculty members as academic professionals, including one research mentor are incorporated as modifications to the survey instrument to establish the validity of the research. The questionnaire is tested by experts in the area of the research in order to validate the reliability and validity of the research. The experts review the survey instrument to maximize the construct validity, face validity, and content validity. Along with the responses from the respondents, the feedback about the clarity of the questions, instructions, and the length of the questionnaire are used as a way to improve the constructs and content validity.

To establish the reliability of standardized tests, Cronbach's alpha coefficient is used to analyze all the scores on individual items. All variables of this study are tested by computing the Cronbach's alpha coefficient. According to Bickman and Rog (1998), a highly reliable test will have an alpha coefficient of 0.70 or more on a scale of zero to one where a high alpha coefficient indicates high reliability.

Pilot Testing

A pilot study is used to establish the reliability and validity of the study. A pilot testing is used to measure the quality of the study. The pilot testing is the method used in this study to validate and measure the reliability of the questionnaire. The approach is taken by experts in the area of the research in order to validate the reliability and validity of the research. The pilot testing is done on the Thai version of the questionnaire. Pilot participants from SME businesses in management level review the survey instrument to maximize the construct validity, face validity and content validity. Along with the responses from the respondents, the feedback is used as a guideline to improve the questionnaire.

Data Collection

The data is collected in three ways: personal contact and self-administered survey. First, the questionnaires with the cover letter, which explained the purposes of the study and requested for cooperation, are provided to the top management level of small and medium businesses by the researcher visiting the samples' workplaces because of time and cost limitations. By visiting the prospective participants in their offices, the researcher expects to obtain a high return rate of responses.

Furthermore, a completely self-administered survey is taken. The survey is done at business seminars attended by SME business persons. These seminars are regularly scheduled by the Office of Small and Medium Enterprises Promotion of Thailand.

Data Processing and Analysis

The purpose of this research is to study the factors affecting the digital change which significantly lead to the digital business transformation. Consequently, the latent variables are digital infrastructure, digital disruption, digital change, and digital transformation.

The observed variables for this study are: hardware infrastructure, software infrastructure, process infrastructure, service infrastructure, technology and innovation, artificial intelligence, customer expectation, digital strategy, digital skill, digital procurement, digital tools, mobility, value of data, digital commerce, digital business model platform.

A factor analysis is conducted using the items that measure the factor structure and initial validity. Factor analysis is useful in discovering potential latent sources of variance and covariance in observed measurements. Items with good measurement properties should exhibit high

factor loadings on the latent factor of which they are indicators, and small factor loadings on the factors that are measured by differing sets of indicators. Therefore, such results provide some evidence of initial validity of measurement items (Segars and Grover, 1993).

To ensure the high quality of instrument development process, .50 is used as the cutoff score for factor loading. Items with loadings lower than .50 and items with serious cross-loadings (i.e. an item loaded very close to .50 on more than one factor) are removed. To streamline the final results, factor loadings lower than .40 is not reported. Moreover, the stability of the factors is analyzed by measuring the ratio of respondents to items, and the Tinsley and Tinsley (1987) guideline of having a minimal ratio between 5 and 10 was followed.

Structural equation modeling is used to analyze the survey responses. It is to specify, test, and modify the measurement model. Model-data fit is evaluated based on multiple fit indexes. The Chi-square goodness of fit index (GFI), adjusted goodness of fit index (AGFI), comparative fit index (CFI), and root mean square residual (RMSR) are used to evaluate the goodness of fit of the model. It measures the difference between the sample covariance and the fitted covariance. these index scores (GFI, AGFI, CFI, NFI) in the range of .80- .89 as representing reasonable fit; scores of .90 or higher are considered as evidence of good fit, while RMSR values range from 0 to 1, with smaller values indicating better model; values below .05 signify good fit (Joreskog and Sorbom, 1989).

Summary of Research Methodology

This chapter discusses the research questions, research design, instruments, subjects, data collection procedures, and data processing used in this study. The research examines the factors enabling the digital change on digital transformation for small and medium businesses. The target population focused on top management level of SMEs in Bangkok, Thailand. The sample of this study consisted of 400 small and medium businesses obtained by convenient sampling. To collect the data, two methods are used: (a) personal contact, and (b) self-administered survey. Structural equation modeling is used to analyze the survey responses. It is to specify, test, and modify the measurement model.

Chapter 4

Research Findings

The purpose of this research is to study the factors affecting the digital change which significantly lead to the digital business transformation. This chapter presents the results of the study as well as a discussion of the data analysis and evaluation of the results. This chapter is divided into four sections including the descriptive statistics, factor analysis technique, and structural relationships, and the hypothesis testing. In the descriptive analysis, the respondents' characteristics are summarized and presented. Factor analysis technique is then conducted to reduce the number of items which are interrelated. The assessments of the confirmatory factor analysis and the measurement model are checked. Next, the structural relationships among constructs as proposed in the conceptual framework are determined. Finally, the hypothesis testing is conducted.

Sample Characteristics and Descriptive Statistics

The purpose of descriptive statistics is to provide a structured depiction of the characteristics of a data set. The target population of this study is SMEs in Thailand. A total of 400 usable questionnaires are obtained. Demographic questions are included as part of the survey. Respondents are asked their gender, age, highest education, position title, types of business, number of employees, approximate revenue. In addition, they are asked to identify their expectation of digital business transformation. The survey is done at business seminars held by Department of Business Development. These seminars are held during July - September to July 2019.

Table 2 shows the distribution of usable responses by gender; the respondents consist of 236 males (59%), and 164 females (41%).

Table 2: *Breakdown of Sample by Gender*

Gender	Frequency	Percentage
Male	236	59
Female	164	41
Total	400	100.00

Table 3 shows the distribution of usable responses by age; 32% report their age to be between 18 and 32; 24.25% report their age to be between 33 and 40; 26% report their age to be between 41 and 50; 5.75% report their age to be between 51 and 60; and 12% reports his/her age to be over 61.

Table 3: *Breakdown of Sample by Age*

Age	Frequency	Percentage
18-32	128	32.0
33-40	97	24.25
41-50	104	26.0
51-60	23	5.75
Over 60	48	12.0
Total	400	100.0

In terms of respondent's level of education, 15 (3.75%) reports high school as their highest level of education. 76 (19%) report having some college education, 228 (57%) indicated they have a bachelor's degrees and 81 (20.25%) reported having master's degrees or higher degrees (Table 4).

Table 4: *Breakdown of Sample by Educational Level*

Educational Level	Frequency	Percentage
High school	15	3.75
College diploma	76	19.0
Bachelor's degree	228	57.0
Master's degree or higher	81	20.25
Total	400	100.0

The majority of the respondents are married 229 (57.25%), 128 (32%) are single, 29 (7.25%) are widowed, and 14 (3.5%) are divorced (Table 5).

Table 5: *Breakdown of Sample by Marital Status*

Marital Status	Frequency	Percentage
Single	128	32.0
Married	229	57.25
Divorced	14	3.5
Widowed	29	7.25
Total	400	100.0

Table 6 shows the distribution of usable responses by job position; 36.5% reports their position as business owner; 34.75% report their position as partner; 14.75% report their position as director; and 14% report their position as manager.

Table 6: *Breakdown of Sample by Job Position*

Job Position	Frequency	Percentage
Business Owner	146	36.5
Partners	139	34.75
Director	59	14.75
Manager	56	14.0
Total	400	100.0

The diversity of the 400 SMEs is indicated in Table 7 showing a distribution in four different categories regarding types of business. 28.25% of the SMEs sampled are in manufacturing, 26.25% of the SMEs sampled are in wholesale, 24% of the SMEs sampled are in retail, and 21.5% of the SMEs sampled are in service.

Table 7: *Breakdown of Sample by Business Classification*

Business Type	Frequency	Percentage
Manufacturing	113	28.25
Wholesale	105	26.25
Retail	96	24.0
Service	86	21.5
Total	400	100.0

The breakdown of the sampled SMEs by the number of employees is shown in Table 8. This section is not only used to provide the demographics of the numbers of employees, but it is also used to indicate the validity of the respondents to insure that they are in SMEs according to the definition of SMEs used in this study. 212 (53%) report their employees to be between 1 and 15, 141 (35.25%) report their employees to be between 16 and 25, 44 (11%) report their employees to be 26-50, and 3 (0.75%) report their employees to be between 51 and 100.

Table 8: *Breakdown of Sample by Numbers of Employees*

Numbers of Employees	Frequency	Percentage
1-15	212	53.0
16-25	141	35.25
26-50	44	11.0
51-100	3	0.75
Total	400	100.0

Table 9 presents the business experience. 7% report that they have been running the business less than one year; 11.25% report that they have been running the business for 1-3 years; 28.5% report that they have been running the business for 4-5 years; and 53.25% report that they have been running the business over 5 years.

Table 9 : *Breakdown of Sample by Business Experience*

Business Experience	Frequency	Percentage
Less than 1 year	28	7.0
1-3 years	45	11.25
4-5 years	114	28.5
Over 5 years	213	53.25
Total	400	100.0

Table 10 presents the business revenue in a year. 23% report that their revenue is less than 1 million baht; 38.25% report that their revenue are between 1-10 million baht; 35.25% report that their revenue are between 10.01-20 million baht; and 3.5% report that their revenue are between 20.01-30 million baht.

Table 10 : *Breakdown of Sample by Business Revenue*

Business Revenue	Frequency	Percentage
Less than 1 million	92	23.0
1-10 million baht	153	38.25
10.01-20 million baht	141	35.25
20.01-30 million baht	14	3.5
Total	400	100.0

Opinions of the Respondents about Digital Infrastructure

The respondents are asked to record their opinion about the digital infrastructure based on the aspects of hardware infrastructure, software infrastructure, process infrastructure, and service infrastructure. Respondents specify their level of agreement to a statement. These items are rated by order of agreement (1 means “strongly disagree”; 2 means “disagree”; 3 means “neutral”; 4 means “agree”; and 5 means “strongly agree”). A summary of means and standard deviations of the response are presented in Tables 11 - 14.

Respondents agree that business has high speed broadband Internet, and digital gateways (mean = 3.89), business has server, storage and network infrastructure (mean = 3.91), business has private cloud system (mean = 3.87), business provides employees the standardize hardware for working such as desktop and laptop (mean = 3.93), business provides employees the mobile devices for working remotely (mean = 3.89), which has an Agree mean response (Table 11).

Table 11: Means, Standard Deviations, and Median Response with Items for the Hardware Infrastructure of Digital Infrastructure

Hardware Infrastructure	Mean	SD.	Median Response
Your business has high speed broadband Internet, and digital gateways	3.89	0.89	Agree
Your business has server, storage and network infrastructure	3.91	0.96	Agree
Your business has private cloud system	3.87	0.81	Agree
Your business provides employees the standardize hardware for working such as desktop and laptop	3.93	0.83	Agree
Your business provides employees the mobile devices for working remotely	3.89	0.93	Agree
Average	3.89	0.95	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that business provides up to date software, needed for employees to work (mean = 4.15), business has security software and updated patch (mean = 4.01), business has enterprise resource planning software to keep recording and tracking data (mean = 4.11), business uses business intelligence software (mean = 3.98), business has real time analytics software and alert (mean = 3.81), and the average (mean = 4.01), which has an Agree mean response (Table 12).

Table 12: Means, Standard Deviations, and Median Response with Items for the Software Infrastructure of Digital Infrastructure

Software Infrastructure	Mean	SD.	Median Response
Your business provides up to date software, needed for employees to work	4.15	0.65	Agree
Your business has security software and updated patch	4.01	0.93	Agree

Your business has enterprise resource planning software to keep recording and tracking data	4.11	0.72	Agree
Your business uses business intelligence software	3.98	0.61	Agree
Your business has real time analytics software and alert	3.81	0.78	Agree
Average	4.01	0.67	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that digital business helps the business keep tracking and managing customers' complaints (mean = 4.06), process infrastructure helps the business to quickly escalate and resolve the issue (mean = 3.99), process infrastructure helps the business to facilitate strategic decision making and enhances efficiency (mean = 4.05), process infrastructure helps the business to share resources and procurement creating value chain (mean = 4.04), digital business helps the business to improve the operation process (mean = 4.05), and the average (mean = 4.04), which has an Agree mean response (Table 13).

Table 13: *Means, Standard Deviations, and Median Response with Items for the Process Infrastructure of Digital Infrastructure*

Process Infrastructure	Mean	SD.	Median Response
Keep tracking and managing customers' complaints	4.06	1.09	Agree
To quickly escalate and resolve the issue	3.99	0.98	Agree
To facilitate strategic decision making and enhances efficiency	4.05	1.07	Agree
To share resources and procurement creating value chain	4.04	1.22	Agree
To improve the operation process	4.05	1.23	Agree
Average	4.04	0.81	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that service infrastructure used as ecosystem platform to integrated vendors and customers (mean = 3.98), the business used chatbot used to communicate your customers (mean = 3.78), customers are able to manage their orders or account by themselves (mean = 4.14), the service infrastructure increases mobility of employees (mean = 4.13), the business uses cloud service provide for allocating storage resources (mean = 3.55), and the average (mean = 3.97), which has an Agree mean response (Table 14).

Table 14: Means, Standard Deviations, and Median Response with Items for the Service Infrastructure of Digital Infrastructure

Service Infrastructure	Mean	SD.	Median Response
Having ecosystem platform to integrated vendors and customers	3.98	1.22	Agree
Having chatbot used to communicate your customers	3.78	1.08	Agree
Customers are able to manage their orders or account by themselves	4.14	1.27	Agree
The service infrastructure increases mobility of employees	4.13	1.01	Agree
Your business uses cloud service provide for allocating storage resources	3.65	1.42	Agree
Average	3.97	0.94	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Opinions of the Respondents about Digital Disruption

The respondents are asked to record their opinion about the digital disruption based on the aspects of technology and innovation, artificial intelligence, and customer expectation. Respondents specify their level of agreement to a statement. These items are rated by order of agreement (1 means “strongly disagree”; 2 means “disagree”; 3 means “neutral”; 4 means “agree”; and 5 means “strongly agree”). A summary of means and standard deviations of the response are presented in Table 15 - 17.

Respondents agree that technology and innovation is a factor of digital disruption, which digital technology is to create barrier the meaningful of human touch (mean =4.03), digital technology requires businesses to respond to the change more quickly (mean = 4.26), digital technology is to discourage customers to stay loyal (mean =4.23), digital technology makes business shorter life span (mean =4.28), digital technology provides competitive advantages than competitive disadvantages (mean = 3.87), and the average (mean = 4.13), which has an Agree mean response (Table 15).

Table 15: *Means, Standard Deviations, and Median Response with Items for the Technology and Innovation as Digital Disruption*

Technology and Innovation as Digital Disruption	Mean	SD.	Median Response
Digital technology is to create barrier the meaningful of human touch	4.03	1.23	Agree
Digital technology requires businesses to respond to the change more quickly	4.26	1.36	Strongly Agree
Digital technology is to discourage customers to stay loyal	4.23	1.35	Strongly Agree
Digital technology makes business shorter life span	4.28	1.34	Strongly Agree
Digital technology provides competitive advantages than competitive disadvantages	3.87	1.10	Agree
Average	4.13	0.68	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that artificial intelligence is a factor of digital disruption, which automation has driven disruption in the workforce (mean = 3.51), AI will transform the nature of work and the workplace itself (mean = 3.73), AI will be able to carry out more of the tasks done by humans (mean = 3.40), all occupations will be affected by automation (mean = 3.77), AI-driven automation would have to fully obsolete current roles (mean = 3.69), and the average (mean = 3.62), which has an Agree mean response (Table 16).

Table 16: Means, Standard Deviations, and Median Response with Items for the Artificial Intelligence as Digital Disruption

Artificial Intelligence as Digital Disruption	Mean	SD.	Median Response
Automation has driven disruption in the workforce	3.51	1.26	Agree
AI will transform the nature of work and the workplace itself	3.73	1.13	Agree
AI will be able to carry out more of the tasks done by humans	3.40	1.75	Neutral
All occupations will be affected by automation	3.77	1.43	Agree
AI-driven automation would have to fully obsolete current roles	3.69	1.07	Agree
Average	3.62	0.79	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that customer expectation is a factor of digital disruption, which digital transformation has triggered many trends in customer expectations (mean = 4.14), customer expectations reflect business in term of business strategy (mean = 4.24), personalization is the most important to focus on customer expectation (mean = 4.11), multiple partners across multiple channels

all working together to provide service value to the same shared customer (mean = 4.21), service partners in complex systems collaborate to make work for the real customer (mean = 4.17), and the average (mean = 4.17), which has an Agree mean response (Table 17).

Table 17: Means, Standard Deviations, and Median Response with Items for the Customer expectation as Digital Disruption

Customer Expectation as Digital Disruption	Mean	SD.	Median Response
Digital transformation has triggered many trends in customer expectations	4.14	0.85	Agree
Customer expectations reflect business in term of business strategy	4.24	1.03	Strongly Agree
Personalization is the most important to focus on customer expectation	4.11	1.02	Agree
Multiple partners across multiple channels all working together to provide service value to the same shared customer	4.21	1.01	Strongly Agree
Service partners in complex systems collaborate to make work for the real customer	4.17	1.08	Agree
Average	4.17	0.74	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Opinions of the Respondents about Digital Change

The respondents are asked to record their opinion about the digital change based on the aspects of digital strategy, digital skill, digital procurement, and digital tool. Respondents specify their level of agreement to a statement. These items are rated by order of agreement (1 means “strongly disagree”; 2 means “disagree”; 3 means “neutral”; 4 means “agree”; and 5 means “strongly agree”). A summary of means and standard deviations of the response are presented in Table 18 - 21.

Respondents agree that digital strategy is a factor of digital change, which business aligns digital technology plan into business plan (mean = 4.01), using digital technology is stated in the business plan in order to increase a business performance (mean = 4.05), digital technology is one of the crucial factors used to develop a business opportunity (mean = 4.17), your business acknowledges the employees to understand the transformation process (mean = 3.97), business has a new business model on digital platform (mean = 3.89), and the average (mean = 4.02), which has an Agree mean response (Table 18).

Table 18: Means, Standard Deviations, and Median Response with Items for the Digital Strategy as Digital Change

Digital Strategy as Digital Change	Mean	SD.	Median Response
Your business aligns digital technology plan into business plan	4.01	0.73	Agree
Using digital technology is stated in the business plan in order to increase a business performance	4.05	0.72	Agree
Digital technology is one of the crucial factors used to develop a business opportunity	4.17	1.05	Agree
Your business acknowledges the employees to understand the transformation process	3.97	1.10	Agree
Your business has a new business model on digital platform	3.89	1.23	Agree
Average	4.02	0.71	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that digital skill is a factor of digital change, which digital technology is the main channel used to communicate, exchange, and share information in the company (mean = 4.12), your employees are required to train up-to-date digital skill (mean = 4.02), your business

prefers to recruit tech savvy (mean = 4.11), you understand and know how to protect and secure your technology devices (mean = 4.01), digital skill is a basic and functional skill for your company (mean = 4.09), and the average (mean = 4.07), which has an Agree mean response (Table 19).

Table 19: Means, Standard Deviations, and Median Response with Items for the Digital Skill as Digital Change

Digital Skill as Digital Change	Mean	SD.	Median Response
Digital technology is the main channel used to communicate, exchange, and share information in the company	4.12	1.43	Agree
Your employees are required to train up-to-date digital skill	4.02	1.72	Agree
Your business prefers to recruit tech savvy	4.11	0.55	Agree
You understand and know how to protect and secure your technology devices	4.01	1.20	Agree
Digital skill is a basic and functional skill for your company	4.09	0.93	Agree
Average	4.07	0.77	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that digital procurement is a factor of digital change, which using advanced analytics and data-driven (mean = 4.06), using digital platform in value-chain interactions (mean = 4.13), using dash board to track business process (mean = 4.02), using digital platform for cross-functional collaboration and exchange (mean = 4.13), digital procurement is used to enhance the procurement function (mean = 4.10), and the average (mean = 4.09), which has an Agree mean response (Table 20).

Table 20: Means, Standard Deviations, and Median Response with Items for the Digital Procurement as Digital Change

Digital Procurement as Digital Change	Mean	SD.	Median Response
You are using advanced analytics and data-driven	4.06	1.11	Agree
You are using digital platform in value-chain interactions	4.13	1.43	Agree
You are using dash board to track business process	4.02	1.05	Agree
You are using digital platform for cross-functional collaboration and exchange	4.13	1.40	Agree
Digital procurement is used to enhance the procurement function	4.10	1.23	Agree
Average	4.09	0.74	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that digital tool is a factor of digital change, which using software tools to computerize business operations (mean =4.02), using social media for business marketing (mean =4.27), using data driven to optimize your online business (mean =4.23), using digital tool to communicate within the business (mean = 4.11), seeking for new digital tool to improve your business efficiency (mean =4.14), and the average (mean =4.15), which has an Agree mean response (Table 21).

Table 21: Means, Standard Deviations, and Median Response with Items for the Digital Tool as Digital Change

Digital Tool as Digital Change	Mean	SD.	Median Response
You are using software tools to computerize business operations	4.02	1.37	Agree
You are using social media for business marketing	4.27	1.14	Strongly Agree

You are using data driven to optimize your online business	4.23	1.15	Strongly Agree
You are using digital tool to communicate within the business	4.11	1.22	Agree
You are seeking for new digital tool to improve your business efficiency	4.14	1.32	Agree
Average	4.15	0.66	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Opinions of the Respondents about Digital Transformation

The respondents are asked to record their opinion about the digital transformation based on the aspects of mobility, value of data, digital commerce, and digital business model platform. Respondents specify their level of agreement to a statement. These items are rated by order of agreement (1 means “strongly disagree”; 2 means “disagree”; 3 means “neutral”; 4 means “agree”; and 5 means “strongly agree”). A summary of means and standard deviations of the response are presented in Table 22 - 25.

Respondents agree that mobility is a factor of digital transformation, which workers have an ability to work outside the office (mean =4.32), your business has virtual private network (VPN) to access the company’s data and information (mean =3.95), you can monitor the business operation in real time (mean = 4.45), and the average (mean = 4.26), which has an Agree mean response (Table 22).

Table 22: Means, Standard Deviations, and Median Response with Items for the Mobility as Digital Transformation

Mobility	Mean	SD.	Median Response
Workers have an ability to work outside the office	4.32	0.70	Strongly Agree

Your business has virtual private network (VPN) to access the company's data and information	3.95	0.67	Strongly Agree
You can monitor the business operation in real time	4.45	0.69	Strongly Agree
Average	4.26	0.74	Strongly Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that value of the data is a factor of digital transformation, which your business has software to integrate traditional data sources and new big data (mean = 4.11), you can leverage the business opportunities in big data (mean = 4.12), you have an ability to evaluate new analytic algorithms (mean = 4.10), and the average (mean = 4.14), which has an Agree mean response (Table 23).

Table 23: Means, Standard Deviations, and Median Response with Items for the Value of Data as Digital Transformation

Value of the Data	Mean	SD.	Median Response
Your business has software to integrate traditional data sources and new big data	4.11	0.79	Agree
You can leverage the business opportunities in big data	4.12	0.84	Agree
You have an ability to evaluate new analytic algorithms	4.10	0.80	Agree
Average	4.14	0.66	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that digital commerce is a factor of digital transformation, which your business has online selling and payment system (mean = 4.17), your business has online marketing

budget separated from traditional marketing budget (mean = 4.32), you have digital business strategies for the business (mean = 4.17), and the average (mean = 4.22), which has an Agree mean response (Table 24).

Table 24: Means, Standard Deviations, and Median Response with Items for the Digital Commerce as Digital Transformation

Digital Commerce	Mean	SD.	Median Response
Your business has online selling and payment system	4.17	0.54	Agree
Your business has online marketing budget separated from traditional marketing budget	4.32	0.69	Strongly Agree
You have digital business strategies for the business	4.17	0.58	Agree
Average	4.22	0.68	Strongly Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Respondents agree that digital business model platform is a factor of digital transformation, which your business runs under new business platform (mean = 4.01), you are using ecosystem to collaborate the business and their partners (mean = 4.04), you are focusing on building an application to serve the customers (mean = 4.10), and the average (mean = 4.05), which has an Agree mean response (Table 25).

Table 25: Means, Standard Deviations, and Median Response with Items for the Digital Business Model Platform as Digital Transformation

Digital Business Model Platform	Mean	SD.	Median Response
Your business runs under new business platform	4.01	0.66	Agree

You are using ecosystem to collaborate the business and their partners	4.04	0.81	Agree
You are focusing on building an application to serve the customers	4.10	0.60	Agree
Average	4.05	0.82	Agree

Note. Mean Range: 1.00-1.80 = Strongly Disagree, 1.81-2.60 = Disagree, 2.61-3.40 = Neutral, 3.41-4.20 = Agree, and 4.21-5.00 = Strongly Agree

Reliability of the Measurement Scales

Before calculating the scale scores for each construct by averaging the scores for the scale items, the scales item reliability is tested to ensure that these items measure the same construct. The reliability analysis is performed for each scale using the Cronbach's Alpha. The results of the Cronbach's Alpha tests indicate that all five scales are reliable and valid for measuring the model. The overall alpha for each scale is high and indicate strong internal consistency among its items as shown in Table 26. According to Bickman and Rog (1998), a highly reliable test will have an alpha coefficient of 0.70 or more on a scale of zero to one where a high alpha coefficient indicates high reliability. The results show that all of the overall alpha values of the factors' scales are significantly higher than 0.7. Therefore, all constructs in the conceptual framework exceed the recommended level of 0.70.

Table 26: *Summary of Scale Reliability*

Constructs	Numbers of Items	Cronbach's Alpha
Hardware Infrastructure	5	0.84
Software Infrastructure	5	0.88
Process Infrastructure	5	0.87
Service Infrastructure	5	0.84
Technology and Innovation	5	0.87
Artificial Intelligence	5	0.83
Customer Expectation	5	0.87
Digital Strategy	5	0.82

The Measurement Model and Confirmatory Factor Analysis

The measurement model is commonly applied in the social research to test the consistency of the relationship between measured variables and unmeasured variables (latent variables), which is developed from previous research. Confirmatory factor analysis (CFA) allows the determination of the overall fit of the measurement model.

Confirmatory analysis model tests the measurement assumptions, relating the indicators of the structural equation model (SEM) to the latent variables. Hence, the objective of using CFA for this study is to confirm that the conceptual framework is well supported by the theoretical concepts and the hypothesized assumptions, which it is used to measure if the data fit to the measurement models.

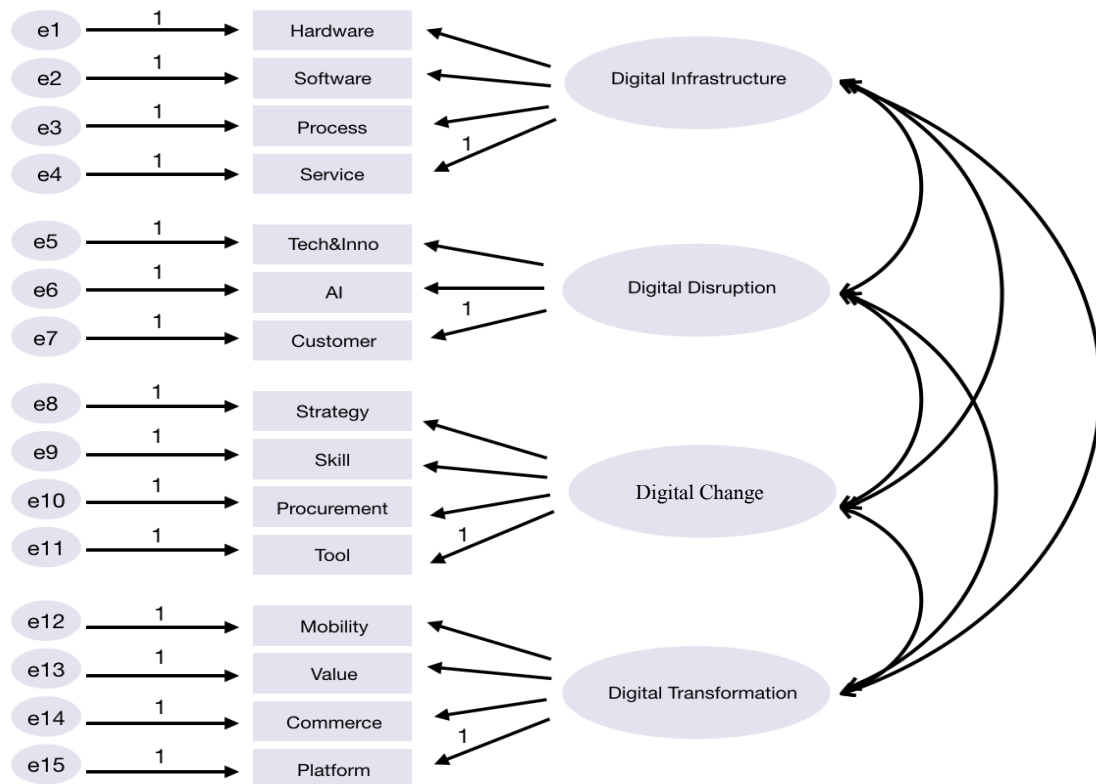


Figure 3 : Measurement Model of the Conceptual Model

Figure 3 shows the measurement model of the conceptual framework. 67 measurement items with 15 constructs (unobserved variables) are included. The results of the model fit index are as the Table 29, and Figure 4.

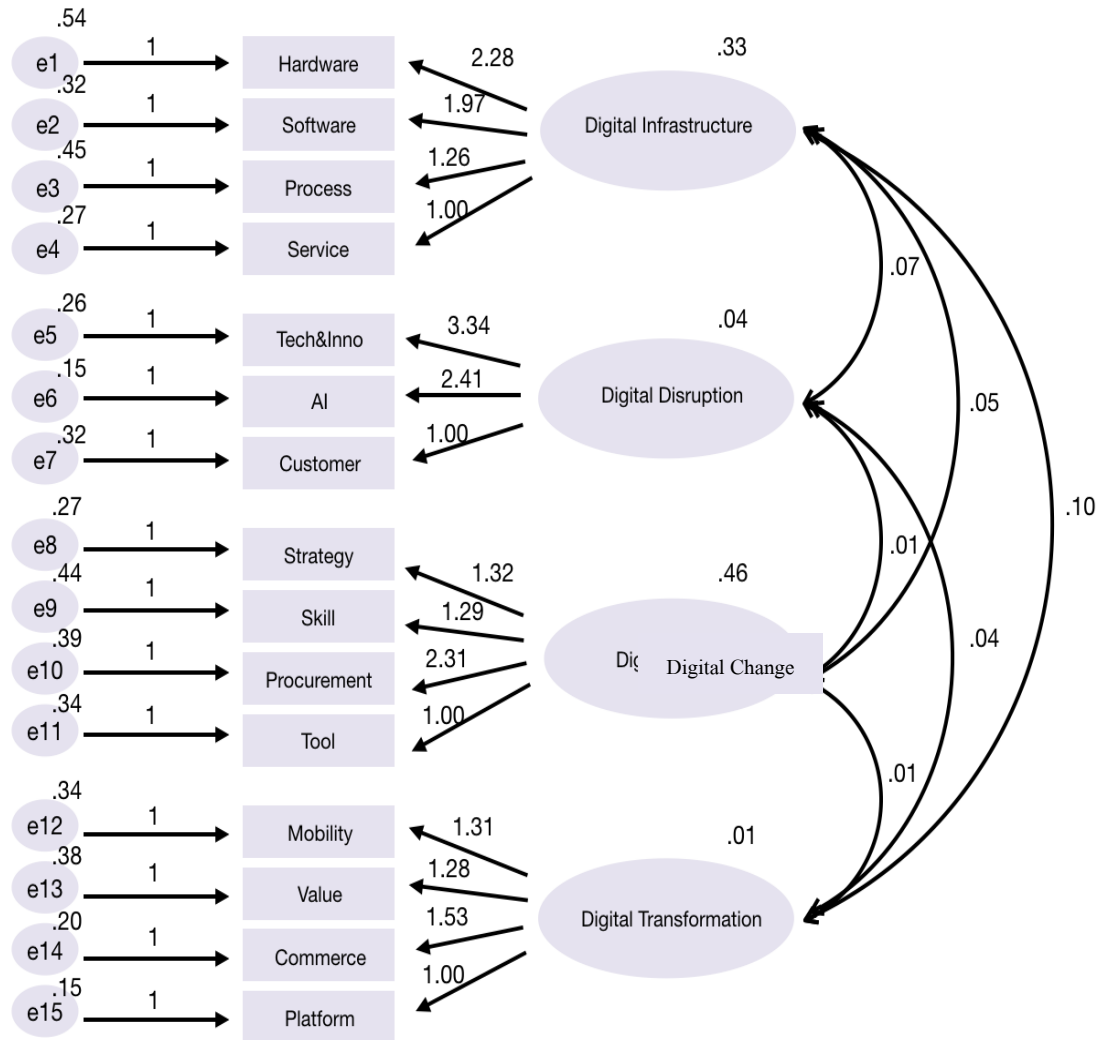


Figure 4 : Results of Measurement Model of the Conceptual Model

Table 29 : *The Results of Model Fit Index*

Chi-Square	P-Value	CMIN/DF	GFI	AGFI	NFI	IFI	CFI	RMSEA
735.243	0.000	8.720	0.861	0.850	0.824	0.875	0.833	0.104

To reduce the sensitivity of Chi-Square to the sample size, CMIN/DF (so called “normal chi-square”) is used to be the major criterion to test the fit of the measurement model. Bollen (1989) suggests that value of CMIN/DF less than 5.0 is recommended as indicating a reasonable fit. GFI index is more than 0.90 which is slightly below the recommended level is indicated the good fit of the measurement model (GFI = 0.861). Other incremental fit indexes, including adjusted goodness-of-fit index (AGFI), normed fit index (NFI), incremental fit index (IFI), comparative fit index (CFI) suggest a marginally acceptable fit for the measurement model as it is very close to the recommended level at 0.90. For Root Mean Square Error of Approximation (RMSEA), it has been suggested that a value between 0.05 and 0.08 suggests a reasonable error of approximation, and if it exceeds 0.10, it suggests a poor fit (Bollen, 1989; Kline, 2005).

However, determination of the model's fit is complicated in this context because various goodness of fit criteria has been developed to evaluate structural equation models under different assumptions. Therefore, the fit indices in SEM do not have a statistical significance test that identifies the correct model considering the sample data.

The chi-square for the overall goodness of fit test is significant (p -value = 0.000), suggesting that the data are not well fitted by the model. However, evaluations using other criteria (CMIN/DF = 8.720, GFI = 0.861, AGFI = 0.850, NFI = 0.824, IFI = 0.875, CFI = 0.833, RMSEA = 0.104) indicate that the model fits the data is not well. Therefore, the model is required to modify in order for the structural equation models to adjust a specific set of relationships among latent variables to improve the model fit.

A way in which fit can be improved is through the correlation of error terms. Correlating within-factor error is used to justify than across latent variable correlations. The researcher examines modification indices to get a sense for what might be causing the model to fit poorly, keeping

in mind that any model modification must be theoretically justifiable. According to Figure 5 and Table 30, modification indices suggest that the largest improvement to the model chi-square can be achieved.

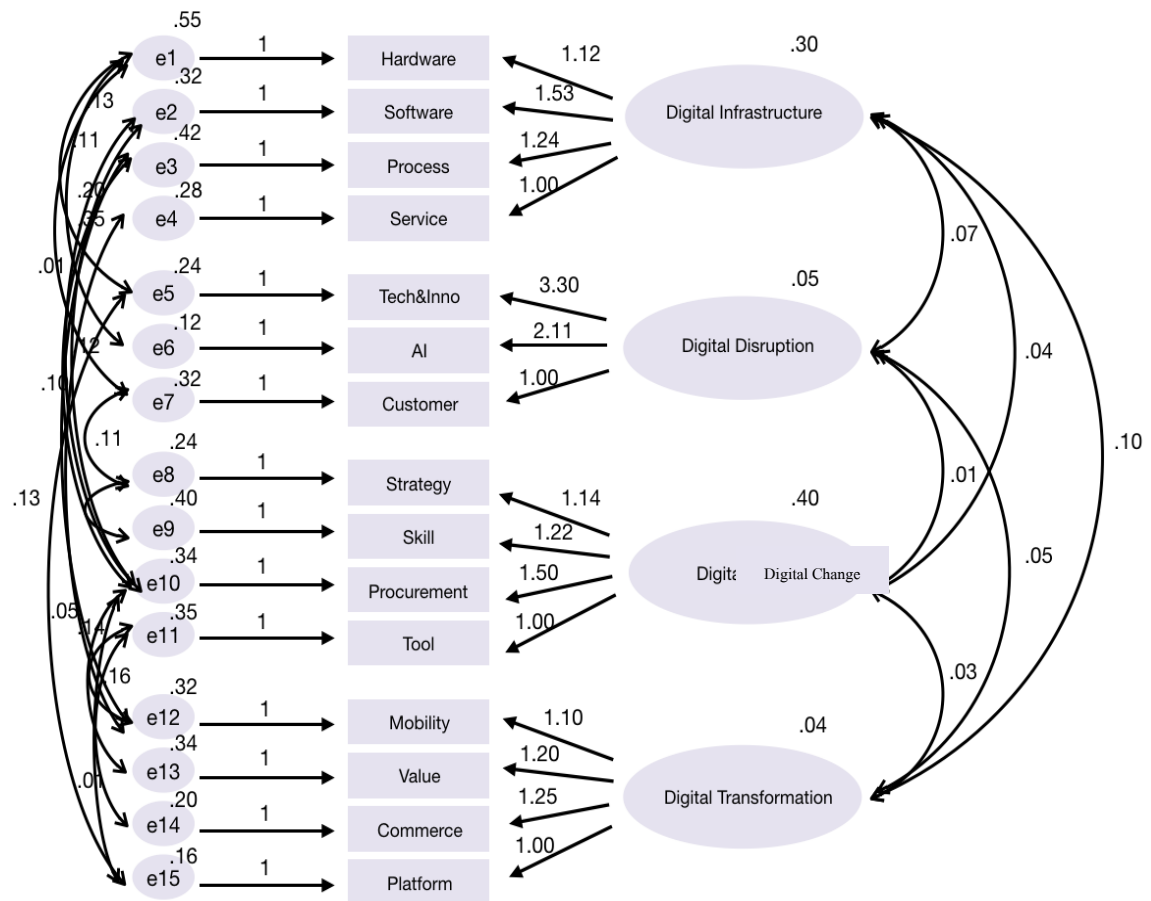


Figure 5: Results of Adjusted Measurement Model of the Conceptual Model

Table 30 : *The Results of Adjusted Model Fit Index*

Chi-Square	P-Value	CMIN/DF	GFI	AGFI	NFI	IFI	CFI	RMSEA
93.741	0.000	2.577	0.954	0.931	0.927	0.944	0.925	0.031

According to Figure 5 and Table 30, the results exhibit that all the measurements have significant loadings to their corresponding construct. Overall, the model has a satisfactory fit with GFI = 0.954, AGFI = 0.931, NFI = 0.927, IFI = 0.944, CFI = 0.925, and RMSR = 0.031. Those are all very

good, which is representing a reasonable model-data fit. Therefore, the model fit indexes for the path model indicated an acceptable approximation of the proposed relationship among the constructs and the results should be interpreted meaningfully. Furthermore, the Table 31 shows the summary of the results of model fit index, including the priori model fit, and the adjusted model fit.

Table 31: *Summary of the Results of Model Fit Index*

Fit Indices	Indication of Fit	Measurement Model		Adjusted Measurement Model	
		Value	Results	Value	Results
CMIN/DF	< 2.00	8.720	Poor	2.577	Fit
P-Value	< 0.05	0.000	Fit	0.000	Fit
GFI	> 0.90	0.861	Fair	0.954	Fit
AGFI	> 0.90	0.850	Poor	0.931	Fit
NFI	> 0.90	0.824	Poor	0.927	Fit
IFI	> 0.90	0.875	Poor	0.944	Fit
CFI	> 0.90	0.833	Poor	0.925	Fit
RMSEA	< 0.08	0.104	Poor	0.031	Fit

Hypothesis Testing

1. Hypothesis 1: Digital infrastructure is positively associated with the digital change of the Thai small and medium businesses.
2. Hypothesis 2: Digital disruption is positively associated with the digital change of the Thai small and medium businesses.
3. Hypothesis 3: Digital change is positively associated with the digital transformation of the Thai small and medium businesses.

Table 32 : *Estimates of Regression Weights*

			Estimate	S.E.	C.R.	P	Label
Digital Change	<---	Digital Infrastructure	2.217	1.012	2.322	0.00**	par_10
Digital Change	<---	Digital Disruption	2.031	1.107	2.527	0.00**	par_11
Digital Business Transformation	<---	Digital Change	1.729	0.971	2.018	0.00**	par_12

Note: * shows p-value < 0.05 ** shows p-value < 0.01

The results of hypothesis testing are reported in terms of z-value (Critical Ratio) at the level of significance of 0.05 or lower as shown in Table 32. Among the significant relationships, the standardized coefficients are 2.217 (digital infrastructure to digital change), 2.031 (digital disruption to digital change), and 1.729 (digital change to digital business transformation). The paths represent directly link in the proposed model. It can be concluded that effective digital change will greatly lead to improve digital transformation.

Therefore, the results indicate that all hypotheses are supported. All construct relationships are found to be positive. The results suggest that there is a significant relationship between digital disruption and digital change ($p < 0.05$) as the direction of the relationship is positive as the study proposed (Hypothesis 1). The results suggest that there is a significant relationship between digital infrastructure and digital change ($p < 0.05$) as the direction of the relationship is positive as the study proposed (Hypothesis 2).

Hypothesis 3 is supported as the results show a significant relationship between digital business change and business transformation ($p < 0.01$). This indicates that digital business change has a positively influence the business transformation in terms of mobility, value of data, digital commerce, and digital business model platform.

Summary

The results of measurement model analysis and path model analysis are presented in this chapter. The data set of 400 samples are collected and summarized as shown in this chapter. The results of the EFA show that cross loading items are eliminated and other measurement items are consistent with the construct validity. The results of the CFA show that the sample data are a favorable fit to the measurement model. Hence, the structural model was reasonably accepted. The results of structural path analysis indicated that all three hypotheses are statistically significant and positive.

Chapter 5

Conclusion, Discussion and Recommendations

This chapter presents a brief summary of the study, research findings. Further, the end result is discussed as the recommendations for future research.

Summary of Research

The purpose of this research is to examine the business performance of digital business transformation on small and medium enterprises in Thailand. The results from this research can be used not only by academicians in further exploring and testing factors causal linkages in business transformation, but also by practitioners for guiding the implementation.

A total of 400 usable questionnaires are obtained. The results of this study show that the SMEs expect digital business transformation to provide the customer service and feedback. SMEs agree that they are ready for the infrastructure; including hardware infrastructure (mean=3.89), software infrastructure (mean =4.01), process infrastructure (mean =4.04), and service infrastructure (mean =3.97). Furthermore, SMEs believe that their businesses are being disrupted and affected by technology and innovation (mean =4.13), artificial intelligence (mean=3.62), and customer expectation (mean = 4.17). The SMEs is planning and preparing their business by creating digital strategy (mean =4.02). They inform the significant importance of the digital skill of their workforce (mean = 4.07), they change the working operation to digital procurement (mean = 4.09), and they invest more on digital tools for daily working (mean =4.15). Respondents agree that their business needs to be transformed to mobility (mean= 4.26), they also view that digital skill is significantly important (mean= 4.07), digital procurement (mean = 4.09), and digital tools (mean = 4.15).

The results of hypothesis testing are reported in terms of z-value (Critical Ratio) at the level of significance of 0.05 or lower as shown in Table 32. Among the significant relationships, the standardized coefficients are 2.217 (digital infrastructure to digital change), 2.031 (digital disruption to digital change), and 1.729 (digital change to digital business transformation). The paths represent

directly link in the proposed model. It can be concluded that effective digital change will greatly lead to improve digital transformation.

Therefore, the results indicate that all hypotheses are supported. All construct relationships are found to be positive. The results suggest that there is a significant relationship between digital disruption and digital change ($p < 0.05$) as the direction of the relationship is positive as the study proposed (Hypothesis 1). The results suggest that there is a significant relationship between digital infrastructure and digital change ($p < 0.05$) as the direction of the relationship is positive as the study proposed (Hypothesis 2). Additionally, hypothesis 3 is supported as the results show a significant relationship between digital business change and business transformation ($p < 0.01$). This indicates that digital business change has a positively influence on the business transformation in terms of mobility, value of data, digital commerce, and digital business model platform.

Discussions and Implications

The research found out that the SMEs realized that how importance about digital infrastructure and digital disruption affecting their business operation, that would require their changes. The SMEs transformed their business model to the digitalization in order to connect with their customers and their market closer, and to distribute and enhance their businesses' performance. Many researchers found the relationship between digital technology and the business transformation, the digital tool and platform help the business to increase business performance (Karaman, 2018). Most of them focus on the digital technology relevance with the business operations for accessing the customer base, building relationships, establishing and branding the business' unique personality.

The results also reported the structural equation modeling (SEM) and hypotheses testing results on the proposed model. To summarize, three hypothesized relationships were significant at the 0.00 level and the final SEM displayed very good fit to the data. However, statistical significance and model fit are not ultimate objectives of academic research. They are basically the means to achieve the end, which is better understanding of the subject under investigation and discovery of new relationships. As mentioned, the results from this research can be used not only by academicians in further exploring and testing causal linkages in the digital infrastructure, digital disruption, and digital

change, but also by practitioners for guiding the digital transformation and the evaluation of the business operation in the digital era. This section will discuss the theoretical and practical implications of the test of each hypothesis.

Digital infrastructure has a positive relationship with digital change. The evolution of digital technologies such as cloud, mobile, analytics and social, will inevitably have an impact on IT within the businesses. The importance of infrastructure for any country is without a doubt a major driver for any country's competitiveness. These findings are also supported by those of studies such as Arnold et al. (2016) and Kiel et al. (2017) who pointed out that the value proposition, internal infrastructure management and customer relationships are mainly influenced by digitalization under the ecosystem. The interconnected ecosystem can serve as the basis for new business models – both benefitting a country's citizens and boosting the sustainable development of the economy. They can recognize that the competition for investment and talent is global, and that digital infrastructure and the business friendliness of a country are critical attributes for attracting both. Digital technology is one of the key fundamentals transforming how businesses protect, manage and secure their data. A paradigm shift of the new operating scenario is the value of data, which increases over time in the digital economy. There is a constant iterative process of data creation, processing, analysis and sharing or selling. How businesses successfully integrate emerging technologies with their existing infrastructure is one of the key challenges that chief of information technology officer (CIO) will have to address. In order to take advantage of the business opportunities that digital technologies offer, there is no doubt that the infrastructure will have to evolve, with more automation being a core requirement. However, the reality for many large established businesses is that their infrastructure has grown incrementally over several decades, which has resulted in a complex, disjointed and often inflexible infrastructure, which requires extensive manual intervention and does not necessarily lend itself to the integration of new technologies. The future infrastructure will need to provide a range of new capabilities to meet business demands. It will need to be more agile, more dynamic, and able to cope with massive scale, whilst continuing to provide security, reliability and high-availability. It should be able to self-optimize to support continuously changing workloads, and it must allow seamless access to resources that are located both on and off premise. For instance, cloud solutions have become highly appealing as

businesses look at how to scale their infrastructure. A cloud solution can significantly reduce the challenge of building out the infrastructure, which must be able to scale and retract when necessary to meet increased load and ensure availability requirements. Cloud can offer significant benefits by enabling IT to transition resources from the data center to be delivered as a service. This provides an opportunity for businesses to reduce hardware and related data center support and infrastructure maintenance costs.

Based on their perceptions of the current effects of digitalization, our respondents anticipated that digitalization would have a major impact on their business. Digital disruption is directly related to digital change. Digital Disruption describes the radical change of markets and business models through digitalization. Digital disruption refers to the set of ground-breaking changes that affect companies both as a result of the emergence of new digital technologies on the market and when they introduce them into various areas of their operations, such as production, organization or relations with their customers. Therefore, the SMEs need to adapt to changes and developments in their business environment and achieve increasingly shorter technology cycles represented triggers for digitalization activities in the businesses. Respondents indicated that the influence of digitalization would challenge existing technologies, for example, through shorter technological innovation cycles.

Practical researches and academic researches found that technology and innovation were the factors that forces the businesses to have to change the way of doing business fasters. Matzler et al. (2016) described these three steps as, first, the digitization of products and services; second, digital processes and decision making with the aid of Industry 4.0, Big Data or artificial intelligence; and, third, the transformation of the value proposition and operating model as such. Businesses recognize that they need to manage the connection between the physical and the digital world in the context of Internet of Things before they offer digital services to customers.

The key issue is that businesses have to develop strategies and roadmaps to address how they will support the enormous increase in devices and data that technology and innovation are likely to bring. Many businesses have already started on this journey by using virtualization technologies to consolidate and virtualize infrastructure resources, as well as automating build and associated processes to provide a more dynamic allocation of resources. Indeed, digital technologies

are used in the day-to-day of every company like artificial intelligence (AI). AI is the wave continually to grow and affects businesses in an increasingly forceful way. Businesses whose operation does not depend crucially on technology are rare. Larger companies, and even many smaller ones, deploy, day by day, a vast technological network that allows them to function and is a sort of great nervous system on which the activity depends. Furthermore, digitalization provides the business with opportunity to adapt and meet changing requirements in alignment with the business strategy (Mezger, 2014; Teece, 2018).

Another crucial consideration for the digital disruption is customer expectation. Customers are at the center of the digital transformation. New technologies have provided both users and companies with a multitude of opportunities to establish all kinds of relationships that were unthinkable just a few years ago such as social networks, apps, online shops, virtual communities. The tools are multiplying at the same time as personalization increases and the bond between users and companies reaches unusual levels. The increasing number of opportunities driven by digitalization also put pressure on companies to critically reflect their current strategy and to systematically and early identify new business opportunities (Kiel et al., 2016.).

Digital change is directly related to digital transformation. Digitalization and digital transformation are drivers for changes in the corporate world, because they establish new technologies based on the internet with implications for society as a whole (Unruh and Kiron, 2017). The digital technology also provides the benefits for those who are able to adapt early. Since the digital market is very different from traditional markets, new rules of the game, a wide range of possibilities, new players in the market. Digital change is a first step for preparing to digital transformation. Digital transformation is then defined as the process that is used to restructure economies, institutions and society on a system level (Unruh and Kiron, 2017). The way of conducting businesses has been changed from the physical to digital world which are converging increasingly frequently and need to work hand-in-hand, so that manufacturing companies can also become digital. Many businesses are using data and big data as the strategic resources, generating value by analyzing and managing data that can be used as a source of competitive advantage. Moreover, to achieve the digital change, the business required the hiring of (new) employees with digital competences.

According to our respondents in the automotive industry, the influence of digitalization on their firms' value propositions affects their products and services. From digital change to digital transformation, it typically delivers a new digital business model, which architecture for how a firm creates and delivers value to customers and the mechanisms employed to capture a share of that value (Teece, 2018). Businesses need to diversify from their existing industry to spread all their risks, however, digital business model is increasingly become a source of innovation and competitive advantage, which the change in a company's business model is new to the firm and results in observable changes in its practices towards customers and partners (Bouwman et al., 2017). Furthermore, digital technologies for the SMEs was viewed as an external trigger to use these technologies in their value creation processes. Digitalization could support the product development processes for value creation in the new business model platform.

Recommendations

As the finding, there are the direct effects among digital infrastructure and digital disruption and digital change. Generally, the efficiency, whereby ventures can utilize digital business through highly scalable infrastructure. To develop talent and skills throughout the organization is a fundamental action for traditional transformations which is one of the most important factors for success in a digital change effort. Therefore, the adoption of technologies plays an important role across digital transformations. Furthermore, the digital change successfully completed is on digital strategy as well. Schumacher, Erol, Sihm (2016) found that the business value derived from integrating this perspective into the company's general strategy. Therefore, from the executives and employees understanding the opportunities of digital that provides and giving them the tools to successfully drive initiatives forward (Ortowski, Ziokowski, Paciorkiewicz, 2017). Therefore, the recommendations are suggested as the followings:

1. The ability to digitally reimagine the business is determined in large part by a clear digital strategy supported by leaders who foster a culture able to change and invent the new.

2. Beside internal factor focusing, to use digital technology and develop it into the business strategies and new business models in order to listen to and better understand customer sentiment about products, brands, and companies as a whole.
3. The business that pursue successful transformations should focus on more sophisticated technologies, such as artificial intelligence, the Internet of Things, and advanced neural machine-learning techniques.
4. To develop talent and skills throughout the organization is a fundamental action for traditional transformations which is one of the most important factors for success in a digital change effort.

Limitations and Recommendations for Future Research

As with any research, this study also has its limitations. The main limitation of this research was the restricted number of informants. Since this research has some limitations, the researcher would like to make some recommendations for future study as the following:

1. Future research may investigate about the process of the digital transformation.
2. Future research may investigate the business model, and compare their performance based on offline and online activities.
3. Future research may conduct a study with more respondents or diversifying the types of businesses.
4. Further analyses are certainly needed to determine the importance and influence of digitalization concerning business strategies.

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Appendices

Appendix A
Questionnaire

**“FACTORS ENABLING THE DIGITAL CHANGE ON DIGITAL TRANSFORMATION
FOR SMALL AND MEDIUM BUSINESSES”**

Your participation in this research is strictly voluntary, and you may choose not to participate without fear of penalty or any negative consequences. Individual responses will be treated confidentially. No individually identifiable information will be disclosed or published, and all results will be presented as aggregate, summary data. Once the research is completed, you may request a copy of the results of this research by writing to the researcher at:

Assistant Professor Dr. Anupong Avirutha (*aupong.av@spu.ac.th*)

Part A: Information about Yourself and Your Business

Please check (X) in the appropriate spaces that are true about your business

1. What is your gender?

<input type="checkbox"/> Male	<input type="checkbox"/> Female
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2. How old are you?

<input type="checkbox"/> 18 – 32	<input type="checkbox"/> 33 – 40	<input type="checkbox"/> 41 – 50
<input type="checkbox"/> 51 – 60	<input type="checkbox"/> Over 60	

3. What is your highest level of education?

<input type="checkbox"/> High school	<input type="checkbox"/> College diploma
<input type="checkbox"/> Bachelor’s degree	<input type="checkbox"/> Master’s degree or higher

4. What is your marital status?

<input type="checkbox"/> Single	<input type="checkbox"/> Married
<input type="checkbox"/> Divorced	<input type="checkbox"/> Widowed

5. What is your position title?

<input type="checkbox"/> Business Owner	<input type="checkbox"/> Partner
<input type="checkbox"/> Director	<input type="checkbox"/> Manager

6. Your business industry is

<input type="checkbox"/> Manufacturing	<input type="checkbox"/> Wholesale
<input type="checkbox"/> Retail	<input type="checkbox"/> Service

7. Numbers of your employees

- 1 – 15 16 – 25 26 – 50
 51 – 100

8. Your experiences doing business

- Less than 1 year 1-3 years
 4-5 years Over 5 years

9. Approximate your company's total revenue in a year

- < 1 million 1 – 10 millions
 10.01 – 20 millions 20.01 – 30 millions

Part B: Digital Infrastructure

Please read each of the statements below about the digital infrastructure, and place X in the suitable box that most accurately reflects your opinion of specific statement. 1 means “Strongly disagree”; 2 means “Disagree”; 3 means “Neutral”; 4 means “Agree”; and 5 means “Strongly agree”.

	Hardware Infrastructure	1	2	3	4	5
10	Your business has high speed broadband Internet, and digital gateways					
11	Your business has server, storage and network infrastructure					
12	Your business has private cloud system					
13	Your business provides employees the standardize hardware for working such as desktop and laptop					
14	Your business provides employees the mobile devices for working remotely					

	Software Infrastructure	1	2	3	4	5
15	Your business provides up to date software, needed for employees to work					
16	Your business has security software and updated patch					
17	Your business has enterprise resource planning software to keep recording and tracking data					

18	Your business uses business intelligence software					
19	Your business has real time analytics software and alert					

	Process Infrastructure	1	2	3	4	5
20	Keep tracking and managing customers' complaints					
21	To quickly escalate and resolve the issue					
22	To facilitate strategic decision making and enhances efficiency					
23	To share resources and procurement creating value chain					
24	To improve the operation process					

	Service Infrastructure	1	2	3	4	5
25	Having ecosystem platform to integrated vendors and customers					
26	Having chatbot used to communicate your customers					
27	Customers are able to manage their orders or account by themselves					
28	The service infrastructure increases mobility of employees					
29	Your business uses cloud service provide for allocating storage resources					

Part C: Digital Disruption

Please read each of the statements below about digital disruption and place X in the suitable box that most accurately reflects your opinion of specific statement. 1 means "Strongly disagree"; 2 means "Disagree"; 3 means "Neutral"; 4 means "Agree"; and 5 means "Strongly agree".

	Technology and Innovation	1	2	3	4	5
30	Digital technology is to create barrier the meaningful of human touch					
31	Digital technology requires businesses to respond to the change more quickly					
32	Digital technology is to discourages customers to stay loyal					
33	Digital technology makes business shorter life span					

34	Digital technology provides competitive advantages than competitive disadvantages					
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	Artificial Intelligence	1	2	3	4	5
35	Automation has driven disruption in the workforce					
36	AI will transform the nature of work and the workplace itself					
37	AI will be able to carry out more of the tasks done by humans					
38	All occupations will be affected by automation					
39	AI-driven automation would have to fully obsolete current roles					

	Customer Expectation	1	2	3	4	5
40	Digital transformation has triggered many trends in customer expectations					
41	Customer expectations reflect business in term of business strategy					
42	Personalization is the most important to focus on customer expectation					
43	Multiple partners across multiple channels all working together to provide service value to the same shared customer					
44	Service partners in complex systems collaborate to make work for the real customer					

Part D: Digital Change

Please read each of the statements below about digital change, and place X in the suitable box that most accurately reflects your opinion of specific statement. 1 means “Strongly disagree”; 2 means “Disagree”; 3 means “Neutral”; 4 means “Agree”; and 5 means “Strongly agree”.

	Digital Strategy	1	2	3	4	5
45	Your business aligns digital technology plan into business plan					
46	Using digital technology is stated in the business plan in order to increase a business performance					

47	Digital technology is one of the crucial factors used to develop a business opportunity					
48	Your business acknowledges the employees to understand the transformation process					
49	Your business has a new business model on digital platform					

	Digital Skill	1	2	3	4	5
50	Digital technology is the main channel used to communicate, exchange, and share information in the company					
51	Your employees are required to train up-to-date digital skill					
52	Your business prefers to recruit tech savvy					
53	You understand and know how to protect and secure your technology devices					
54	Digital skill is a basic and functional skill for your company					

	Digital Procurement	1	2	3	4	5
55	You are using advanced analytics and data-driven					
56	You are using digital platform in value-chain interactions					
57	You are using dash board to track business process					
58	You are using digital platform for cross-functional collaboration and exchange					
59	Digital procurement is used to enhance the procurement function					

	Digital Tool	1	2	3	4	5
60	You are using software tools to computerize business operations					
61	You are using social media for business marketing					
62	You are using data driven to optimize your online business					
63	You are using digital tool to communicate within the business					
64	You are seeking for new digital tool to improve your business efficiency					

Part E: Digital Transformation

Please read each of the statements below about digital transformation, and place X in the suitable box that most accurately reflects your opinion of specific statement. 1 means “Strongly disagree”; 2 means “Disagree”; 3 means “Neutral”; 4 means “Agree”; and 5 means “Strongly agree”.

	Mobility	1	2	3	4	5
65	Workers have an ability to work outside the office					
66	Your business has virtual private network (VPN) to access the company's data and information					
67	You can monitor the business operation in real time					

	Value of the Data	1	2	3	4	5
68	Your business has software to integrate traditional data sources and new big data					
69	You can leverage the business opportunities in big data					
70	You have an ability to evaluate new analytic algorithms					

	Digital Commerce	1	2	3	4	5
71	Your business has online selling and payment system					
72	Your business has online marketing budget separated from traditional marketing budget					
73	You have digital business strategies for the business					

	Digital Business Model Platform	1	2	3	4	5
74	Your business runs under new business platform					
75	You are using ecosystem to collaborate the business and their partners					
76	You are focusing on building an application to serve the customers					

Biography

Name	Assistant Professor Dr. Anupong Avirutha
Date of Birth	May 2, 1979
Place of Birth	Bangkok, Thailand
Current Address	1111/40 Soi.Suthiporn Phachasongkor Rd., Din Dang, Bangkok
Position Office	Head, Digital Business Management Department, Faculty of Business Administration, Sripatum University
Education	
B.E. 2549	Doctor of Business Administration (1 st Class Honor) , Strategic Management from Argosy University, CA, U.S.A.
B.E. 2544	Master of Business Administration (1 st Class Honor), Marketing from Oklahoma City University, U.S.A.
B.E. 2543	Master of Business Administration (1 st Class Honor), Information Technology from Oklahoma City University, U.S.A.
B.E. 2542	Bachelor of Business Administration (2 nd Class Honor) , Management from University of the Thai Chamber of Commerce
B.E. 2555	Mini MBA, Digital Marketing from Nation University

