

Department of
Management

Course of International Operations and Supply Chain

Exploring Digital Supply Chain and Its Impact on Organizational Innovation; The Case of Private Hospitals in Jordan

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CHAPTER ONE

INTRODUCTION

1.1 Background

In this era of globalization and the continuous emergence of technological trends, organizational innovation has become a primary priority in the global economy. Therefore, all organizations are constantly looking for ways to innovate and enhance their performance (Naveed, et al. 2022). Today, innovation is becoming more crucial to organizational performance and it is also critical for organizations that seek to have a competitive advantage (Alves, et al. 2018). And that fast growth in technology has affected all businesses and all business functions.

This is more applicable in the healthcare sector (Hussien, et al. 2021). For instance, in the light of the importance of providing high-quality healthcare services, there is no doubt that the development of the healthcare sector has become one of the most important priorities worldwide. Today, the healthcare sector should work with high-quality and continuous improvements; this means that innovation in healthcare services is becoming inescapable (Tan, et al. 2020). Moreover, in the light of COVID-19, many public healthcare organizations are being forced to change radically. Thus, in order to continuously improve and streamline the processes within organizations, innovation is therefore required (Farzad, et al. 2020).

Supply Chain has become one of the key business functions that are impacted by the implementation of different technologies. Today, supply chains are headed towards digitalization, because of the environmental changes and the crisis that the world faces every now and then. Thus, converting the traditional supply chain into a digital supply chain (DSC). The digital supply chain is a value-added process that employs new and smart technological approaches, hence, urging innovation and value-creating (Büyükoğkan and Göçer, 2018).

Accordingly, as a result of the dynamic environment and the continuous emergence of technology, there is an incessant need to identify where digital supply chains may provide businesses and organizations with benefits and help to innovate and develop in order to maximize such gains (Nürk, 2019).

Additionally, innovation plays a big role in healthcare; it is one of the major driving forces in finding the balance between cutting costs and healthcare quality (Omachonu

and Einspruch, 2010). And digital supply chains have important implications for organizational innovation in healthcare. Digital transformation in the supply chain allows organizations to anticipate and plan to respond to risks in a timely manner. Many studies have highlighted the importance of digital supply chain (DSC) and organizational innovation, and researchers discussed its different applications and influence on organizations. But, there is a shortfall of verification regarding how the digital supply chain impacts organizational innovation (Nasiri, et al. 2020).

This research aims to analyze the potential impact of the four selected digital supply chain dimensions (Digital supplier relationships, Digital service production system, Digital inventory management, and Digital customer (patient) relationships) on organizational innovation at private hospitals in Jordan. Additionally, it reviewed the existing literature on digital supply chain (DSC) and organizational innovation.

1.2 Problem Statement

Despite the considerable advancements in the healthcare industry, inefficiencies using innovation in healthcare still exist (Thakur, Hsu, and Fontenot,2012). For example, in the times of a crisis, such as an infectious disease outbreak, hospitals are first on the scene (Liu, et al. 2018). Therefore, innovation is a need in the healthcare sector and should be prompted in hospitals at all times, especially the times of crisis, for example, the most recent crisis of the COVID-19 pandemic.

2019, the unfortunate year that had brought the world one of the most disturbing news within the 21st century so far. “Wuhan, China, recorded the first human infection with the Coronavirus (COVID-19)” was reported on the news of each nation around the globe in November 2019. Little did we know that what we expected to be “just another virus” will turn into the pandemic we know today and flip our world upside down and that we will be forced to live under strict rules of “stay at home” and social distancing for months.

The healthcare system is of substantial significance. According to the Ministry of Health, the Jordanian healthcare industry accounts for approximately 10 percent of the GDP. Like all other industries and business sectors, the healthcare system, has been affected dramatically in Jordan. The reason why this happened, it being the fact that the healthcare infrastructure was not fully ready to contest this fast-moving beast (COVID-19). One of the pandemic’s main factors that caused a burnout of the hospitals in Jordan

was the female nurses wanting to leave their jobs when they were exceedingly needed to be helping in coping with this virus outbreak, and the reason for their desire to leave their jobs, was due to the work pressure they faced and the absence of social life (Algunmeeyn, et al. 2020). Furthermore, to be able to help in fighting this life-threatening virus, all humanity and at the head of it the medical labor, needed to be provided with protective equipment and medical supplies (Khot, 2020). However, one of the main issues that were faced in managing this crisis is the manufacturing of essential healthcare supplies and equipment, in addition to distributing these supplies. And, due to the lockdown of cities and the closing of borders, the healthcare supply chains were disrupted, by that leading to challenges in the production/manufacturing, supplying, and distribution of preventive and medical equipment, which resulted in a massive lack of such primary equipment and relatively increased costs (Iyengar, 2020).

The Jordanian healthcare system was seriously knocked in 2020 due to the proceeding problem of coronavirus (COVID-19), restrictions in cross-border shippings, and health regulations. This led to issues in the healthcare supply chains resulting in delays in the provision and delivery of primary and preventive equipment, such as face masks and shields, gloves, pharmaceuticals, oxygen ventilators, and later, vaccines. This was in the times when they were maximum needed, and the reason behind this is that Jordan heavily relies on imports from abroad (Khot, 2020).

Definitely, the unusual crisis of COVID-19 is forcing all organizations to find a way to survive. In order for hospitals to survive and get the healthcare system back to normal (to pre-crisis position), innovation should be reinforced and prompted throughout the entire healthcare system, including healthcare supply chains (Lee and Trimi, 2021).

Therefore, for healthcare organizations and hospitals to overcome any crisis and be able to increase their survival, innovation should be rapidly implemented and scaled to provide solutions to health delivery challenges posed by crises (Crawford and Serhal, 2020).

Innovation is the process of developing something new and solving a problem by applying solutions through adding value, making a change, and introducing new ideas. Lee and Trimi (2021) stated that all organizations constantly need innovation, but innovation is critically crucial in times of crisis and emergencies. Which lead us to the

understanding of the importance of innovation in the healthcare supply chain during the coronavirus pandemic to shape a survived life for the healthcare system and services.

Digitalizing the supply chains, could be one effective way for enhancing innovation in hospitals. In the light of the COVID-19 pandemic and social distancing, digital supply chains play an effective role in keeping organizations and all parties of the healthcare supply chain connected, by providing up-to-date needed information (Iyengar, at al. 2020). Several studies have shown the effective role digitalization plays in the dynamic, constantly changing environment and how it contributes to achieving positive organizational performance.

Thus, generally, the main problem of this research is to determine how digital supply chain (Digital supplier relationships, Digital Service Production Systems, Digital Inventory Management, and Digital Customer (patient) relationships) impacts organizational innovation at private Hospitals in West Amman, Jordan.

1.3 Research Questions

1.3.1 Main question

The main research question that this research attempts to answer is:

What is the impact of Digital Supply Chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on Organizational Innovation at Private Hospitals in Jordan?

1.3.2 Sub-questions

Based on digital supply chain dimensions, the main question is divided into the following four sub-questions:

- 1- What is the impact of digital supplier relationships on organizational innovation at Private Hospitals in Jordan?
- 2- What is the impact of digital service production system on organizational innovation at Private Hospitals in Jordan?
- 3- What is the impact of digital inventory management on organizational innovation at Private Hospitals in Jordan?
- 4- What is the impact of digital customer (patient) relationships on organizational innovation at Private Hospitals in Jordan?

1.4 Research purpose and objectives

The main purpose of this research is to investigate the impact of Digital Supply Chain (Digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation at Private Hospitals in West Amman, Jordan. Furthermore, this research aims to achieve the following objectives:

- 1- To determine the impact of digital supplier relationships on organizational innovation at Private Hospitals in Jordan.
- 2- To determine the impact of digital service production system on organizational innovation at Private Hospitals in Jordan.
- 3- To determine the impact of digital inventory management on organizational innovation at Private Hospitals in Jordan.
- 4- To determine the impact of digital customer (patient) relationships on organizational innovation at Private Hospitals in Jordan.

1.5 Significance of the Research

The research has additional significance and value, that emerges from the following theoretical and practical considerations:

1.5.1 Theoretical significance

To the knowledge of the researcher, few studies have looked into the relationship between the digital supply chain and organizational innovation in the healthcare system; this research investigated the impact of the digital supply chain on organizational innovation at Private Hospitals, particularly in Amman, Jordan. As well, this research contributes to providing recommendations and suggestions to researchers in the healthcare sector, by clarifying the impact of each dimension of the digital supply chain on organizational innovation. And it contributes to providing recommendations and suggestions to researchers in the healthcare sector, particularly, private hospitals, and is seeking to fill the contextual gap in the growing literature.

1.5.2 Practical significance

The practical significance of this research stems from what is expected to be provided by information that can benefit the healthcare system in Jordan. It also could be used to give recent recommendations for managers and IT staff in private hospitals, on the

importance of the digital supply chain and its effect on organizational innovation, to help them in decision making in times of crisis.

Therefore, the importance of this research comes from the following Scientific and Practical Considerations:

1. Highlighting the importance of the digital supply chain in private hospitals in Jordan and its impact on organizational innovation.
2. Supporting researchers in discussing the significance of digitizing hospitals' supply chains to the Jordanian healthcare sector.
3. Helping managers and policymakers to take advantage of the advantages of the application of digital supply chain and give them recommendations.

1.6 Research Hypotheses

Based on the research questions and according to the conceptual framework, the following hypotheses are developed and will be tested:

1.6.1 Main hypothesis

H0: There is no significant impact of the Digital Supply Chain on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

Based on Digital Supply Chain dimensions, the main hypothesis is divided into the following sub-hypotheses:

1.6.2 Sub-hypotheses

H01: There is no significant impact of Digital Supplier Relationships on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

H02: There is no significant impact of Digital Service Production System on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

H03: There is no significant impact of Digital Inventory Management on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

H04: There is no significant impact of Digital Customer (Patient) Relationships on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

1.7 Conceptual Framework

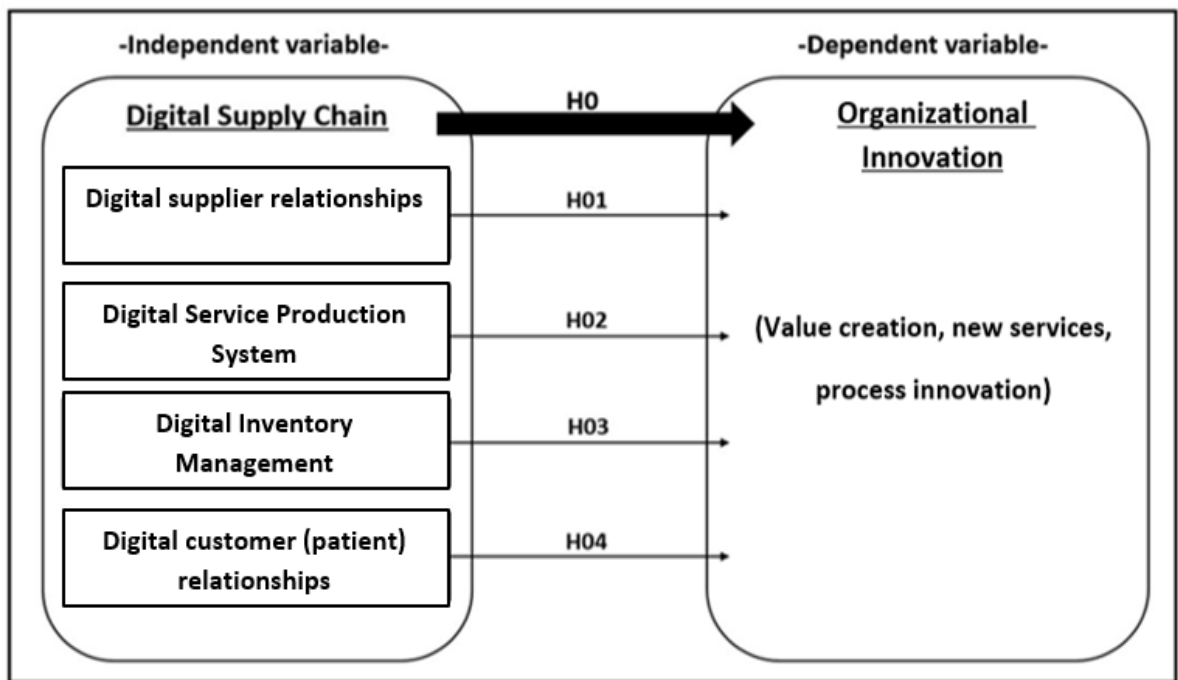


Figure 1.1 Conceptual framework

Source: Model was developed based on previous studies (Sadeghi and Jafari, 2021; Farahani, et al. 2017).

1.8 Operational definitions

Digital supply chain: Is the automation of the supply chain through applying different electronic technologies to all the processes and communications of the supply chain, starting from the point of acquiring inputs and all the way to the end customer/consumer in order to enhance collaboration and connectivity between all parties of the supply chain, through digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships.

Digital supplier relationships: It is the process of improving the organization's operations through building long-term collaborations and partnerships between the party who supplies inputs and goods (or services) and the party who purchases these inputs and goods (or services).

Digital service production system: It is an integrated, technology-based system that enables the information of resources, processes, and services to be linked, observed, and be taken through processes of change.

Digital inventory management: Is the process of automated supervision and control of inputs (raw materials), components, assemblies and finished products that a business keeps at hand to be able to meet customer/ patient demand.

Digital customer (patient) relationships: It is the process of building trust and lasting connections with customers (patients) by providing them with personalized interactions through the use of electronic technology.

Organizational innovation: Is the process of creating organizational value, by approaching existing ideas, services, and processes in new ways, thus resulting in a change, added value, and increased organizational performance.

1.9 Research Limitations

Human limitation: The research was carried out on managers and IT staff of the Private Hospitals in West Amman, Jordan.

Place limitation: The research was carried out on the private hospitals that are located in West Amman, Jordan.

Time limitation: The research was implemented and finished in the second semester of the academic year 2021/2022.

CHAPTER TWO

LITERATURE REVIEW AND PREVIOUS STUDIES

2.1 Introduction

In this chapter, the main variables and sub-variables of digital supply chain and organizational innovation will be discussed and defined, in addition to the relationship between the variables, and some related previous studies.

2.2 Literature Review

2.2.1 Supply Chain

The supply chain is a complicated system, that consists of multiple practices and activities, which are influenced by several parties, such as suppliers, producers, wholesalers, distributors, retailers, and final customers (Wieland, 2021). Organizations, customers, and stakeholders operating through a supply chain create value through supply chain management (Estampe, et al. 2013). Supply chain can be defined as a system of interconnected organizations and activities that exchange information and provide a corporation with the required inputs to produce and distribute finished goods or services to the final customer, to achieve customer satisfaction (Muñoz-Villamizar, et al. 2019). Quesada, Gazo, and Sanchez (2012), also referred to the supply chain as the operational excellence that results in better delivery of value and remarkable experiences for customers.

Supply chains are divided into a service supply chain and a manufacturing supply chain. In manufacturing supply chains, the physical handling of a product leads to centralized and standardized procedures. Counter to manufacturing supply chains, in service supply chains, human labor is the major element in the process of value delivery, where decisions are made directly and the change and uncertainties in outputs are higher due to the active involvement of humans. Moreover, efficiencies in service supply chains are focused on capacity management, resource flexibility, service performance, and information and cash flows (Sengupta, Heiser, and Cook, 2006).

Supply chain in the service sector is defined as the network of the transformed resources, inputs, suppliers, processes, information, transactions, consumers, and funds for the purpose of delivering the service to customers (Elgazzar and Elzarka, 2017). And healthcare supply is one example of the service supply chains. In the healthcare sector, supply chain is defined as a part of the healthcare system that is fundamental and essential

in providing the best quality of medical care under the finest conditions to patients (Lee, Lee, and Schniederjans, 2011).

Therefore, supply chain is considered to be one of the most important organizational factors in improving the effectiveness of the interaction between all the elements of the business chain and in enhancing the communication with customers by delivering value.

2.2.2 Healthcare supply chain

Most organizations widely implement supply chain management. And over the past few years, the healthcare industry has been facing challenges such as being confronted with rising costs. Supply chain strategies enable healthcare systems to strategically manage and continually control the desired objectives as a vital management tool and vehicle for success (Mathur, et al. 2018).

Hospital supply chains are distinct from traditional industrial supply chains in many aspects because hospitals are complex organizations that rely on the flow of materials, products, and services to satisfy the needs of the parties who work with the patients and serve them (Mathur, et al. 2018). In addition, the healthcare supply chain is frequently fragmented and difficult to manage. The reason for this is that the procedure involves manufacturers, insurance firms, hospitals, providers, group purchasing organizations, and regulatory authorities. However, hospitals and medical offices may save money in the long run by improving the efficiency of the healthcare supply chain (Min, 2014). However, to get a clearer understanding, the typical structure for healthcare supply chains can be found in **Figure 2.1** (Shah, 2004; Morton, 2003). Beginning with the medical product producer, things are made and shipped to a distribution center. Then depending on the goods, hospitals can either buy directly from the manufacturer or distributor or through a group purchasing organization that negotiates with the manufacturer on their

behalf. Then the medical products are subsequently shipped to the healthcare organization to be stocked for clinicians and patients (Min, 2014).

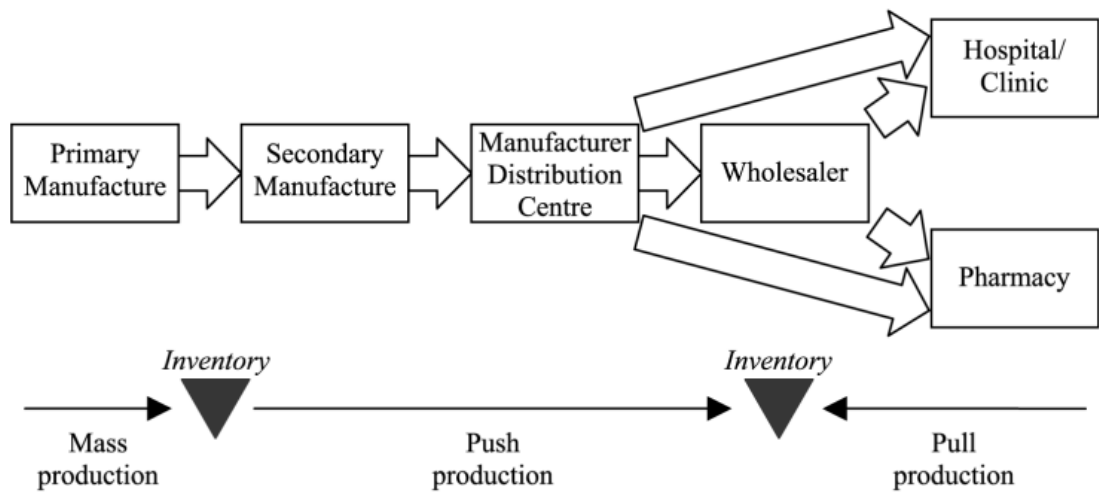


Figure 2.1 Healthcare supply chain structure (Shah, 2004; Morton, 2003).

As known, one of the main organizational functions is supply chain management; consequently, the key activities in healthcare supply chain management include monitoring and supporting the flow of medications, medical supplies and equipment, and medical services from manufacturer to patient (Min, 2014). Moreover, there are numerous benefits to a well-functioning supply chain in healthcare, including improved workflows, more effective treatment, and happier and satisfied patients (Manrodt and Schott, 2016).

However, it is common for the healthcare supply chain to encounter issues such as product expiration, increasing demand for certain types of inventory, shortages, and seasonal availability swings. Also, lack of automation in operations and erroneous data reporting are among the issues faced (Manrodt and Schott, 2016). Therefore, as a way to overcome this gap managers need to introduce automation and digitalization approaches to improve the performance of the healthcare supply chain (Beaulieu and Bentahar, 2021).

2.2.3 Digitalization and Supply Chain

The business environment is facing a continuous dynamic change and rapid technological growth, by that making many supply chains unprepared to get along with this environment of high levels of technological rise. Thereby, forcing corporations and supply chain managers to center their attention towards finding new ways of increasing the linkages and connections between all supply chain members by introducing and

enabling up-to-date processes (Agrawal and Narain, 2018). New digital technologies are appearing day-to-day and directing all business processes toward digitalization; therefore transforming the traditional supply chain into a digital supply chain (DSC) as well (Tavana, et al. 2022; Farahani, et al. 2017).

The evolution of the digital supply chain

A supply chain is traditionally organized as a series of acts that are performed one after the other. The material moves from suppliers to the final assembly, while information is transmitted from the customer to the suppliers. The information does not reach every member at the same time; instead, the information from the previous step of the process is passed on to each member in the chain. This limits the process's visibility and flexibility, as well as its capacity to respond to client demand in real-time (Iskanius, 2006). Greis and Kasarda (1997) explain the differences of traditional supply and digital supply shown in **figure 2.2**.

Traditional Supply Chain

Digital Supply Chain

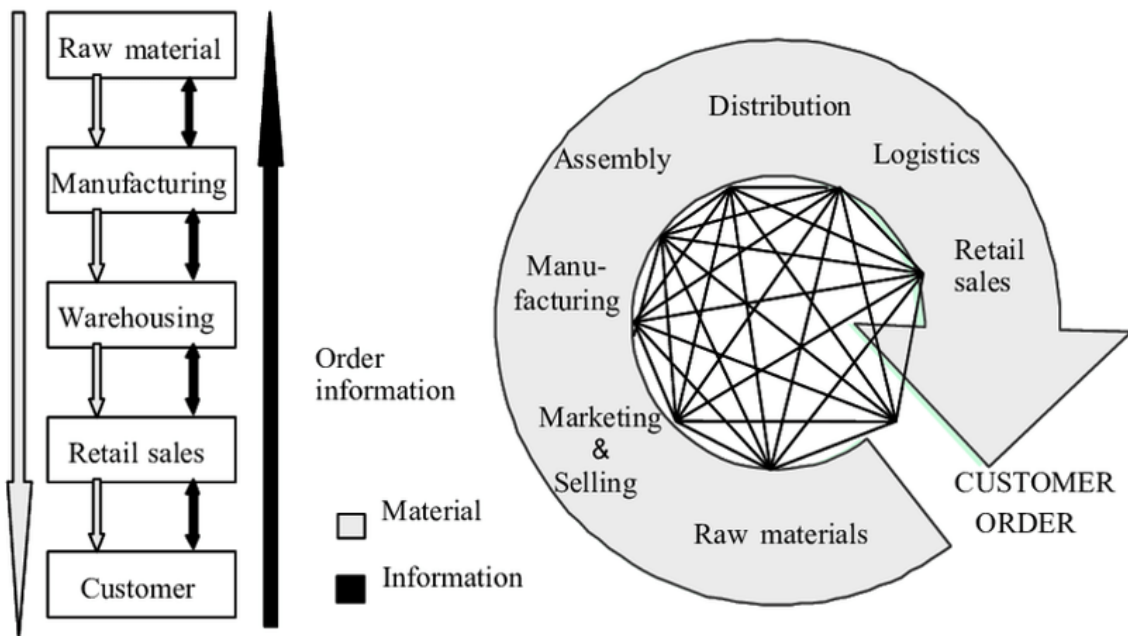


Figure 2.2 Traditional supply chain versus the digital supply chain (Greis and Kasarda, 1997).

The term “digital” which was added to the supply chain, is highly related to virtuality; meaning that the traditional supply chain has been transformed into a “virtual supply chain”. As a result of the “virtual supply chain” and its key components (containing information collection and gathering, systemization, selection, processing, distribution,

exchange, analysis and offering), a digital supply chain (DSC) has emerged (Garay-Rondero, et al. 2020).

Digitalization, including digital platforms and the emergence of new technologies, plays a big role in enhancing the communication and information sharing between the members of the supply chain (Iddris, 2018). And the digital structure of the supply chain represents an ongoing process that gathers customers' actual decisions in real-time and transmits them directly to other network participants (Iskanius, 2006). Thus, blurring the lines between the digital and physical worlds and erasing traditional organizational boundaries (Sen and Sengupta, 2020). This type of structure promotes synchronized communication among many members (Iskanius, 2006). Hence, resulting in creating value, achieving integration between all members, and increased performance (Agrawal and Narain, 2018).

Integration in supply chain allows organizations and suppliers to work collectively in order to simplify and streamline logistics and distribution activities by using a standardized and centralized system. As a result, all third-party participants within an integrated supply chain should benefit from their involvement (Agrawal and Narain, 2018; Banerjee, 2018). Also, organizations could more proactively identify areas of possible risk before an issue arises, or have a faster notice and respond to any disruption, by embracing digital technology and expanding real-time visibility into every component of the value chain (Tasnim, 2020). As a result, sharing and growing information are vital to improving supply chain efficiency (Topal and Sahin, 2018). Therefore, knowledge management can improve communications with suppliers, ultimately increasing efficiency and reducing costs (Wong and Wong, 2011).

Iddris, 2018; Xue, et al. (2013) described the digital supply chain (DSC) as a system that is shared between many organizations in order for the firms to digitize their processes of communication, transaction, and cooperation with their suppliers and supply chain members. According to Agrawal and Narain (2018), the digital supply chain (DSC) is changing the traditional supply chain process into automated activities by using new innovative technologies throughout the entire process of the supply chain, by that enhancing the communication and integration between all members.

Furthermore, digital supply chain (DSC) is defined as the development of information systems and the use of innovative technologies boosting the integration and

agility of the supply chain, hence improving customer service and the organization's long-term performance (Ageron, Bentahar, and Gunasekaran, 2020).

Additionally, digital supply chain (DSC) benefits include cost-effectiveness of services and value-creation activities that benefit many actors in the ecosystem, including businesses and their suppliers, employees, and customers. And it is identified by the strategic and operational exchange of information (financial, production, design, research, and/or competition) amongst suppliers in order to improve communication between the actors of the members (Korpela, Hallikas, and Dahlberg, 2017). Finally, supply chain management is about managing the relationship with the upstream and downstream activities to improve the flow of materials, money, and information. It is also an effective way to improve organizational innovation and performance. And this could be enhanced by adopting digital technologies or by digitizing supply chains that help in identifying and reducing possible risks, thus improving the effectiveness and efficiency of management of these relationships (Gharakhani, et al. 2012; Tasnim, 2020).

2.2.4 Dimensions of Digital Supply Chain

In their research, Farahani, Meier and, Wilke (2017) stated that every supply chain consists of a series of processes that are carried out to obtain inputs or raw materials, transform them into final products, store them as finished products inventories, and finally distribute them to the final customers. **Figure 2.3** shows that they have confirmed that the digital supply chain is measured by six dimensions which are suppliers, production, inventory and logistics, customers, information technology, and performance measurement.

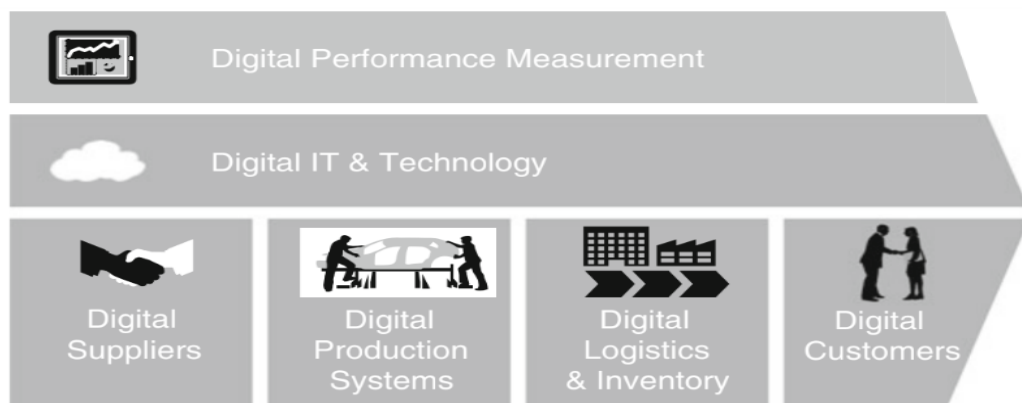


Figure 2.3 Six dimensions of digital supply chain management (Farahani, Meier, and Wilke, 2017).

Also, Sadeghi and Jafari (2021) divided supply chain management as a discipline into four main dimensions; which are supplier, logistics and inventory, production, and supplier, and two secondary dimensions, technology, and performance measurement. **Figure 2.4** shows the dimensions of the digital supply chain.

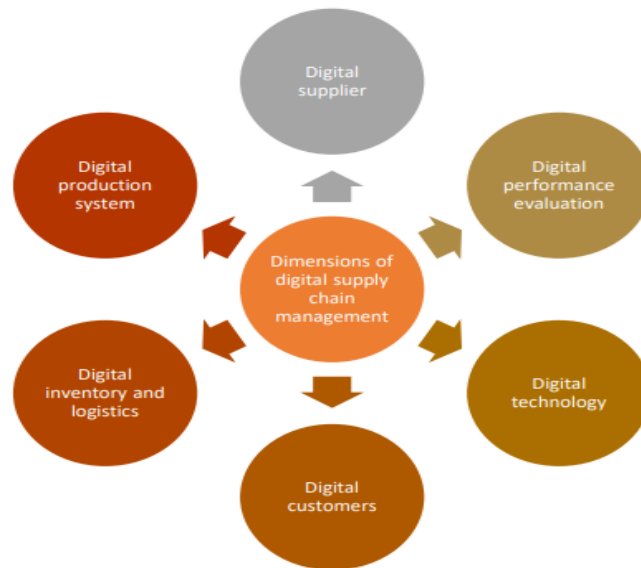


Figure 2.4 Dimensions of the digital supply chain (Sadeghi and Jafari, 2021).

This research focuses on private hospitals which are a part of the healthcare industry. Therefore, it is valuable to look into how today’s digital technologies are influencing service encounters between customers (patients) and medical service providers in the healthcare industry (Lee and Yoon, 2021). Accordingly, the digital supply chain in this research is measured through four dimensions, which are supplier, production, inventory, and customer; since they are more compatible with supply chains in the service sector (Yap and Tan, 2012; Lin, et al. 2010). And the following four sub-variables for digital supply chain were chosen:

2.2.4.1 Digital supplier relationships

Suppliers are now considered an essential source of innovation in an increasingly competitive environment. Long-term collaborations and partnerships allow businesses and organizations to tap into suppliers' expertise in order to improve their operations. Moreover, in the future, the supplier will no longer be only another link in the supply chain, but will also encourage change, innovation, and digitization as an internal resource of the organization (Fröhlich and Steinbiß, 2020) .

In the Digital Era, management emphasizes on the importance of business-to-business (B2B) supplier–buyer relationships (Obal and Lancioni, 2013). Digitalization contributes to developing new relationships between the supplier and the buying firm, thus creating a value-added partnership (Scuotto, et al. 2017) .

According to Oswald and Kleinemeier (2017) the digital supplier relationship is defined as building a network between supply chain partners (supplier-buyer) by automating the supply chain purchasing process, for the purpose of exchanging data regarding the sales and purchase orders. Also, the digital supplier relationships are referred to as the automated integration and communication between organizations and suppliers in the upstream flow of the supply chain, through exchanging electronic data, thus, adding value across the entire supply chain (Korpela, et al. 2017) .

In summary, digital supplier relationships are automated business-to-business (B2B) relationships between the supplier and the buying organization through interchanging digitized data concerning the inputs (raw materials), purchase orders, and sales, for the purpose of adding value through the entire chain.

2.2.4.2 Digital Service Production System

Global supply chains, including manufacturing and production systems, are operating in environments of continuous dynamism and change. In order to maintain effectiveness and empower pre-eminence in the production networks and systems, digital technologies are developed. This emergence of digitalization in the production systems resulted in new and advanced processes in manufacturing operations (Chien, et al. 2014).

Various businesses are using and developing digital production. Digital production is a method of carrying out activities and making decisions in a virtual environment using digital models and simulations rather than real prototypes or trials (Choi, et al. 2015). Also, it is considered to be critical for adaptation and is based on tools and techniques for engineering, control, supervision, and network management (Hirsch-Kreinsen, 2016). Hence proved, that a digital production system brings together complex production processes across departments and minimizes paper procedures, which can be prone to errors and repetitive information (Bi, 2021).

Furthermore, digital production systems aid in saving time and money, as well each stakeholder benefits from the use of digital production systems because they provide them with faster and more accurate data. This increases the efficiency of processes while

also improving the overall quality of organizational decision-making and accelerates innovation inside the organization. (Bi, 2021).

Also, the evolution of new-generation information and communication technologies, has switched the production mode from mass production to mass individualization (Ding, et al. 2019). Additionally, Shinohara, et al. (2017) defined the digital manufacturing system as a mechanism for integrating the traditional manufacturing with the automated digital technologies for structuring the production process.

According to Ding, et al. (2019) a production system is a set of integrated equipment and human resources that perform value-added production operations on a starting input, part, or set of parts. Lastly, a digital production system is also defined as the process of applying digital technologies to the manufacturing of a product and to the production of services, by linking multiple systems and procedures throughout all functions and departments in the organization (Bi, 2021).

2.2.4.3 Digital Inventory Management

Inventory management is a crucial part of efficient supply chain management, which can be the foundation for a company's success (Copacino, 2019; Wang, Chen and Xie, 2010). According to Godana and Ngugi (2014), inventory management is defined as all the activities required for managing the number (quantity) of items in stock from all levels (Inputs or raw materials, semi-finished materials, and finished goods) in order to maintain the availability of sufficient supplies.

The advancements in digital technology create a fully integrated system all over the supply chain, thus, giving clearer visibility and reduced inventory levels which results in enhancing the organization's management of inventory as a whole (Agrawal and Narain, 2018; Godana and Ngugi, 2014). As well, the digital supply chain inventory management choices are known to be based on inventory data received from automated or manual control systems (Hugos, 2018).

Additionally, product designers, material suppliers, local manufacturers, and logistics providers may all connect on new production platforms enabled by digital technology and additive manufacturing (Song, et al. 2020).

Finally, digital inventory management is the automated process of managing and controlling the organization's inputs, components, and finished products to meet it is

customers' demands. Also, by using digital inventory management systems, merchants and shippers can gain control and insight over existing inventory and prepare for future inventory needs.

2.2.4.4 Digital Customer (Patient) Relationships

Digital communication channels between a business and its customers have been formed as a result of the mobile internet and social media. Also, technological advancements have transformed the way businesses interact and communicate with their customers (Goworek, et al, 2016). Furthermore, progress in digitalization and technological advancements reinforce customer communication and ease the reach for customer data. This increased customer data availability will as a result allow organizations to imply more personalization in the production of products and services that will lead to better organization of relationships with customers, and later to reach the point of creating long-lasting relationships (Libai, et al. 2020).

Heinonen and Michelsson (2010), stated that customer initiative is typically vital for building a relationship in a digital context. This means that digital channels are employed more frequently in business-to-customer (B2C) relationships than they are in business-to-business (B2B) relationships. Also, in many circumstances, the consumer can learn about, acquire, and consume a service digitally without having to contact the company, and as a result, all connections can be made through digital ways. As stated above, this tends to be more common in business-to-consumer (B2C) partnerships when the customer learns about the offering and obtains information digitally before contacting a relevant service provider. It could be due to the growing usage of self-service technology, which allows customers to purchase and consume services from a distance from the service provider (Sharma, et al. 2021).

Accordingly, digital customer relationship is referred to as the process of building and creating automated digital communication channels for building relationships between any company and its customers, thus, allowing both parties to communicate and make transactions without time or place boundaries (Goworek, et al. 2016).

2.2.2 Organizational Innovation

Innovation is complicated, ambiguous, to some degree disorganized, and prone to a variety of changes. In order to satisfy economic, technological, and other types of constraints (all at the same time) innovation is difficult to quantify and requires close

coordination of enough technical knowledge and outstanding market judgment. The innovation process must be understood as a sequence of changes in a comprehensive system, including the market environment, manufacturing facilities and expertise, and the social surroundings of the innovation organization (Kline and Rosenberg, 2010).

To properly manifest innovation and realize its benefits, it's important to understand that innovation is three things: an outcome, a method, and a mindset. Product/service innovation, process innovation, business model innovation, supply chain innovation, and organizational innovation are all examples of innovation as an outcome. The way in which innovation should be organized so that outcomes may be realized is called innovation as a process, and it encompasses both an overall innovation process and a new product or service development process. Internalization of innovation by individual members of the company, where innovation is implanted and embedded, as well as the formation of a supportive organizational culture that allows innovation to flourish, are addressed by innovation as a mindset (Kahn, 2018).

At the technological and scientific frontiers, the forces of advancement frequently present options for designing new products, increasing the performance of existing ones, or producing and providing those products and services at a lower cost (Kline and Rosenberg, 2010).

Kahn (2018), stated that changes in the organization are addressed by organizational innovation. Such changes may occur in organization structure, new forms of management, new processes, new products or services and work environments.

Organizational innovation is one of the major factors affecting the company's performance (Wang and Chen, 2020). Organizational innovation, also called managerial innovation and administrative innovation, is a way of making a change to the organization; this change can be in the organization's structure, the work environment, or by approaching new ways of processes and products (Alves, et al. 2018; Kahn, 2018). Organizational innovation is also a way of prospering organizational growth and enhancing organizational performance (YuSheng and Ibrahim, 2019).

According to Wikhamn (2019), organizational innovation is defined as a process of including new techniques in the firm's business practices, for example in supply chain management, in a way that has not been included earlier in the organization. It could also

be defined as a method of acquiring a new idea, management tool, process, or behavior to the existing management or business practices (Damanpour, 2014).

Dimensions of Organizational Innovation

In addition to the dimensions used for the digital supply chain, the literature was reviewed to determine which dimensions of organizational innovation are the most suitable for the current research, considering that organizational innovation is the second basic pillar of this research. It was found that the most relevant dimensions to measure organizational innovation are process innovation and service innovation or new services (Guerola-Navarro et al. 2021). In addition, value creation is highly associated with innovation and is one of its key elements (Wikhamn, 2019; Kathy, et al. 2009). Accordingly, three dimensions for organizational innovation were established.

Value Creation

The purpose of innovation is to create value for the organization (Lee and Trimi, 2018). Value can be defined in a variety of ways, including incremental enhancements to existing products, the development of entirely new products and services, and cost reduction. Organizations strive to create value because their capacity to innovate successfully and effectively determines their survival, development, and ability to compete in a continuously changing market (business) environment (Kathy, Lyn, and Faith, 2009).

Thus, for organizations to be able to create value and innovation in the continuously changing market environment, the long-held beliefs about value creation and how innovation actually occurs these days need to be reconsidered—in other words, success strategies need to be updated. Meaning that the expectation of the individualized feedback of the customers may be combined with the new organizational structures, as well as the new organizational structures to boost value creation and innovation (Johannessen and Olsen, 2010).

In summary, value creation is the organization's offering of something of value to customers/ consumers, to receive something valuable in return. And it involves innovation that develops or raises the consumer's valuing of the benefits of using a service or consuming a product.

New Services

The creation of new services, new combinations of services, service elements, and technology development are all under the “new services” dimension of organizational innovation (Glückler, 2017; Van der Aa and Elfring, 2002).

New services or services innovation, are innovations that are intangible in nature and they focus on developing new processes, new procedures, and customer experiences and feedback in established organizations (Lusch and Nambisan, 2015). For example, hospitals are large, complex service organizations that offer a wide range of services that both support and influence the quality of treatment and care they deliver to the patient, where the patient is a consumer of a complicated mix of services, and efforts should be made to meet and satisfy the needs of the customer. Accordingly, the introduction of new types of clinics within some hospitals and “the hospital at home”, are examples of new services/ services innovation in the (healthcare) organizations (DeCherrie, et al. 2021; Djellal and Gallouj, 2007).

Process Innovation

Process innovation is a key component of most innovation and economic growth theories (Reichstein and Salter, 2006). Management and organization are affected by process innovations. They alter connections among organizational members and have an impact on rules, roles, procedures, and structures, as well as communication and exchange between organizational members and the environment (Walker, 2014).

Reichstein and Salter (2006), referred to process innovation as the new elements introduced into an organization's production or service operations input materials, task specifications, work and information flow mechanisms, and equipment used to produce a product or offer a service with the goal of achieving lower costs and/or higher product or service quality (Kogabayev and Maziliauskas, 2017) . Also, process innovation can be defined as the introduction of novel production methods, management approaches, and technology that can be utilized to improve production and management processes (Crossan and Apaydin, 2010).

Lastly, the delivery of services is the focus of process innovation (Snyder, 2016). They encompass the organizational and technological components of the organization, as well as inter-organizational linkages (Walker, 2014).

2.2.3 Relationship between digital supply chain and organizational innovation

Currently, organizational innovation capability is considered one of the main critical success capabilities of any organization, including health care organizations (hospitals). Where the continuous dynamic change in the external environment imposes on the organizations to keep pace and constant development (Chen and Cates, 2018). Today, technology development and digitization have contributed to improving organizations' ability to innovate and develop by enhancing their abilities to collect and analyze a larger volume of information and acquire new knowledge and skills, including the ability to explore and improve the ability for research and development and continuous development (Heredia, et al. 2022).

Lately, some researchers investigated the link between the digital supply chain and organizational performance (Hanaysha and Alzoubi, 2022; Büyüközkan and Göçer 2018). Today, innovation is becoming more crucial to organizational performance (Alves, et al. 2018).

According to Neutzling, et al. (2018); Williams, et al. (2002), organizational innovation drives changes in the entire organizational structure and systems, as well as the employees' behavior, which will have an impact on the entire supply chain's operations. Besides, the increasing requirements for cooperation and connectivity between the supply chain members would generate a significant impact on organizational innovation (Yap and Tan, 2012).

Previous supply chain management literature has focused on manufacturing industries, with little attention paid to the service and healthcare industries (Chong, et al. 2011). It was stated that supply chain management mainly focuses on product quality. In the service industry, the benefits of innovation in service and quality are contingent on effective supply chain management. (Williams, et al. 2002).

The challenge arises from the quick environmental shift, which causes firms to become increasingly focused on responding to environmental changes. And such capability is influenced by whether or not the organization can make innovation (Yap and Tan, 2012).

As a result of the emergence of Industry 4.0 and digital transformation, organizations are increasingly integrating digital transformations and technologies into their supply

chain operations. If they have the correct tools and strategies, they can effectively manage their supply chains (Ghadge, et al. 2020).

Therefore, for more effective management and improved performance of the supply chain, as well as information sharing in real-time, information and digital technologies should be implemented (Wang, et al. 2020; Chong, et al. 2011).

Based on what is mentioned above, supply chain management, including information and digital technologies, can help organizations optimize their value in the business market, and has a positive impact on the organization's innovation (Shieh, 2010).

2.3 The Difference between the Current Research and Previous Studies

Many researchers studied the relationships between digital supply chain, competitive advantages, innovation, and organizational performance, Nasiri, et al. (2020), analyzed how an organization's digital transformation can power technology and accordingly impact the performance in the relationships. Büyüközkan and Göçer (2018), studied the importance of digitalization of supply chain operations on the organization's performance and hence the competitive advantage of the organization. Agrawal and Narain (2018), presented seven dimensions of the digital supply chain and studied how using innovative digital technologies positively impacts creating a sustained competitive advantage for organizations. Ageron, Bentahar, and Gunasekaran (2020) reviewed the current developments in digital supply chain management, along with challenges and future opportunities.

However, despite the fact that a large number of studies have been reviewed to find the correlation between variables, few studies are directly relevant to this topic. Therefore, the researcher has pooled independent variables from various studies that indicate a possible impact on the dependent variable. So, this research reviews pieces of literature to explore digital supply chain and its impact on organizational innovation. The conceptualization of digital supply chain is extracted based on the summarization of previous studies.

In summary, the following is what differentiates the current research from previous research and studies:

1. This research might be considered one of the few pieces of research which explores the impact of digital supply chain on organizational innovation in the Jordanian healthcare industry, particularly in private hospitals in West Amman.
2. The majority of past research has taken place in countries outside of the Arab world. While the current research is being carried out in one of the Arab World's countries, Jordan.
3. This research focused on the healthcare sector, particularly private hospitals, which are considered to be part of the service sector. While other studies were focusing more on other sectors, mainly manufacturing and industrial.
4. The topic of digital supply chain, its concepts, and dimensions has few studies and is considered as relatively new. Therefore, the research aims to increase awareness

about the role of digital supply chain in enhancing and boosting organizational innovation.

5. Most of the previous research has focused on the impact of the traditional supply chain practices (suppliers, internal processes and operations, and customers' integrations) on organizational performance or competitive advantages; while the current research is focused on the impact of digital supply chain dimensions (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation.
6. This research was conducted during exceptional circumstances, in the coronavirus pandemic (COVID-19).
7. The current research findings are compared to those of previous research to highlight the similarities and differences.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter includes the research design, population and sampling, data collection methods, research tool, statistical techniques in data analysis, and validity and reliability tests.

3.2 Research design

The current research is descriptive research; it tempted to examine the relationship between digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) and organizational innovation (value creation, new services, and process innovation) at the private hospitals in Jordan. The research began with a review of the literature to develop a model for measuring the impact of digital supply chain on private hospitals in Jordan. Subsequently, a questionnaire was developed, which was used for the purpose of data collection. Next, the collected data were checked and coded on SPSS (Statistical Package for the Social Sciences). Then, validity and reliability were tested and the correlation between variables was calculated, Finally, the hypotheses were tested using multiple regressions.

3.3 Population and Sample

The research population consisted of managers (Top-level, Middle-level, and Lower-level managers) and IT staff working at private hospitals in Amman, Jordan. The researcher relied on using a purposive sampling technique to collect data from respondents; which is a method adopted by researchers to obtain information and collect data from a specific segment of the whole targeted that is capable of providing information, either because they are easier to reach, or of their location (Amman, Jordan), and because they meet the research criteria. Accordingly, (6) medium and large hospitals (due to the number of beds) were selected, namely: Istishari Hospital (130 beds), Arab Medical Center (150 beds), Ibn AlHaytham Hospital (200 beds), The Specialty Hospital (250 beds), Islamic Hospital (273 beds), and Jordan Hospital (300 beds), and the questionnaire was distributed to managers and IT staff.

3.4 Data Collection Methods

For the purpose of this research, the researcher gathered the data from two main sources: primary data and secondary data.

Primary data

Primary data collected from managers and IT staff working at Private Hospitals in Jordan using a questionnaire, which was based on previous literature and experts to actualize the current research.

The researcher prepared a questionnaire of two types, a paper questionnaire (distributed and collected by hand) and an online questionnaire using (Google forms), which were distributed and published to employees in the managerial cadres and IT department in cooperation with Human Resources Management and Quality Assurance departments. Thus, approximately (300) questionnaires were published and distributed, of which only (217) responses were received and a total of (204) were valid for analysis because of the pressure and workload of the hospitals' managers.

Secondary data

Secondary data collected from different sources such as books, articles, journals, academic research, dissertations, and the Internet, to build a strong theoretical foundation and research direction.

3.5 Research Instrument (Tool)

The questionnaire:

The questionnaire was developed based on previous studies, the research model, and a questionnaire referee was done by academics through face validity, and it consists of the following three sections:

- The first section contains the demographic characteristics related to gender, age, educational qualification, job position, and years of experience.

- The second section contains the independent variable (Digital supply chain) and it includes four sub-variables: digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships. And five questions were used to measure each sub-variable.
- The third section contains the dependent variable (Organizational innovation) and it includes: value creation, new services, and process innovation. And six questions were used to measure the dependent variable.

The research adopted the Five Point Likert Scale, shown below in **table 3.1** and all variables (sub-variables) were measured by suitable questions rated from (1 to 5) for the sake of giving the respondents (managers and IT staff of the private hospitals) the flexibility in the selection of their actual perceptions.

Table 3.1 Likert Scale

Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	2	3	4	5

The purpose of designing the questionnaire is to reflect the main aim of the research objectives, research model, and hypotheses. The researcher interviewed a panel of judges from academic institutions (Universities) to referee the questionnaire, where some of the interviews were held in offices, some were by email and phone calls, and discussed the topic of the research to develop/ adjust the questionnaire. The review was undertaken by five internal faculty members and eight external reviewers from five Jordanian Universities (Al-Ahliyya Amman University, The University of Jordan, Zarqa University, Mutah University, and Al-Zaytoonah University). The list of reviewers is presented in **Appendix (1)**. Thus, the phrasing of various paragraphs has been improved and corrected according to the academic judges' revisions and criticisms.

3.6 Statistical Techniques in Data Analysis

The Statistical Package of Social Sciences (SPSS) was used to conduct descriptive and inferential analysis and test hypotheses in order to answer the research questions and test hypotheses using the following statistical methods:

3.6.1 Descriptive Statistics

Descriptive statistics used to display the characteristics of the sample members and describe their answers. Types of descriptive statistics tests and their use:

- Frequencies and percentages and arithmetic mean; which are applied to compute the relative frequency distributions of the sample members' characteristics as well as their responses to the questionnaire statements and to describe the research sample's perspectives on the research variables and to assess the significance of the statements in the questionnaire.
- Standard deviation; is employed as one of the dispersion measures to determine how far the sample members replies differ from their arithmetic mean.

3.6.2 Inferential Statistics

Inferential statistics used to apply the statistical methods and indicators. Types of inferential statistics and their use:

- Multiple linear regression analysis; is used to test the effect of independent variables on the dependent variable.
- Cronbach alpha test; is used to test the research tool (questionnaire) stability.
- Pearson correlation; is used to measure the strength and direction of the linear relationship between two variables.
- Variance inflation factor (VIF); is used to test for non-interference between the research independent variable and the power of the research model.

3.7 Validity and reliability

3.7.1 Validity

Validity simply implies measuring what is supposed to be measured and ensuring that the data produced represents the intended investigation area (Taherdoost, 2016). An assessment regarding the clarity, relevance, and suitability of the questionnaire was completed by academics in the same field of research in the faculty of administrative and financial sciences of the University of Petra through face validity. Based on their helpful suggestions, some elements were added and others were removed. Others were modified to improve the research instrument by making them more precise.

3.7.2 Reliability

The degree to which a measurement of phenomena produces a stable and constant result is referred to as reliability. The term "reliability" also refers to the capacity to repeat

anything. A test, for instance, is considered to be dependable if repeated measurements taken under the same conditions yield the same result (Taherdoost, 2016).

Cronbach's alpha, McDonald's h, Revelle's beta, and Sijtsma's ECV are examples of internal consistency reliability measurements. However, Cronbach's alpha is the most often utilized for reliability when making use of Likert scales (Oktavia, et al 2018). Hence, Cronbach's alpha coefficient will be employed as the measure of the instrument's internal consistency reliability in this research.

Table 3.2 Reliability Statistics

	Cronbach's Alpha	N of Items
Digital Supplier Relationships	.856	5
Digital Service Production System	.868	5
Digital Inventory Management	.897	5
Digital Customer (Patient) Relationships	.880	5
Organizational Innovation	.914	6

Acceptable Cronbach's Alpha values range from 0.70 to 0.95, according to various studies. A small Cronbach's Alpha value may be caused by a small set of questions, inadequate item inter-relatedness, or diverse conceptions (Tavakol and Dennick, 2011). **Table 3.2** clarifies that the values of Cronbach's Alpha for the variables of the research are all within an acceptable range of reliability.

CHAPTER FOUR
DATA ANALYSIS AND HYPOTHESES TESTING

4.1 Introduction

This chapter covers the findings of the statistical analysis for the data obtained by the questionnaire and the testing of the suggested research hypotheses. In addition, several methods have been used in order to analyse the data, mainly, descriptive analysis, correlation and collinearity statistics, multiple regression analysis. In the descriptive analysis the mean, standard deviation, and importance degree were calculated for digital supply chain (Independent variable) and organizational innovation (Dependent variable). Correlation and collinearity statistics have been used to explore the relationship between variables and check the multicollinearity assumption. In the last section, multiple regression analysis was used to test the suggested hypotheses of research.

4.2 Demographic Profile of Respondents

Table 4.1 illustrates the frequencies of demographic characteristics of participants (gender, age, educational qualification, job position (managerial position), years of experience).

Table 4.1 Frequencies of Demographic Variables of Participants

		Frequency	Percent
1. Gender	female	94	46.1%
	male	110	53.9%
	Total	204	100.0%
2. Age	Less than 30	53	26.0%
	Less than 40	82	40.2%
	Less than 50	65	31.9%
	60 and above	4	2.0%
	Total	204	100.0%
3. Educational Qualification	College diploma	45	22.1%
	Bachelor's	117	57.4%
	Master's	32	15.7%
	PhD	10	4.9%
	Total	204	100.0%

		Frequency	Percent
4. Job Position (Managerial position)	Top-level manager (CEO, president, vice-president)	8	3.9%
	Middle-level manager (Head of department)	77	37.7%
	Lower-level managers (Office manager, supervisor)	75	36.8%
	IT / Support staff	28	13.7%
	other	16	7.8%
	Total	204	100.0%
5. Years of experience	10 or less	87	42.6%
	11 – 20	76	37.3%
	21 – 30	38	18.6%
	Above 30	3	1.5%
	Total	204	100.0%

Table 4.1 clarifies the descriptive analysis results of the demographic characteristics of the participant. It is obvious from the frequencies in the table that (40.2%) of the participants were aged between (30 and 40) years which indicates the main focus age of the research. On the other hand, the frequency of the respondents' gender was approximately equal where (53.9%) of the research participants were male, and (46.1%) were female. Regarding the level of education; more than half of the participants have a bachelor's degree qualification (57.4%). Concerning the distribution of research respondents according to years of experience; the table shows that the highest percent of experience is 10 years or less (42.6%), followed by the experience from 11 -20 years (37.3%), then from 21-30 years (18.6%), and finally above 30 (1.5 %). In conclusion, the analysis of the job title represents that 54 (37.7%) of the participants are middle-level managers (head of department), (36.8%) from lower-level managers (Office manager, supervisor), and (13.7%) IT / Support staff. The results of the demographic analysis above show that the majority of the respondents are in the subject of the research and have job positions that qualify them to make a decision.

4.3 Digital Supply Chain Descriptive Analysis (Independent Variable)

Descriptive statistics were calculated by extracting the mean, standard deviation, and importance degree as demonstrated in the following subsections.

4.3.1 Digital Supplier Relationships Descriptive Analysis

Table 4.2 clarifies the digital supplier relationships variable importance level according to the mean values obtained by the respondent's answers to the related questions, where the mean values of the questions range between (3.789- 4.162) and the standard deviation values range between (.8333- .9767) with a high average mean of (3.930) and standard deviation value of (.7286) that indicates a high importance level of digital supplier relationships in the private hospitals sector in Jordan.

Table 4.2 Digital Supplier Relationships

	Mean	Std. Deviation	Importance
1. The hospital uses digital channels (e.g. emails) to develop relationships with suppliers	4.162	.976	High
2. The hospital seeks to hire individuals responsible for electronic demand and supply planning of medical supplies.	4.015	.833	High
3. The hospital uses modern digital technologies that ease the collection of supplier data.	3.882	.898	High
4. The hospital seeks to use up to date technologies to speed up transactions with suppliers.	3.804	.936	High
5. The hospital updates its digital platforms regularly to avoid any delays regarding receiving medical products and equipment from suppliers.	3.789	.925	High
Digital Supplier Relationships	3.930	.728	High

More specifically, the findings in the table above confirm that the highest mean value was obtained by the statement “The hospital uses digital channels (e.g. emails) to develop relationships with suppliers” with a mean value of (4.162) and a standard deviation value of (.976). Whereas the lowest mean value was obtained by the statement “The hospital updates its digital platforms regularly to avoid any delays regarding receiving medical products and equipment from suppliers” with a mean value of (3.789) and a standard deviation value of (.925). However, the lowest mean value is still high and thought high

in terms of level which confirms the high level of agreement among respondents. In addition, the in-between statements' mean values are all within the range of high importance such as the statements that ask if the hospital seeks to hire individuals responsible for electronic demand and supply planning of medical supplies and the one that investigates the usage of modern digital technologies in the hospital which ease the collection of supplier data, where the two statements measured mean values are (4.015), and (3.882) consequently. Thus, it could be concluded from the descriptive statistics concerning the digital supplier relationships statements that the variable is considered with high importance from the participants' perspective.

4.3.2 Digital Service Production System Descriptive Analysis

Table 4.3 clarifies the digital service production system variable importance level according to the mean values obtained by the respondent's answers to the related questions, where the mean values of the questions range between (3.926- 4.21) and the standard deviation values range between (.758- .799) with a high average mean of (4.037) and standard deviation (.630) that indicates a high importance level of the digital service production system in private hospitals sector in Jordan.

Table 4.3 Digital Service Production System

	Mean	Std. Deviation	Importance
6. The hospital uses a digital system(s) to provide health services.	4.211	.762	High
7. The hospital offers e-services to expand its existing health services.	4.103	.758	High
8. The digital system used by the hospital helps to develop the productivity of its services.	4.000	.775	High
9. The hospital's automated service production system enables it to monitor services related to patients.	3.946	.795	High
10. The hospital relies on automated technologies for producing higher quality health services.	3.926	.799	High
Digital Service Production System	4.037	.630	High

More specifically, the findings in the table above confirm that the highest mean value was obtained by the statement “The hospital uses a digital system(s) to provide health services” with a mean value of (4.211) and a standard deviation value of (.762). Whereas the lowest mean value was obtained by the statement “The hospital relies on automated technologies for producing higher quality health services” with a mean value of (3.926) and a standard deviation value of (.799). However, the in-between statements' mean values are all within the range of high importance such as the statements that seek to offer e-services to expand their existing health services in the private hospitals sector and the one that asks if the hospital's digital technology aids in increasing the productivity of its operations, where the two statements measured mean values are (4.101), and (4.000) consequently. Thus, it could be concluded from the descriptive statistics concerning the digital service production system statements that the variable is considered with high importance from the perspective of the participants.

4.3.3 Digital Inventory Management Descriptive Analysis

Table 4.4 clarifies the digital inventory management variable importance level according to the mean values obtained by the respondent's answers to the related questions, where the mean values of the questions range between (3.931- 4.21) and the standard deviation values range between (.722- .839) with a high average mean of (4.055) and standard deviation (.668) that indicates a high importance level of digital inventory management in the private hospitals sector in Jordan.

Table 4.4 Digital Inventory Management

	Mean	Std. Deviation	Importance
11. The hospital uses a computerized digital system for managing and controlling its inputs and outputs.	4.211	.7224	High
12. The hospital uses a digital inventory system for improved management of medical supplies in stock.	3.931	.8394	High

13. The hospital is able to manage large amounts of medical inventory due to using a digital inventory system.	3.966	.8148	High
14. Digital systems used by the hospital reduces costs related to inventory management.	3.985	.8093	High
15. Digital inventory management helps in inventory reduction issues among hospital staff (e.g., loss).	4.181	.7825	High
Digital Inventory Management	4.055	.6686	High

In more detail, the findings in the table above confirm that the highest mean value was obtained by the statement “The hospital uses a computerized digital system for managing and controlling its inputs and outputs” with a mean value of (4.211) and standard deviation value of (.7224). Whereas the lowest mean value was obtained by the statement “The hospital is able to manage large amounts of medical inventory due to using a digital inventory system” with a mean value of (3.966) and a standard deviation value of (.8148). However, the lowest mean value is still high and thought high in terms of level which confirms the high level of agreement among respondents, besides the in-between statements mean values are all within the range of high importance such as the statements that describe reducing inventory difficulties among hospital workers, reducing the hospital costs related to inventory management and adopting digital inventory system for better management of medical goods in stock. Thus, it could be concluded from the descriptive statistics concerning the digital inventory management statements that the variable is considered with high importance from the perspective of respondents.

4.3.4 Digital Customer (Patient) Relationships Descriptive Analysis

Table 4.5 clarifies the digital customer (patient) relationships variable importance level according to the mean values obtained by the respondent's answers to the related questions, where the mean values of the questions range between (3.975- 4.127) and the standard deviation values range between (.8002- .870) with a high average mean of (4.029) and standard deviation (.689) that indicates a high importance level of digital customer (patient) relationships in the private hospitals sector in Jordan.

Table 4.5 Digital Customer (Patient) Relationships

	Mean	Std. Deviation	Importance
16. The hospital uses digital channels to develop relationships with patients.	3.990	.800	High
17. Digitalization enhances communication with patients, particularly regarding services (e.g. making an appointment) and feedback processing.	4.127	.867	High
18. The computerized system that the hospital uses helps to facilitate the medical procedures for the patient.	4.054	.833	High
19. The hospital uses modern digital technologies that ease the collection of patients' data.	3.975	.870	High
20. Having one integrated digital communication system improves the communication with patients and their experience.	3.995	.815	High
Digital Customer (Patient) Relationships	4.029	.689	High

In more detail, the findings in the above table confirm that the highest mean value was obtained by the statement “Digitalization enhances communication with patients, particularly regarding services (e.g. making an appointment) and feedback processing” with a mean value of (4.127) and standard deviation value of (.867). Whereas the lowest mean value was obtained by the statement “The hospital uses modern digital technologies that ease the collection of patients data” with a mean value of (3.975) and a standard deviation value of (.870). However, the lowest mean value is still thought high in terms of level which confirms the high level of agreement among respondents, additionally, the in-between statements' mean values are all within the range of high importance such as the statement “The computerized system that the hospital uses helps to facilitate the medical procedures for the patient” which ranked second with a mean value of (4.054). Accordingly, it could be concluded from the descriptive statistics concerning the digital

customer (patient) relationships statements that the variable is considered with high importance from the perspective of respondents.

To conclude, the four dimensions of digital supply chain variable (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) all achieved a high level of importance from the viewpoint of respondents in the Private Hospitals in Jordan with the overall mean values for the four dimensions range between (3.930) for the digital supplier relationships to (4.055) for the digital inventory management.

4.4 Organizational Innovation Descriptive Analysis (Dependent Variable)

The mean, standard deviation, and importance degree were also used in the descriptive analysis of the dependent variable, organizational innovation as shown in section (4.4.1).

4.4.1 Organizational Innovation Descriptive Analysis

Table 4.6 clarifies the organizational innovation variable importance level according to the mean values obtained by the respondents' answers to 6 questions related to the variable. As shown in the table the mean values of the questions range between (3.892-4.113) and standard deviation values range between (.776- .841) with a high average mean of (4.019) and standard deviation (.674) reflecting the high importance level of organizational innovation in the private hospitals sector in Jordan from the respondents' perspective.

Table 4.6 Organizational Innovation

	Mean	Std. Deviation	Importance
21. The hospital uses digital systems on a continuous basis to boost innovation.	3.971	.8417	High
22. Digital relationships with suppliers reinforce value creation in the relationships among the hospital and other parties to encourage organizational innovation.	3.892	.780	High
23. The use of digital channels improved the internal processes in the hospital.	4.054	.776	High

24. Using digital technologies across the supply chain boosts value creation such as enhancing the speed of communication.	4.113	.807	High
25. The hospital provides innovative resources for the development of new services.	4.029	.818	High
26. Supply chain digitalization encourages organizational changes that promote innovation in the hospital (e.g. improved health policies and practices).	4.054	.819	High
Organizational Innovation	4.019	.674	High

More precisely, the findings in the table above confirm that the highest mean value was obtained by the statement “Using digital technologies across the supply chain boosts value creation such as enhancing the speed of communication” with a mean value of (4.113) and a standard deviation value of (.807). followed by the statement “The use of digital channels improved the internal processes in the hospital” and “Supply chain digitalization encourages organizational changes that promote innovation in the hospital (e.g. improved health policies and practices)” with the same mean value (4.054). Whereas the lowest mean value was obtained by the statement “Digital relationships with suppliers reinforce value creation in the relationships among the hospital and other parties to encourage organizational innovation” with a mean value of (3.892) and standard deviation value of (.7804). However, it is very important to mention that the lowest mean value (3.892) is still thought high in terms of level which confirms the high level of agreement among respondents on the importance of the dependent variable. Accordingly, it could be concluded from the descriptive statistics concerning the organizational innovation statements that the variable is considered with high importance from the perspective of respondents.

4.5 Adequacy of the Data Analysis for Testing Hypotheses

4.5.1 Correlation Analysis

This research aims to investigate the impact of using a digital supply chain on organizational innovation in private hospitals in Jordan, consequently, correlation analysis is used in order to analyze the relationship among the variables of the research.

Table 4.7 Correlations

		Digital Supplier Relationships	Digital Service Production System	Digital Inventory Management	Digital Customer (Patient) Relationships	Organizational Innovation	
Digital Supplier Relationships		Pearson Correlation	1	.628* *	.566**	.585**	.707**
	Sig. (2-tailed)		.000	.000	.000	.000	.000
	N	204	204	204	204	204	204
Digital Service Production System	Pearson Correlation	.628**	1	.671**	.622**	.659**	
	Sig. (2-tailed)	.000		.000	.000	.000	
	N	204	204	204	204	204	
Digital Inventory Management	Pearson Correlation	.566**	.671**	1	.547**	.625**	
	Sig. (2-tailed)	.000	.000		.000	.000	
	N	204	204	204	204	204	
Digital Customer (Patient) Relationships	Pearson Correlation	.585**	.622**	.547**	1	.726**	
	Sig. (2-tailed)	.000	.000	.000		.000	
	N	204	204	204	204	204	
Organizational Innovation	Pearson Correlation	.707**	.659**	.625**	.726**	1	
	Sig. (2-tailed)	.000	.000	.000	.000		
	N	204	204	204	204	204	
**. Correlation is significant at the 0.01 level (2-tailed).							

Table 4.7 presents the results of the correlation analysis between the independent variables on the dependent variable. According to the results in the table, it is obvious that there is a significant positive relationship between the digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) and organizational innovation, with correlation coefficients values range between (0.625, digital inventory management) and

(0.726, digital customer (patient) relationships), and significant values at 5% level for are all the correlation coefficients.

Digital supply chain dimensions showed a significant positive relationship with each other according to the results in **table 4.7**. For instance, the correlation coefficient between the digital supplier relationships and digital inventory management is (0.566), and between digital supplier relationships and digital customer (patient) relationships is (0.585). Additionally, the correlation coefficients between the digital supply chain dimensions are significant at a 5% level.

4.5.2 Collinearity Statistics

Table 4.8 shows the extent of the Collinearity of the independent variables. The multiple correlation test was used between these variables, as follows:

Table 4.8 Collinearity Analysis

Coefficients ^a		
Model	Collinearity Statistics	
	Tolerance	VIF
(Constant)		
Digital Supplier Relationships	.524	1.909
Digital Service Production System	.418	2.391
Digital Inventory Management	.502	1.991
Digital Customer (Patient) Relationships	.538	1.860
a. Dependent Variable: Organizational Innovation		

As shown in the table above, the values of the coefficient of variation inflation were less than 10, and the value of (Tolerance) was confined higher than 0.1, which indicates that there is no problem with multiple linear correlations between all research variables, and therefore research hypotheses can be tested.

4.6 Research Hypotheses Test

This research aims to investigate the impact of using a digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation in the private hospitals in Jordan. Therefore, one main hypothesis and four sub hypotheses have been

established and multiple regression analysis was used to test hypotheses related to the research as shown in **table 4.9**.

Table 4.9 Regression Analysis

Model Summary						
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate		
1	.824 ^a	.679	.672	.38629431142570		
a. Predictors: (Constant), Digital Customer (Patient) Relationships, Digital Inventory Management, Digital Supplier Relationships, Digital Service Production System						
ANOVA^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62.760	4	15.690	105.145	.000 ^b
	Residual	29.695	199	.149		
	Total	92.456	203			
a. Dependent Variable: Organizational Innovation						
b. Predictors: (Constant), Digital Customer (Patient) Relationships, Digital Inventory Management, Digital Supplier Relationships, Digital Service Production System						
Coefficients^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.204	.195		1.045	.297
	Digital Supplier Relationships	.301	.051	.325	5.850	.000
	Digital Service Production System	.122	.067	.114	1.831	.069

	Digital Inventory Management	.159	.057	.157	2.773	.006
	Digital Customer (Patient) Relationships	.372	.054	.380	6.933	.000
a. Dependent Variable: Organizational Innovation						

The results of the regression analysis in **table 4.9** illustrate that R-squared is equal to (0.679), which indicates that (68%) of the variability in the organizational innovation could be justified by using a digital supply chain. Moreover, the results in the table above show that the f-test is significant at 5% which also confirms the significance of the overall model, based on that, the first null hypothesis, which states “H0: There is no significant impact of using Digital Supply Chain on Organizational Innovation at level ($\alpha \leq 0.05$)” could be rejected and conclude that there is a significant impact of using Digital Supply Chain on Organizational Innovation at level ($\alpha \leq 0.05$).

Moreover, the results of the regression analysis in **table 4.9** illustrate that the coefficient for the digital supplier relationships variable is positive 0.301, with a high t-value calculated (5.850) and a low p-value (0.000). Therefore, the first sub-hypothesis, which states “H01: There is no significant impact of digital supplier relationships on organizational innovation at level ($\alpha \leq 0.05$)” could be rejected and conclude that there is a significant positive impact of digital supplier relationships on organizational innovation at level ($\alpha \leq 0.05$). This highlights the positive impact of using digital supplier relationships on enhancing organizational innovation. In addition, the findings are compatible with the findings of the digital supplier relationships descriptive analysis in section (4.3.1).

Furthermore, the results in the table above illustrate that the coefficient for the digital service production system variable is positive 0.122, with a t-value calculated (1.831) and a p-value (0.069). Therefore, the second sub-hypothesis, which states “H02: There is no significant impact of digital service production system on organizational innovation at level ($\alpha \leq 0.05$)” could not be rejected and conclude that there is no significant impact of digital service production system on organizational innovation at level ($\alpha \leq 0.05$).

Likewise, the coefficient for the digital inventory management system variable is positive 0.159, with a t-value calculated (2.773) and a low p-value (0.006). Therefore, the third sub-hypothesis, which states “H03: There is no significant impact of digital inventory management system on organizational innovation at level ($\alpha \leq 0.05$)” could be rejected and conclude that there is a significant positive impact of digital inventory management system on organizational innovation at level ($\alpha \leq 0.05$). This highlights the positive impact of applying a digital inventory management system on enhancing organizational innovation. In addition, the findings are compatible with the findings of the digital inventory management system descriptive analysis in section (4.3.3).

Finally, the results in **table 4.9** show that the coefficient for the digital customer (patient) relationships variable is positive 0.372, with a high t-value calculated (6.933) and a low p-value (0.000). Therefore, the fourth sub-hypothesis, which states “H04: There is no significant impact of digital customer (patient) relationships on organizational innovation at level ($\alpha \leq 0.05$)” could be rejected and conclude that there is a significant positive impact of digital customer (patient) relationships on organizational innovation at level ($\alpha \leq 0.05$). This highlights the positive impact of adopting digital customer (patient) relationships on enhancing organizational innovation. In addition, the findings are compatible with the findings of the digital customer (patient) relationships descriptive analysis in section (4.3.4).

4.7 Conclusion

Table 4.10 Regression Analysis Summary

Null Hypotheses	Accepted/Rejected	Conclude
H0: There is no significant impact of using Digital Supply Chain on Organizational Innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant impact of using Digital Supply Chain on Organizational Innovation.
H01: There is no significant impact of digital supplier relationships on organizational innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant positive impact of digital supplier relationships on organizational innovation.
H02: There is no significant impact of digital service production system on organizational innovation at level ($\alpha \leq 0.05$)	Accept the null hypothesis and reject the alternative hypothesis	There is no significant impact of digital service production system on organizational innovation.
H03: There is no significant impact of digital inventory management system on organizational innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant positive impact of digital inventory management system on organizational innovation.
H04: There is no significant impact of digital customer (patient) relationships on organizational innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant positive impact of digital customer (patient) relationships on organizational innovation.

The results of the regression analysis for testing hypotheses are summarized in table 4.10.

CHAPTER FIVE

DISCUSSING FINDINGS AND RECOMMENDATIONS

5.1 Introduction

In this chapter, the results of descriptive statistical analysis for the sample members' responses to the research variables and hypotheses testing were discussed with the goal of identifying the impact of digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation in the private hospitals in West Amman, Jordan. Accordingly, the research questions presented in chapter 1 will be answered. And the researcher then gave several recommendations and suggestions based on the results.

5.2 Results discussion

The main result that can be drawn from this research is summarized by confirming the significant positive impact of the digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation in the private hospitals in Amman, Jordan. This result is consistent with the findings of some previous studies such as Al-Madi, et al. (2021), Valmohammadi, (2017), Yap and Tan, (2012), and Chong, et al. (2011).

According to these studies and to what is stated above, it is confirmed that supply chain practices including supplier partnership and customer relationship management have a significant impact on organizational performance (Al-Madi, et al. 2021), there is a positive and significant, though weak, effect of customer relationship management practices on organizational performance and innovation (Valmohammadi, 2017), there is a significant and positive direct relationship of service supply chain management practices and its five dimensions (information and technology management, demand management, customer relationship management, supplier relationship management, capacity and resource management) on organizational performance; including innovation (Yap and Tan, 2012), and there is a significant and positive impact of supply chain management practices on innovation performance (Chong, et al. 2011). This indicated that the digital supply chain sub-variables that were adopted for this research have a significant impact on organizational innovation and performance.

However, the research revealed some variances of that impact among the digital supply chain sub-variables. Based on the statistical analysis of data, it has been found that supply chain digitization contributes to organizational innovation. More specifically, the four dimensions of the digital supply chain variable namely; digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships all achieved a high level of importance from the viewpoint of respondents at the Private Hospitals in West Amman, Jordan with the overall mean values for the four dimensions as follows: the highest mean value (4.055) was obtained by the sub-variable “digital inventory management” followed by a mean value of (4.037) obtained by the sub-variable “digital service production system”, then “digital customer (patient) relationships with a mean value (4.029), and the lowest mean value (3.930) was obtained by the sub-variable “digital supplier relationships”.

However, since this research was conducted during an exceptional period of time (COVID-19), the researcher believes that this impact mainly appeared due to the coronavirus pandemic (COVID-19).

5.3 Conclusions

The current research was designed primarily with the aim to examine the impact of the digital supply chain on organizational innovation at Private Hospitals in West Amman, Jordan. In addition, it aimed to answer the main research question: *What is the impact of Digital Supply Chain (Digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on Organizational Innovation at Private Hospitals in Jordan?*

The researcher has designed a questionnaire to collect the data, and the validity and reliability of the questionnaire have been performed. And to test the research hypotheses, correlation and multiple regression have been operated.

Finally, a high level of implementation of all the digital supply chain sub-variables (Digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) was found. Moreover, the path analysis results revealed that the level of "digital customer (patient) relationships" sub-variable has the highest impact on organizational innovation amongst other sub-variables variables of the digital supply chain, followed by digital supplier relationships, then digital inventory management and digital service production system respectively, which

has the lowest impact on organizational innovation. Therefore, it could be concluded that it is suggested that more can be done regarding the digital supply chain to achieve higher levels of organizational innovation than the existing ones and that digital communication and information sharing with customers (patients) at private hospitals in Jordan is a vital issue in managing the digital supply chain to achieve better organizational innovation and accordingly, performance.

5.4 Recommendations

5.4.1 Recommendations for Private Hospitals in Jordan

- Managers and IT staff working at Private Hospitals in Amman, Jordan represent the parties that focus their reliance on the use of modern technology, including their attention to (Supplier relationships, production systems, inventory management, and customer (patient) relationships) therefore, it is recommended that they accept to employ the digital systems provided by the medical field companies.
- This research encourages hospitals to pay more attention to their relationships with patients and rely more on digital technologies for their relationships with the patients because the results showed that digital customer (patient) relationships have the highest impact on organizational innovation.
- This research recommends that hospitals improve their health information technology and shift towards digitizing their supply chains because it helps in enhancing the development, innovation, and the overall performance of the hospital.
- It is also recommended that hospitals employ up-to-date digital systems and technologies to be prepared during times of crisis and to cope with the environmental uncertainties and challenges through innovation.
- This research recommends that the healthcare sector in Jordan strengthen its use of technology in private hospitals by establishing digital platforms and digitizing the healthcare supply chains in Jordan so that each hospital provides faster and easier access to information required for both healthcare professionals and hospital staff, and patients, and thus, improve its performance.

5.4.2 Recommendations for academics and future research

- Since many studies have been conducted previously on the supply chain, this research should provide an additional explanation of how the digital supply chain

contributes to organizational innovation at Private Hospitals in Jordan, as it is the first research to examine these two variables at private hospitals in West Amman, Jordan. Furthermore, the researcher has found that the digital supply chain had a positive impact on Organizational Innovation and that these findings were consistent with previous studies and research on various approaches and different target populations.

- This research was carried out only on managers and IT staff of (6) private hospitals in West Amman, Jordan. Therefore, it is recommended to go in more depth by including other employee positions or increasing the number of hospitals.
- This research was conducted only at private hospitals in Amman, Jordan, whereas it can also be conducted in public hospitals to be able to generalize the results.
- The researcher recommends using other dimensions of the digital supply chain other than those used in the current research.
- This research was carried out within a limited period. Therefore, it is suggested that this research be repeated after an appropriate period of time to check the healthcare industry's progress and development.
- The researcher recommends using the same research variables in future research but applying them in other sectors such as industrial, education, insurance, and banking.
- This research was conducted during the COVID-19 pandemic, therefore, it could be repeated once the pandemic is over.

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APPENDICES

Appendix (1)

Letter and Questionnaire of Respondents



<<Questionnaire>>

This questionnaire is a part of a research that the researcher undertakes to obtain a double Master's degree in Business Administration from the University of Petra and in International Management from Luiss Guido Carli University.

The research is entitled:

**“Exploring Digital Supply Chain and Its Impact on Organizational Innovation;
The Case of Private Hospitals in Jordan”**

This research aims to identify the impact of Digital Supply Chain (Digital Supplier Relationships, Digital Service Production System, Digital Inventory Management, Digital Customer (Patient) Relationships) on Organizational Innovation, and it will target the Private Hospitals in West Amman, Jordan.

It would be highly appreciated if you help me and dedicate 10 minutes of your precious time to answer this questionnaire. And kindly note that any data you provide will be treated with utmost confidentiality and privacy, and used solely for the purpose of scientific research.

Thank you in advance for your valuable assistance and support.

.....

Researcher: Suzan Musa Al-Hindi

email: suzan.alhindi11@gmail.com

Section (1) Demographics:

1. Gender:

- Male
- Female

2. Age:

- Less than 30
- Less than 40
- Less than 50
- 60 and above

3. Educational Qualification:

- College diploma
- Bachelor's
- Master's
- PhD
- Other:

4. Job Position:

Managerial position:

- Top-level manager (CEO, president, vice-president)
- Middle-level manager (head of department)
- Lower-level managers (Office manager, supervisor)
- Other:

- IT / Support staff

5. Years of experience:

- 10 or less
- 11 – 20
- 21 – 30
- Above 30

Section (1): Independent Variable - Digital Supply Chian

No.	Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Sub-Variable: Digital Supplier Relationships						
1.	The hospital uses digital channels (e.g. emails) to develop relationships with suppliers.					
2.	The hospital seeks to hire individuals responsible for electronic demand and supply planning of medical supplies.					
3.	The hospital uses modern digital technologies that ease the collection of supplier data.					
4.	The hospital seeks to use up to date technologies to speed up transactions with suppliers.					
5.	The hospital updates its digital platforms regularly to avoid any delays regarding receiving medical products and equipment from suppliers.					
Independent Sub-Variable: Digital Service Production System						
6.	The hospital uses a digital system(s) to provide health services.					
7.	The hospital offers e-services to expand its existing health services.					
8.	The digital system used by the hospital helps to develop the productivity of its services.					
9.	The hospital's automated service production system enables it to monitor services related to patients.					
10.	The hospital relies on automated technologies for producing higher quality health services.					
Independent Sub-Variable : Digital Inventory Management						
11.	The hospital uses a computerized digital system for managing and controlling its inputs and outputs.					

No.	Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
12.	The hospital uses a digital inventory system for improved management of medical supplies in stock.					
13.	The hospital is able to manage large amounts of medical inventory due to using a digital inventory system.					
14.	Digital systems used by the hospital reduces costs related to inventory management.					
15.	Digital inventory management helps in inventory reduction issues among hospital staff (e.g., loss).					
Independent Sub-Variable: Digital Customer (Patient) Relationships						
16.	The hospital uses digital channels to develop relationships with patients.					
17.	Digitalization enhances communication with patients, particularly regarding services (e.g. making an appointment) and feedback processing.					
18.	The computerized system that the hospital uses helps to facilitate the medical procedures for the patient.					
19.	The hospital uses modern digital technologies that ease the collection of patients data.					
20.	Having one integrated digital communication system improves the communication with patients and their experience.					

Section (2): Dependent Variable: Organizational Innovation

No.	Item	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
21.	The hospital uses digital systems on a continuous basis to boost innovation.					
22.	Digital relationships with suppliers reinforce value creation in the relationships among the hospital and other parties to encourage organizational innovation.					
23.	The use of digital channels improved the internal processes in the hospital.					
24.	Using digital technologies across the supply chain boosts value creation such as enhancing the speed of communication.					
25.	The hospital provides innovative resources for the development of new services.					
26.	Supply chain digitalization encourages organizational changes that promote innovation in the hospital (e.g. improved health policies and practices).					

Additional comments (optional):

THESIS SUMMARY

Abstract

Purpose: The purpose of this research is to investigate the impact of the digital supply chain (digital supplier relationships, digital service production system, digital inventory management, digital customer (patient) relationships) on organizational innovation at private hospitals in Jordan. The research covered (6) Private Hospitals in West Amman, Jordan, based on the number of beds, namely (Istishari Hospital, Arab Medical Center, Ibn AlHaytham Hospital, The Specialty Hospital, Islamic Hospital, and Jordan Hospital).

Design/Methodology/Approach: To actualize this research, data was collected from hospitals managers and IT staff using a questionnaire. After confirming the validity and reliability of the questionnaire, descriptive analysis was carried out, and the correlation between variables was checked. Finally, the impact was tested by multiple regressions.

Findings: The result of the research shows that the Digital Supply Chain has a positive impact on Organizational Innovation at private hospitals in Jordan. Where the variable digital customer (patient) relationships has the highest impact on organizational innovation, followed by Digital supplier relationships, then Digital inventory management, and Digital service production system has the lowest impact on organizational Innovation.

Recommendations: The research recommends that Private Hospitals in Jordan apply digital technologies in their supply chain operations to enhance their organizational innovation and overall performance, which is especially crucial in times of crisis.

Originality/Value: This research is one of the few research to look into the impact of the digital supply chain on organizational innovation in the Jordanian healthcare industry, particularly in private hospitals.

Keywords: Supply Chain, Digitalization, Digital Supply Chain, Organizational Innovation, Private Hospitals, Jordan.

Introduction

In this era of globalization and the continuous emergence of technological trends, organizational innovation has become a primary priority in the global economy. Therefore, all organizations are constantly looking for ways to innovate and enhance their performance (Naveed, et al. 2022). Today, innovation is becoming more crucial to organizational performance and it is also critical for organizations that seek to have a competitive advantage (Alves, et al. 2018). And that fast growth in technology has affected all businesses and all business functions.

This is more applicable in the healthcare sector (Hussien, et al. 2021). For instance, in the light of the importance of providing high-quality healthcare services, there is no doubt that the development of the healthcare sector has become one of the most important priorities worldwide. Today, the healthcare sector should work with high-quality and continuous improvements; this means that innovation in healthcare services is becoming inescapable (Tan, et al. 2020). Moreover, in the light of COVID-19, many public healthcare organizations are being forced to change radically. Thus, in order to continuously improve and streamline the processes within organizations, innovation is therefore required (Farzad, et al. 2020).

Supply Chain has become one of the key business functions that are impacted by the implementation of different technologies. Today, supply chains are headed towards digitalization, because of the environmental changes and the crisis that the world faces every now and then. Thus, converting the traditional supply chain into a digital supply chain (DSC). The digital supply chain is a value-added process that employs new and smart technological approaches, hence, urging innovation and value-creating (Büyükozkan and Göçer, 2018).

Accordingly, as a result of the dynamic environment and the continuous emergence of technology, there is an incessant need to identify where digital supply chains may

provide businesses and organizations with benefits and help to innovate and develop in order to maximize such gains (Nürk, 2019).

Additionally, innovation plays a big role in healthcare; it is one of the major driving forces in finding the balance between cutting costs and healthcare quality (Omachonu and Einspruch, 2010). And digital supply chains have important implications for organizational innovation in healthcare. Digital transformation in the supply chain allows organizations to anticipate and plan to respond to risks in a timely manner. Many studies have highlighted the importance of digital supply chain (DSC) and organizational innovation, and researchers discussed its different applications and influence on organizations. But, there is a shortfall of verification regarding how the digital supply chain impacts organizational innovation (Nasiri, et al. 2020).

This research aims to analyze the potential impact of the four selected digital supply chain dimensions (Digital supplier relationships, Digital service production system, Digital inventory management, and Digital customer (patient) relationships) on organizational innovation at private hospitals in Jordan. Additionally, it reviewed the existing literature on digital supply chain (DSC) and organizational innovation.

Main research question

The main research question that this research attempts to answer is: What is the impact of Digital Supply Chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on Organizational Innovation at Private Hospitals in Jordan?

Research purpose and objectives

The main purpose of this research is to investigate the impact of Digital Supply Chain (Digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation at Private Hospitals in West Amman, Jordan. Furthermore, this research aims to achieve the following objectives:

1- To determine the impact of digital supplier relationships on organizational innovation at Private Hospitals in Jordan.

2- To determine the impact of digital service production system on organizational innovation at Private Hospitals in Jordan.

3- To determine the impact of digital inventory management on organizational innovation at Private Hospitals in Jordan.

4- To determine the impact of digital customer (patient) relationships on organizational innovation at Private Hospitals.

Research hypotheses

Based on the research question and according to the conceptual framework, the following hypotheses are developed and will be tested:

Main hypothesis:

H0: There is no significant impact of the Digital Supply Chain on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

Based on Digital Supply Chain dimensions, the main hypothesis is divided into the following sub-hypotheses:

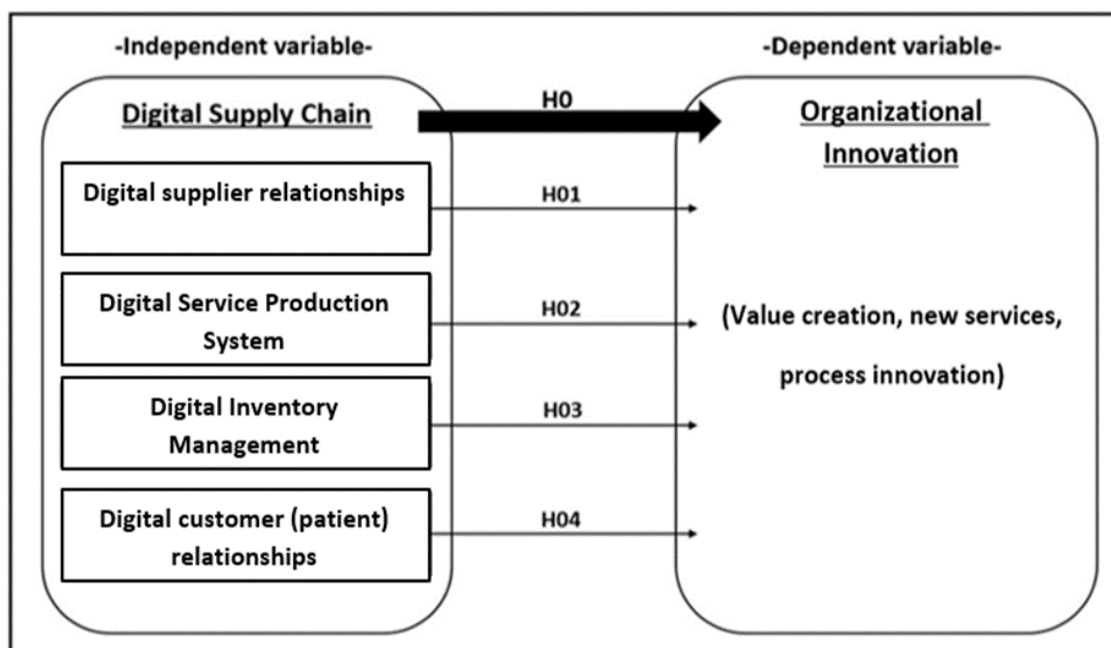
H01: There is no significant impact of Digital Supplier Relationships on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

H02: There is no significant impact of Digital Service Production System on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

H03: There is no significant impact of Digital Inventory Management on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

H04: There is no significant impact of Digital Customer (Patient) Relationships on Organizational Innovation at Private Hospitals in Jordan at level ($\alpha \leq 0.05$).

Conceptual framework



Source: Model was developed based on previous studies (Sadeghi and Jafari, 2021; Farahani, et al. 2017).

Research design

The current research is descriptive research; it tempted to examine the relationship between digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) and organizational innovation (value creation, new services, and process innovation) at the private hospitals in Jordan. The research began with a review of the literature to develop a model for measuring the impact of digital supply chain on private hospitals in Jordan. Subsequently, a questionnaire was developed, which was used for the purpose of data collection. Next, the collected data were checked and coded on SPSS (Statistical Package for the Social Sciences). Then, validity and reliability were tested and the correlation between variables was calculated, Finally, the hypotheses were tested using multiple regressions.

Population and sample

The research population consisted of managers (Top-level, Middle-level, and Lower-level managers) and IT staff working at private hospitals in Amman, Jordan. The researcher relied on using a purposive sampling technique to collect data from

respondents; which is a method adopted by researchers to obtain information and collect data from a specific segment of the whole targeted that is capable of providing information, either because they are easier to reach, or of their location (Amman, Jordan), and because they meet the research criteria. Accordingly, (6) medium and large hospitals (due to the number of beds) were selected, and the questionnaire was distributed to hospital managers and IT staff.

Primary data collected from managers and IT staff working at Private Hospitals in Jordan using a questionnaire, which was based on previous literature and experts to actualize the current research.

Data collection methods

The researcher prepared a questionnaire of two types, a paper questionnaire (distributed and collected by hand) and an online questionnaire using (Google forms), which were distributed and published to employees in the managerial cadres and IT department in cooperation with Human Resources Management and Quality Assurance departments. Thus, approximately (300) questionnaires were published and distributed, of which only (217) responses were received and a total of (204) were valid for analysis because of the pressure and workload of the hospitals' managers. And Secondary data collected from different sources such as books, articles, journals, academic research, dissertations, and the Internet, to build a strong theoretical foundation and research direction.

Statistical techniques in data analysis

The Statistical Package of Social Sciences (SPSS) was used to conduct descriptive and inferential analysis and test hypotheses in order to answer the research questions and test hypotheses.

Data analysis and hypotheses testing

Several methods have been used in order to analyse the data, mainly, descriptive analysis, correlation and collinearity statistics, multiple regression analysis. In the descriptive analysis the mean, standard deviation, and importance degree were calculated for digital supply chain (Independent variable) and organizational innovation (Dependent variable). Correlation and collinearity statistics have been used to explore the relationship between variables and check the multicollinearity assumption.

Regression analysis summary

Null Hypotheses	Accepted/Rejected	Conclude
H0: There is no significant impact of using Digital Supply Chain on Organizational Innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant impact of using Digital Supply Chain on Organizational Innovation.
H01: There is no significant impact of digital supplier relationships on organizational innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant positive impact of digital supplier relationships on organizational innovation.
H02: There is no significant impact of digital service production system on organizational innovation at level ($\alpha \leq 0.05$)	Accept the null hypothesis and reject the alternative hypothesis	There is no significant impact of digital service production system on organizational innovation.
H03: There is no significant impact of digital inventory management system on organizational innovation at level ($\alpha \leq 0.05$)	Reject the null hypothesis and accept the alternative hypothesis	There is a significant positive impact of digital inventory management system on organizational innovation.
H04: There is no significant impact of digital customer (patient) relationships on	Reject the null hypothesis and accept	There is a significant positive impact of digital customer (patient)

organizational innovation at level ($\alpha \leq 0.05$)	the alternative hypothesis	relationships on organizational innovation.
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Results discussion

The main result that can be drawn from this research is summarized by confirming the significant positive impact of the digital supply chain (digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on organizational innovation in the private hospitals in Amman, Jordan. This result is consistent with the findings of some previous studies such as Al-Madi, et al. (2021), Valmohammadi, (2017), Yap and Tan, (2012), and Chong, et al. (2011). This indicated that the digital supply chain sub-variables that were adopted for this research have a significant impact on organizational innovation and performance . However, the research revealed some variances of that impact among the digital supply chain sub-variables. Based on the statistical analysis of data, it has been found that supply chain digitization contributes to organizational innovation. More specifically, the four dimensions of the digital supply chain variable namely; digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships all achieved a high level of importance from the viewpoint of respondents at the Private Hospitals in West Amman, Jordan with the overall mean values for the four dimensions as follows: the highest mean value (4.055) was obtained by the sub-variable “digital inventory management” followed by a mean value of (4.037) obtained by the sub-variable “digital service production system”, then “digital customer (patient) relationships with a mean value (4.029), and the lowest mean value (3.930) was obtained by the sub-variable “digital supplier relationships ”. However, since this research was conducted during an exceptional period of time (COVID-19), the researcher believes that this impact mainly appeared due to the coronavirus pandemic (COVID-19).

Conclusions

The current research was designed primarily with the aim to examine the impact of the digital supply chain on organizational innovation at Private Hospitals in West Amman, Jordan. In addition, it aimed to answer the main research question: What is the impact of Digital Supply Chain (Digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) on Organizational Innovation at Private Hospitals in Jordan?

The researcher has designed a questionnaire to collect the data, and the validity and reliability of the questionnaire have been performed. And to test the research hypotheses, correlation and multiple regression have been operated. Finally, a high level of implementation of all the digital supply chain sub-variables (Digital supplier relationships, digital service production system, digital inventory management, and digital customer (patient) relationships) was found. Moreover, the path analysis results revealed that the level of "digital customer (patient) relationships" sub-variable has the highest impact on organizational innovation amongst other sub-variables variables of the digital supply chain, followed by digital supplier relationships, then digital inventory management and digital service production system respectively, which has the lowest impact on organizational innovation. Therefore, it could be concluded that it is suggested that more can be done regarding the digital supply chain to achieve higher levels of organizational innovation than the existing ones and that digital communication and information sharing with customers (patients) at private hospitals in Jordan is a vital issue in managing the digital supply chain to achieve better organizational innovation and accordingly, performance.

Recommendations

-This research encourages hospitals to pay more attention to their relationships with patients and rely more on digital technologies for their relationships with the patients because the results showed that digital customer (patient) relationships have the highest impact on organizational innovation .

-This research recommends that hospitals improve their health information technology and shift towards digitizing their supply chains because it helps in enhancing the development, innovation, and the overall performance of the hospital .

-It is also recommended that hospitals employ up-to-date digital systems and technologies to be prepared during times of crisis and to cope with the environmental uncertainties and challenges through innovation .

-This research recommends that the healthcare sector in Jordan strengthen its use of technology in private hospitals by establishing digital platforms and digitizing the healthcare supply chains in Jordan so that each hospital provides faster and easier access to information required for both healthcare professionals and hospital staff, and patients, and thus, improve its performance.

-Since many studies have been conducted previously on the supply chain, this research should provide an additional explanation of how the digital supply chain contributes to organizational innovation at Private Hospitals in Jordan, as it is the first research to examine these two variables at private hospitals in West Amman, Jordan. Furthermore, the researcher has found that the digital supply chain had a positive impact on Organizational Innovation and that these findings were consistent with previous studies and research on various approaches and different target populations .

-This research was carried out only on managers and IT staff of (6) private hospitals in West Amman, Jordan. Therefore, it is recommended to go in more depth by including other employee positions or increasing the number of hospitals .

-This research was conducted only at private hospitals in Amman, Jordan, whereas it can also be conducted in public hospitals to be able to generalize the results.

-The researcher recommends using other dimensions of the digital supply chain other than those used in the current research .

-This research was carried out within a limited period. Therefore, it is suggested that this research be repeated after an appropriate period of time to check the healthcare industry's progress and development.

-The researcher recommends using the same research variables in future research but applying them in other sectors such as industrial, education, insurance, and banking.

-This research was conducted during the COVID-19 pandemic, therefore, it could be repeated once the pandemic is over.