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A Thesis Submitted in Partial Fulfilment of the Requirements for the
Degree of Master of Business Administration

Enhancing Service Innovation Through Knowledge Management Infrastructure in Private Professional Training Centers in Saudi Arabia.

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مراكز التدريب المهني الخاص في المملكة العربية السعودية

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The student is awarded a grade A in the thesis subject.

- ☐ Without making any changes to the thesis.
- ☒ After making the modifications attached with this decision.

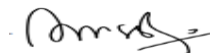
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Enhancing Service Innovation Through Knowledge Management Infrastructure in Private Professional Training Centers in Saudi Arabia

Abstract

Purpose - This research aims to examine the role of knowledge management infrastructure in enhancing service innovation in private professional training centers in Saudi Arabia. **Design/methodology/approach** - The knowledge management infrastructure factors considered in this study are organizational culture, organizational structure, information technology, a community of practice, and physical environment. A quantitative research method was used, and the data was collected from 200 employees at these centers through a questionnaire that contained 30 items. Correlation and regression analyses were conducted to test the research hypotheses. **Findings** - The results of this research indicate that knowledge management infrastructure has a statistically significant, positive impact on service innovation in private professional training centers in Saudi Arabia. The knowledge management infrastructure factors that have the highest level of positive impact on service innovation are information technology and organizational culture, followed by the community of practice, the physical environment, and organizational structure are statistically significant positive impacts on service innovation. **Limitation of research** – This study concentrated only on the private professional training sector. Furthermore, the sample size is small, and the convenience sample technique that was utilized may not represent the entire population. **Originality/value** – This research offers a unique empirical direction for service innovation in private professional training centers in Saudi Arabia. As there is a lack of empirical studies regarding service innovation in these training centers in Saudi Arabia. The empirical evidence obtained from this study can contribute positively in enhance service innovation through knowledge management infrastructure. **Recommendations** - Based on the result of this research, the provided recommendations can be beneficial for organizations to achieve service innovation through investing in knowledge management infrastructure.

Keywords: **Knowledge Management Infrastructure, Service Innovation, Private Professional Training Centers, Saudi Arabia.**

تعزيز ابتكار الخدمة من خلال البنية التحتية لإدارة المعرفة في مراكز التدريب المهني الخاص في المملكة العربية السعودية

ملخص البحث

الغرض - يهدف هذا البحث لدراسة دور البنية التحتية لإدارة المعرفة في تعزيز ابتكار الخدمة في مراكز التدريب المهني الخاصة في المملكة العربية السعودية. **التصميم / المنهجية / النهج** - عوامل البنية التحتية لإدارة المعرفة التي تم أخذها في الاعتبار في هذه الدراسة هي الثقافة التنظيمية، والهيكل التنظيمي، وتكنولوجيا المعلومات، ومجتمع الممارسة، والبيئة المادية. تم استخدام أسلوب البحث الكمي، وتم جمع البيانات من 200 موظف في هذه المراكز من خلال استبانة تحتوي على 30 فقرة أجريت تحليلات الارتباط والانحدار لاختبار فرضيات البحث.

النتائج - تشير نتائج هذا البحث إلى أن البنية التحتية لإدارة المعرفة لها تأثير إيجابي على الدلالة الإحصائية لابتكار الخدمة في مراكز التدريب المهني الخاص في المملكة العربية السعودية. إن عوامل البنية التحتية لإدارة المعرفة التي لها أعلى مستوى من التأثير الإيجابي على ابتكار الخدمة هي تقنية المعلومات والثقافة التنظيمية التي يتبعها مجتمع الممارسة، والبيئة المادية والهيكل التنظيمي لهما تأثير إيجابي على الدلالة الإحصائية لابتكار الخدمة.

محدودية البحث - ركزت هذه الدراسة فقط على قطاع التدريب المهني الخاص. علاوة على ذلك، حجم العينة صغير وتقنية العينة الملائمة التي تم استخدامها قد لا تمثل المجتمع بأكمله. **الأصالة / القيمة** - يقدم هذا البحث اتجاهًا تجريبيًا فريدًا للابتكار في الخدمة في مراكز التدريب المهني الخاصة في المملكة العربية السعودية. حيث يوجد نقص في الدراسات التجريبية بخصوص ابتكار الخدمة في هذه المراكز التدريبية في المملكة العربية السعودية. يمكن للأدلة التجريبية التي تم الحصول عليها من هذه الدراسة أن تساهم بشكل إيجابي في تعزيز ابتكار الخدمة من خلال البنية التحتية لإدارة المعرفة. **التوصيات** - بناءً على نتائج هذا البحث ويمكن أن تكون هذه التوصيات مفيدة للمؤسسات لتحقيق ابتكار الخدمة من خلال الاستثمار في البنية التحتية لإدارة المعرفة

Dedication

This thesis is dedicated to my beloved parents, my children Reem, Mohammad, and Yazeed, and my entire family, who supported me throughout my studying for and writing of the thesis.

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I have gained significant experience from when I first started my thesis until now that it has been submitted. It has been a wonderful journey with many challenges. It has been an inspiring and encouraging experiment. Many people contributed to the completion of this task during my journey, and without them it would have been impossible to complete this thesis. First, I would like to thank all leaders of private professional training centers in Saudi Arabia who shared the questionnaire with their subordinates.

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List of Abbreviations

PPTCs	Private Professional Training Centers
KM	Knowledge Management
DIKW	Data, Information, Knowledge, and Wisdom
IT	Information Technology
CoP	Community of Practice
PMP	Project Management Professional
HRM	Human Resource Management
CIPD	Chartered Institute of Personnel and Development
L&D	Learning and Development
CPA	Certified Public Accountant
CMA	Certified Management Accountant
CISA	Certified Information Systems Auditor
CISM	Certified Information Security Manager
CRISC	Certified in Risk and Information Systems Control
SPSS	Statistical Package for the Social Sciences

Definitions of Terms

Knowledge Management (KM) is a systematic and collective process of creating, sharing, and applying knowledge that can enable employees, teams, and organizations as a whole to accomplish their strategic and operational objectives. It contributes to the efficiency and effectiveness of operations as well as enhancing innovation. Additionally, it aims to generate knowledge from information and invests such knowledge to maintain a competitive advantage that can be revealed as a source of success in business (North & Kumta, 2018).

Knowledge Management Infrastructure

Knowledge Management Infrastructure is defined as tools and environments that can facilitate the successful implementation of knowledge management. It includes organizational culture, organizational structure, information technology, a community of practice, and physical environment.

Organizational Culture

(Martins & Terblanche 2003) indicate that organizational culture can be defined as a set of values and beliefs shared by employees within an organization. They added that culture represents an organization's character because it is connected to feelings, symbolism, meanings behind language, behaviors, artifacts, and physical settings. They indicated that organizational culture fills the gap between what is formally announced and what actually occurs.

Organizational Structure

Hao et al. (2012) presents the claim that organizational structure includes the layers of hierarchy, centralization of authority, and horizontal integration. It is associated with work division roles and responsibilities, including specialization, centralization, decentralization, departmentalization, and complexity. (Chen & Huang 2007) indicated that the organizational structure impact on how to circulate knowledge and information efficiently.

Information Technology

(Onn & Sorooshian 2013) state that the term “information technology” covers a wide range of processing and computer applications in an organization, so it relates to systems of information and the use of Internet-connected technologies. They added that “IT infrastructure” can be computer software, networks, and hardware that are utilized in the process of transmitting information within an organization.

Community of Practice

Wenger (2011) indicates that a community of practice is a group of people who share the same concern or passion for doing something. They want to do those things perfectly by exchanging knowledge, information, and experience. He added that a community of practice is crucial for enabling team members to share knowledge and expertise, leading to improvement and innovation in organizations.

Physical Environment

The physical environment consists of three key elements: interior design factors such as furniture, equipment, and decoration; interior architectural factors such as size, shape, arrangement of workspaces, and type/color of construction materials; and ambient conditions such as lighting, temperature, and sound (Hoff & Öberg, 2015, as cited in Ayoko & Ashkanasy, 2019).

Innovation

Innovation consists of many processes that enable organizations to transform ideas into new or improved products, services, or processes, so that organizations can advance, compete, and differentiate themselves in the marketplace (Baregheh, Rowley, & Sambrook, 2009).

Private Professional Training Centers in Saudi Arabia

The target population of this research is all employees of private professional training centers in Saudi Arabia. In particular, it only considers professional training centers that provide professional qualifications in the fields of Business Studies, Training, Management, and Computer Skills, for example, Project Management Professional

(PMP), Human Resource Management (HRM), Chartered Institute of Personnel and Development (CIPD), Learning and Development (L&D), Certified Public Accountant (CPA), etc.

Chapter 1: Introduction

1.1 Overview

One of the main objectives of Saudi Vision 2030 is to reduce the nation's dependence on crude oil and diversify its economy. This transformation depends on a variety of service sectors. Therefore, private professional training centers in Saudi Arabia are considered a critical enabler in enhancing economic diversifications by enabling Saudi youth to gain professional qualifications. Due to the high demand for professional qualifications such as Society for Human Resource Management (SHRM), Chartered Institute of Personnel and Development (CIPD), Certified Public Accountant (CPA), Certified Information Systems Auditor (CISA), Certified Information Security Manager (CISM), Certified in Risk and Information Systems Control (CRISC), Project Management Professional (PMP), and Certified Management Accountant (CMA) in Saudi Arabia, professional training centers should provide such professional training courses.

(Plessis, 2007) indicates that knowledge impacts positively on innovation, and managing knowledge is essential to achieving successful innovation. This empirical study on service firms Ode & Ayavoo (2020), indicate that knowledge management practice has a significant positive impact on innovation. Such empirical studies show the significant role of knowledge management in enhancing innovation. Establishing a robust foundation that enables implementing knowledge management to enhancement innovation is requiring knowledge management infrastructure. (Obeidat et al., 2015), indicate the KM infrastructure elements have a statistically significant positive impact on innovation in telecommunication companies in Jordan except organisational structure. The study focused on the KM infrastructure elements (organizational culture, organizational structure, information technology, physical environment, and human resource).

Therefore, the aim of this research is to investigate the impact of KM infrastructure on service innovation in PPTCs. In particular, the PPTCs deal with a large amount of knowledge and information, so knowledge and information are essential in the input, process, and output of the delivery of the training.

1.2 Research Problem

One of the key factors of Saudi Vision 2030 is to increase the percentage of Saudization in the private sector. Therefore, the demand for professional qualifications has been increased so that a considerable number of private professional training centers have opened since 2016. Due to the fact, the competition in private training centers has become fierce. Innovative service such providing training is inescapable to be sustainable and a highly competitive advantage in such sector. However, the majority of such training centers adopt traditional method in process of providing training courses which means the lack of innovation.

Therefore, the core problem of this research is lack innovation in the private professional training centers in Saudi Arabia. Consequently, the aim of this research is to investigate the role of KM infrastructure elements and their impact on service innovation. They might find them enablers for service innovation. The elements of KM infrastructure (organizational culture, organization structure, information technology, a community of practice, and physical environment) and their impact on service innovation in professional training centers in Saudi Arabia.

1.3 Research Questions

Based on the topic of this research, the project's research questions should examine the impact of KM infrastructure (organizational culture, organizational structure, information technology, community of practice, and physical environment) in enhancing innovation. Consequently, research questions should be formulated based on variables that examine each factor and consider its impact on innovation.

The central research question is as follows:

What is the impact of knowledge management infrastructure on service innovation?

To be more specific, the following sub-questions will be addressed:

1. What is the impact of organizational culture on service innovation in private professional training centers (PPTCs) in Saudi Arabia?
2. What is the impact of organizational structure on service innovation in PPTCs in Saudi Arabia?
3. What is the impact of information technology on service innovation in PPTCs in Saudi Arabia?
4. What is the impact of community of practice on service innovation in PPTCs in Saudi Arabia?
5. What is the impact of physical environment on service innovation in PPTCs in Saudi Arabia?

1.4 Research Objectives

The aim of this research is to investigate the elements of KM infrastructure and their impact on the service innovation of professional training centers in Saudi Arabia.

The objectives can be summarised as follows:

- ⇒ To examine the impact of organizational culture on enhancing service innovation
- ⇒ To investigate the the impact of organizational structure on enhancing service innovation
- ⇒ To examine the impact of information technology on enhancing service innovation
- ⇒ To investigate the impact of the community of practice on enhancing service innovation
- ⇒ To assess the impact of the physical environment on enhancing service innovation
- ⇒ To propsoe recommendations in terms of achieving service innovation based on this ressearch's result.

1.5 Research Significance

Innovation is essential for any organization, whether it is public or private. This research is valuable to different sectors inside and outside of Saudi Arabia. This is especially the case because it concentrates on one of the most significant factors that can enhance innovation, which is KM infrastructure.

This research is significant for researchers, academicians, and practitioners to eliminate ambiguity regarding KM and its impact in enhancing innovation. KM has a wide range of dimensions such as KM processes, KM systems, and KM infrastructure. Therefore, this study is more precise and specific in focusing on KM infrastructure and its impact on organizational innovation, and it specifically covers five elements of KM infrastructure and their impact on innovation.

This study can be a road map for researchers to investigate such KM infrastructure in future research. Furthermore, this research can be significant for staff at the managerial level by encouraging them to consider KM infrastructure to be a critical factor for enhancing innovative products and services so that organizations can develop a highly competitive advantage over their competitors. Last but not least, the field of this study can be distinguished from other studies because it focuses on professional centers as well as the geographical scope of Saudi Arabia.

Innovative services are a vital factor for any organization to have a sustainable competitive advantage. Increasing demand for professional qualifications has led numerous centers to offer professional training, which has led to increasing competition among centers in Saudi Arabia. Virtual learning has become common, especially during the pandemic, so it has become a threat to plenty of centers as a substitute for physical attendance of classes. Such factors can cause a considerable number of challenges for such training centers, so adopting innovative solutions to survive in such fierce competition is an inescapable challenge.

Conclusion of this part regarding the significance of this research, it may be beneficial for researchers to focus only on one dimension of knowledge management such as KM

infrastructure to replicate such theoretical framework in other sectors. Furthermore, this study may help private professional training centers in Saudi Arabia to be aware of significance of organizational knowledge management infrastructure and its impact on innovative service. Moreover, other public institutions may also be assist them regarding producing innovative service due to knowing how the impact of KM Infrastructure on innovative service. In addition, GCC

1.6 Research Steps

The following research steps were taken to achieve the research objectives:

1. Reviewing previous studies regarding KM infrastructure elements and their impact on innovation. Explaining various types of KM to eliminate ambiguity by identifying KM infrastructure elements. Identifying specific factors related to KM infrastructure and how they can have an impact on innovative organizations.
2. Covering specific independent variables and their impact on service innovation by adapting a theoretical framework that had already been tested.
3. Conducting a study on professional training centers due to the lack of empirical studies on this sector; Additionally, it covers a specific demographic area such as Saudi Arabia.
4. Conducting a survey to collect data to test the impact of independent variables on service innovation in professional training centers in Saudi Arabia. A quantitative research method is used.
5. Analyzing the collected quantitative data and interpreting the results.
6. Writing a conclusion, recommendations, and proposing for future research.

1.7 Thesis Structure

This thesis is divided into five chapters and has seven appendices.

Chapter One: Introduction. This chapter provides an overview of the research aim regarding knowledge management infrastructure and its impact on innovation, the research problem, research questions, research objectives, and research significance. Moreover, this chapter shows the research steps and the structure of the thesis.

Chapter Two: This chapter is a literature review and it covers all of the variables and their impact on service innovation based on previous studies.

Chapter Three: This chapter focuses on the methodology of this research. It covers the research method design, theoretical framework, and pilot study for testing the validity and reliability of the questionnaire; it also considers the research instrument in the process of data collection and analysis, as well as the sample population.

Chapter Four: This chapter covers the process of data analysis and illustrates the project's use of the quantitative research method of questionnaire analysis, which ensures that the research questions can be answered and the research objectives achieved by analyzing and discussing the hypotheses.

Chapter Five: This chapter introduces a conclusion for the entire thesis and provides recommendations based on previous studies as well as this study. Furthermore, it will shed light on this research project's limitations and propose future empirical studies.

Chapter 2: Literature Review

2.1 Introduction

Before explaining the concept of knowledge management (KM), understanding the word “knowledge” is crucial. In terms of definition, knowledge is defined in various ways. According to previous literature reviews, “knowledge” describes evolutions in information, which is a sophisticated term to refer to data. This part provides the concept of knowledge as a general category as well as considering the different types of knowledge. Furthermore, it provides an overview of KM and the processes of KM. Understanding concepts, types, and the processes of KM is vital. Notably, this research focuses on KM infrastructure as crucial tools to implement KM in an organization to achieve innovation.

2.1.1 History and evolution of knowledge

Rowley (2007) presented a hierarchical account of knowledge, and the classification includes data, information, knowledge, and wisdom (DIKW). Rowley suggests that previous studies had limitations because they did not cover all of the aspects of DIKW. The study aimed to analyze and articulate how the hierarchy of DIKW was presented in previous books. It indicates that there have been longstanding attempts in the literature to explore the DIKW hierarchy. It illustrates that according to Ackoff’s definition, knowledge is defined as “know-how” and a method that can transfer information into directions, and knowledge can be gained either by being transferred from someone who has it or by being extracted from experience. This indicates that knowledge is more complicated than either data or information in terms of definition: numerous KM textbooks offer interpretations, and it has a wide range of manifestations and representations.

Hence, there is no consensus regarding the definition of knowledge. However, Ackoff adds that such interpretations have appeared in plenty of books and mentions that

information systems define knowledge in terms of data and information. The author concludes that the definition of knowledge can be a combination of information, understanding, capability, experience, skills, and values. This account indicates that not all authors present all such elements of knowledge.

Another study indicates that the process of gathering data can lead to information, and then that information can lead to knowledge, which leads to wisdom. This interpretation was first mentioned in detail by R. L. Ackoff in 1988. The sequence of knowledge hierarchy is as follows: data-information-wisdom, according to Ackoff's formula, and he was the first to combine these terms in 1989. Moreover, this account suggests that the negative counterparts of the terms Data-Information-Knowledge-Wisdom can be explained as follows: the opposite meaning of "data" can be seen as absence or want of data or missing data. The opposite of information is misinformation, disinformation, or error; the opposite of knowledge is ignorance; the opposite of wisdom is stupidity. This structure indicates that regardless of whether these are the antonyms of these terms, the opposite meaning of knowledge is ignorance. However, it indicates that the concept of knowledge is culturally specific, which means that knowledge can be outdated. It adds that knowledge can be of numerous types and thus it is possible to have different kinds of ignorance as well (Bernstein, 2009).

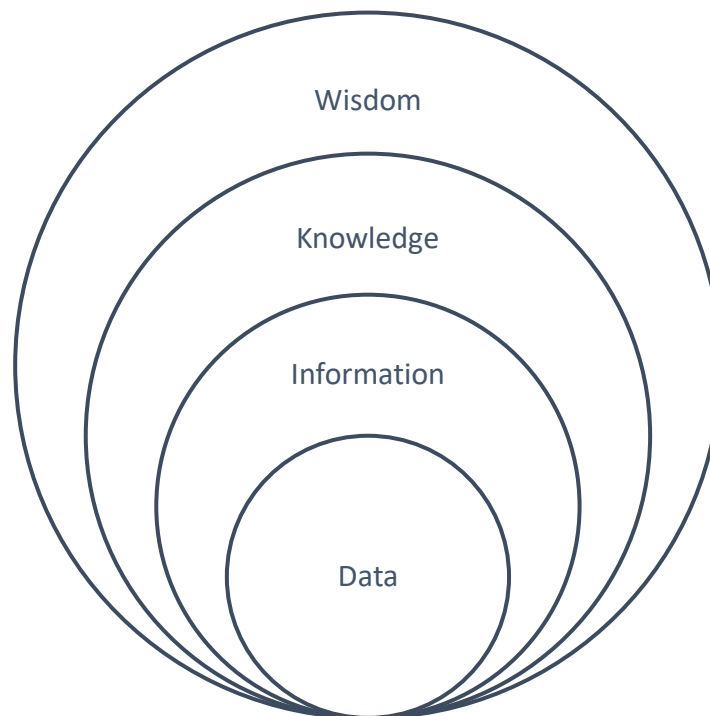


Figure 2.1 source: Rowley (2007).

2.1.2 Types of Knowledge: Tacit and Explicit

Having now explained knowledge and how previous textbooks and authors define it, it is critical to understand the types of knowledge. Explicit knowledge and implicit (tacit) knowledge are two common types of knowledge, so understanding them is crucial for this study. Explicit knowledge can be touched, such as file documents and data that can be explained to others, whereas implicit (tacit) knowledge refers to intangible assets such as experience, personality, and impalpable traits. Understanding such aspects of knowledge leads to effectively managing and controlling knowledge through KM. Different features of the two types of knowledge are explained in Table 2.1.

Table 2.1 Features of Implicit Knowledge versus Explicit Knowledge

Features of implicit (tacit) knowledge	Features of explicit knowledge
Changeability: reacting to unexpected situations	Refining, reaching, and disseminating throughout the organization
Experience, know-how, know why	Can be trained and learned
Intangible knowledge	Can be easily explained and controlled
Hard to articulate	Easy to articulate
Knowledge can be transferred through coaching and mentoring	Knowledge can be transferred through documents

Source: adapted from researchers Kitimbo and Dalkir (2013) and Ceptureanu et al. (2015)

2.2 Knowledge Management

2.2.1 Introduction

Knowledge management has become an essential factor for plenty of aspects of business. It is a combination of tangible and intangible assets, so both are significant. These days, organizations work to be innovative so that they will be sustainable in such fierce competition, so KM is critical because it enables them to achieve goals and to facilitate the implementation of strategies.

KM is a systematic and collective process of creating, sharing, and applying knowledge that can enable employees, teams, and organizations as a whole to accomplish their strategic and operational objectives. It contributes efficiently and effectively in the process of operations as well as in enhancing innovation. Additionally, it aims to generate knowledge from information and invests such knowledge in maintaining a competitive advantage that can be revealed as a source of success in business (North & Kumta, 2018).

Numerous disciplines consider knowledge as a valuable source of a company's competitive advantage. Knowledge in connection with management appeared in a 1959 source by Peter Drucker when he used the term "knowledge worker" in his book, *Landmarks of Tomorrow*. Later on, in the 1990s, the management of knowledge became a hot topic. Nonaka and Takeuchi presented their theory of organizational knowledge creation in their renowned book of 1995, and it is considered one of the most cited books in the knowledge management literature.

During the 1990s, a number of books on knowledge were published. For example, Dorothy Leonard-Barton published *Wellsprings of Knowledge: Building and Sustaining the Source of Innovation*. She showed the empirical applications of knowledge and considered knowledge as a significant resource for an organization to gain and sustain a competitive advantage. Another book, *Working Knowledge*, was published by Tom Davenport and Laeey Prusak in 1998. By the end of the 1990s, knowledge management themes were flourishing in academic and business journals worldwide. One of the issues relevant to a corporation is the ability to manage knowledge and react to observed changes in environmental economies. Notably, such changes occur rapidly in the external environment and across a wide range of dimensions, such as open innovation, globalization of markets, technological breakthroughs, and emerging new industries. External changes in the environment led to increasing interest in knowledge and are considered a primary resource for firms seeking a competitive advantage. Creating knowledge and managing knowledge are significant activities, whether for local or international companies, because they address the core competency necessary for them to be sustainable and competitive (Nonaka & Takeuchi, 2006, p. 5-6).

KM is necessary for any organization to achieve a competitive advantage--whether it is a national or international company. Two great examples of global companies, GE and Toyota, exploit KM successfully so that KM is a crucial factor in enabling them to be sustainable and gain a competitive advantage in the worldwide market. Toyota has widely communicated its significant knowledge program of practicing *kaizen* (continuous improvement), which enables workers to consistently produce high-quality cars through different Toyota subsidiaries. GE knowledge selects the best practices to be shared by its famous operating mechanisms such as global leadership meetings, Corporate Executive Councils, and corporate officer meetings as ways to share knowledge (Nonaka & Takeuchi, 2006, p. 3-4).

KM can contribute positively to solving problems, and it fosters collaborative learning and enables professionals to learn from their mistakes. For instance, KM can prepare organizations for the future by helping them to develop a process that enables them to be ready for future changes, such as technological changes, and that can take place through cross-departmental workshops. The importance of adaptation and reaction for organizations' learning is important and scholars have identified some features related to this, including organisations' learning commitments, strategies supporting innovation, and systems that support learning and use it to enable the transfer of knowledge between individuals or amongst groups to support practitioners (North & Kumta, 2018, p. 16-18)

Combining knowledge from different sources is essential for innovation and considering investors' perspectives, which is essential for permanently increasing the value of the firm. Traditional firms consider knowledge as a commodity like information that can be divided and stored ("frozen food"), whereas knowledge firms are familiar with the idea of knowledge as requiring creation and transfer among individuals and a cumulative learning process that is hard to dominate or control totally. Thus, for instance, the speed of learning of one firm to another is different because some are faster than others, and the transfer of knowledge within an organization is different from one to another. In those cases, the corporate vision and mission consider knowledge a key success factor in business, so employees must be rewarded based on both individual performance and their contribution to the overall success of the firm.

This will, therefore, increase individuals' motivation to contribute positively to the firm as a whole (North & Kumta, 2018, p. 22-23).

2.2.2 Knowledge Management Processes

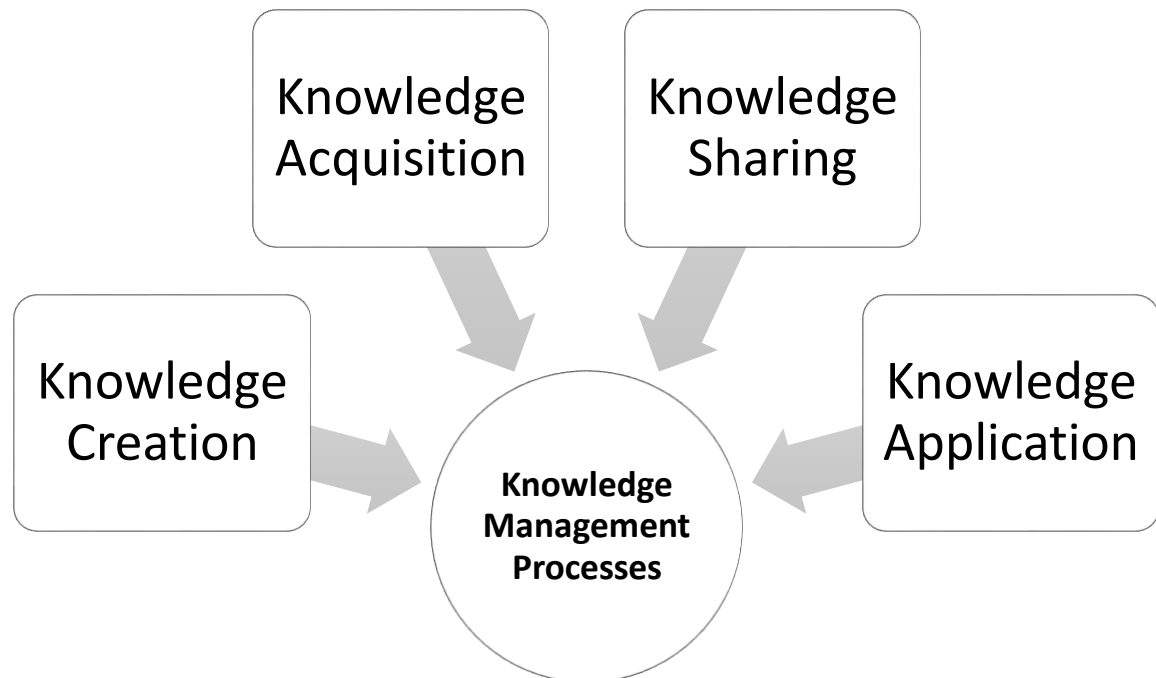


Figure: 2.2 Source: Ugwu and Ekere (2018), Boroujerdi et al. (2019)

“Knowledge creation” is defined as a continuous transition and transformation of various kinds of knowledge. “Knowledge acquisition” is any knowledge that can be obtained from either internal or external organizational sources. “Knowledge sharing” is the process of exchanging explicit knowledge and implicit knowledge between employees to make new knowledge. “Knowledge application” is the use of available knowledge to make decisions and perform tasks.

The aim of this research is to investigate the correlation between KM and organizational innovation in higher education centers (Boroujerdi et al., 2019). Ugwu and Ekere (2018) indicate that the KM cycle entails capturing and creating knowledge, sharing and transferring knowledge, and applying and using knowledge. Understanding the process of KM is significant to enable an organization to exploit KM enablers to achieve innovation.

2.3 Innovation

Due to the rapidly changing business worldwide, innovation has become a significant enabler for some organizations. Additionally, product lifecycles have become shorter and increased the rate of new product and development so that innovation is a vital factor to maintain a competitive advantage for organizations. Therefore, knowledge has a significant role in innovation, so both managing and reorganizing knowledge are crucial to achieving successful innovation (Plessis, 2007).

“Innovation” is considered the generation of new knowledge or ideas that facilitate new business outcomes. It aims to enhance internal business processes and structures to produce market-driven services. Innovation can be both radical and incremental (Baregheh et al., 2009). According to Brem et al. (2016), the definition of “innovation” is the transfer of new ideas into practice and the identification of opportunities to produce new services or processes. Producing services or processes in a new way or improving them is considered a common feature of innovation. Process of innovation requires new or significantly improved procedures (Gault, 2018).

The consulting company PwC conducted a survey of senior executives regarding the impact of innovation in their organization through their 2015 Global Innovation Survey. It indicates that about half of the 1757 executives interviewed, 43%, felt that innovation is essential for their organizations to be competitive. The finding was presented in a prior study that innovative firms achieved a growth rate of 16% compared to those who are less innovative (Tidd & Bessant, 2020).

Table 2.2 Service Innovation Definition

Reference	Definition
Windrum (2008)	“Systematic innovation involves new or improved ways of interacting with other organizations and knowledge bases.”

Baregheh et al. (2009)	Innovation consists of many processes that enable organizations to transform ideas into new or improved services, so that organisations can advance, compete, and differentiate themselves in the marketplace.
Arundel and Huber (2013)	Innovation can be defined as how to make something better through new or improved services.
Gault (2018)	Innovation is the process of the implementation of new or significantly changed process of producing services.
UK Department of Innovation and Skills	“Innovation is the successful exploitation of new ideas.”
American Society for Quality-ASQ	“The successful conversion of new concepts and knowledge into new services that deliver new customer value in the marketplace.”

Source: explained by the researcher based on the above-mentioned references.

To conclude, most innovation definitions focus on making something better or more creative by adopting new methods or creating a process of changing something radically or incrementally to make it more innovative.

2.4 Knowledge Management Infrastructure Factors for Enhancing Service Innovation in Private Professional Training Centers in Saudi Arabia.

Introduction

Exploiting KM in enhancing service innovation requires appropriate tools that facilitate the successful implementation of KM. Therefore, KM infrastructure elements, such as organizational culture, organizational structure, information technology, a community of practice and physical environment, can play an efficient and effective impact on achieving service innovation. Innovativeness is a vital factor for any organization to achieve a sustainable competitive advantage. Increasing demand for professional qualifications has led numerous centers to offer professional training, which has led to increasing competition among centers in Saudi Arabia. Virtual learning has become inescapable, especially during the pandemic, so it has become a threat to plenty of centers because it provides a substitute for physical attendance at class. Such factors can cause a considerable number of challenges for such training centers so that adopting service innovation to survive in such fierce competition is critical.

Understanding the key factors of KM processes such as acquiring, sharing and applying is critical to consider some success factors that can facilitate executing KM successfully to enhance organizational innovation. Consequently, an understanding of KM infrastructure elements and their impact on enhancing service innovation is crucial and must be tested to examine their impact on innovation. The following is the key KM infrastructure factors with a focus on their impact on innovation.

2.4.1 Organizational Culture

Beliefs and values that are shared between employees in an organization can be defined as an “organizational culture,” which determines the characteristics of the organization (Martins & Terblanche, 2003). Therefore, organizational culture is a critical factor for any organization and can help to build and implement strategies, so an understanding

of the culture of an organization is crucial. Contemporary studies regarding corporate culture have concentrated on intangible features such as values, behaviors, and attitudes, which can be beneficial for decision-makers and development. Thus, numerous studies were conducted regarding the impact of organizational culture on organizational innovation, especially through KM. Numerous empirical studies have been conducted regarding the impact of organizational culture on corporate innovation.

To begin with, a study was conducted on the private and public sectors in Bahrain regarding organizational culture's impact on enabling the sharing of knowledge. Both qualitative and quantitative research methods were used in this research. The total responses were 231 out of 300, which represents 77% as a percentage rate of responses. The selection of respondents was random and captured different job titles from various organizations. The study sheds light on corporate culture as a critical factor for an organization's success in enhancing the transfer of knowledge among team members to equip them with know-how, which in turn will increase productivity. The result of the study indicates that the organizational culture has a positive impact on the sharing of knowledge in the organization, In terms of research recommendations, the article suggests building trust among team members through arranging social events and outdoor discussions. Such events can reduce work stress and encourage informal friendships. It also recommends improving the physical environment by designing offices in a way that enables employees to interact with each other easily and conveniently and establishing a robust relationship between top management and employees as well as expressing the importance of sharing knowledge for the organization as a whole (Al-Alawi, 2007). Obeidat et al. (2015) indicates that organizational culture has a positive impact on service innovation through KM. The research was conducted on telecommunication companies in Jordan.

Another study investigates the significance of cultural values, corporate culture, and management style and how they can impact innovation. Notably, it examines service innovation performance in European countries. It evaluates and compares the theoretical frameworks of well-known scholars Hofstede, House, Schwartz, Boisot, and Cameron. Based on the literature review it concludes that there is a strong positive relationship between cultural characteristics and innovative strength. It indicates the significance of cultural values for innovation (Moonen, 2017).

Moreover, the empirical study was done to examine the impact of organizational culture and leadership to enhance innovation, and it focuses on innovative universities. Corporate culture is used as a mediating variable between organizational innovation and leadership. A quantitative research method was used, a questionnaire, and for data analysis the Partial Least Squares statistical technique was used. Top-ranked universities have adopted transformational leadership methods that enhance innovation. The study indicated that although transactional leadership has a positive relationship with organizational culture and innovation, the results were statistically insignificant. The result shows that corporate culture has a positive impact on innovation. The study indicates that transformational leadership has been adopted by top universities and has had a positive impact on innovation (Bhutto et al., 2018).

Furthermore, the research examines the relationship between organizational culture, knowledge management, organizational learning, and their impact on innovation. The framework of the study was developed to investigate the factors that can have an impact on innovation. A quantitative research method was used in this study through the use of a questionnaire distributed to 279 Iranian automobile parts companies. The research methods and techniques that were used to evaluate and estimate the results of the study were the Partial Least Squares statistical technique, structural equation modeling (SEM), stratified random sampling because the study classified its respondents demographically, and the responses of all groups were put on an equal basis. All variables were measured using a seven-point Likert scale. The results of the study indicate that organizational culture has a positive impact on corporate innovation. Establishing an appropriate cultural environment is essential for any organization to enhance innovative capabilities. The results of the study are beneficial for decision-makers and managers when considering strategies for sustainable innovation. Innovation enables organizations that are supplying the product or service to be more innovative, competitive, and profitable (Abdi et al., 2018).

Last but not least, the latest study was conducted in 183 Chinese companies. The study examined the fit between organizational culture and innovation strategy, focusing on the speed and quality of innovation. The study is about the relationship between corporate culture and its innovation strategy. The study was built to develop a conceptual model that considers an organizational culture in managing to achieve an innovative strategy in terms of speed and quality. Specific elements of corporate culture

include clan, adhocracy, hierarchy, and market cultures. The findings reveal the managers should take into consideration the benefits of incorporating innovation strategies into the company's culture-strategy. Assessing organizational culture is critical before implementing an innovation strategy. The findings assert that the fit between organizational culture and innovation strategy are essential and a critical driver of strategy implementation. Most importantly, the findings indicate that a holistic assessment of organizational culture characteristics is significant for the implementation of an innovation strategy. The study findings indicate that the cultural-strategy fit provides a key competitive advantage instead of pure strategy. Understanding the organization's culture is significant for the adoption of an innovation strategy, so the fit between the two can be beneficial for managers to understand the synergies and conflicts and enhance the positive sides of the business's culture and overcome the negative ones. Consequently, understanding organizational culture is beneficial for managers to be proactive when they adopt an innovation strategy. This understanding can lead managers to be more aware of how to build synergies and control or avoid conflict between various types of innovation strategies and organizational cultures. The study focuses on the fit between innovation strategy and organizational culture from a holistic perspective (Chen et al., 2018).

Another study indicates that organizational culture is a crucial driver for achieving a firm's innovation in the long term. The study's framework was established based on previous literature reviews, and it focuses on having the right culture as an essential factor that enables a corporation to be innovative. Such dramatic and fast changes in current business are required for a company to be innovative, so that means adopting new and innovative products and processes to enable an organization to be more sustainable (Bendak et al., 2020).

Such empirical studies within different time scales and different sectors affirm that organizational culture is a significant enabler for enhancing innovation. This project will test a hypothesis to find out how organizational culture influences innovation. Consequently, the first hypothesis is as follows:

H1 Organizational culture has a statistically significant impact on service innovation.

2.4.2 Organizational Structure

One of the key elements of KM infrastructure is organizational structure, and it is considered a critical element to enable cross-functional knowledge sharing that enhances or inhibits innovation. Therefore, understanding the various organizational structural types is critical to avoiding the misunderstanding of organizational structures and distinguishing between different kinds of structures.

To begin with, centralization and decentralization of organizational structure are completely different. “Centralization” means that an organization strictly follows a hierarchical level. In contrast, “decentralization” means communication quickly reaches the top management, and no chain of command is followed, and it is also called a “flat structure.” Such a brief introduction regarding types of organization structures is crucial. A number of empirical studies indicate the impact of organizational structure and its impact on innovation. The centralization structure of an organization can inhibit communication and the sharing of knowledge, whereas the decentralization structure is the best way to facilitate knowledge sharing (Al-Alawi, 2007).

Another study examines the relationship between organization structure and innovation performance. It was conducted on small and medium-sized enterprises in the UK. It tests different work environments to find the optimal organisational structure, and it covers new and old firms in high-tech sectors. It indicates that the capabilities for innovation of different models are different from one to another. The decentralization of decision making is more supportive of innovation in most circumstances compared to other structures. The study found that organisations with decentralized structures, especially amongst young firms that operate in high technology sectors, tend to be more innovative. Whether formal or informal organizational structure decentralization should be adopted to enhance a firm’s innovation tendency by involving employees in decision making is critical because of the rapid changing of skills and knowledge that is now required (Cosh et al., 2012). According to Obeidat et al. (2015), the centralization of an organizational structure has a negative impact on organizational innovation.

Centralization encourages less innovative behavior among employees because the employees are not involved in the decision making processes and they are restricted to getting approval from top management. Due to such restrictions, employees are reluctant to generate creative ideas. The second finding the article presents is that formalization reduces employees' innovative behavior because the employees are restricted by the rules and procedures of an organization. Consequently, reducing the chance for employees to seek out new methods or ways that things can be done. In this case, innovation is inhibited (Dedahanov et al., 2017).

Another empirical study was conducted on Turkish public companies, and it focuses on the centralization and formalization structure of an organization and the impact of such on innovation. The data were collected from 198 managers from these Turkish companies. The result indicates that centralization has a negative impact on innovation, whereas the impact of formalization is not confirmed regarding its impact on innovation (Kalay and Lynn, 2016). Such empirical studies indicate that organizational structure can enhance or impede innovation. They suggest that a decentralized organizational structure has a positive impact on innovation, whereas the other organizational structure has a negative impact on innovation.

Such empirical studies indicate that organizational structure can enhance or impede innovation. They suggested that a decentralized organizational structure has a positive impact on innovation, whereas the other organizational structure has a negative impact on innovation. The following hypothesis can be formulated to find out how organizational structure influences innovation:

H2 Organizational structure has a statistically significant impact on service innovation.

2.4.3 Information Technology

One of the key KM infrastructure factors is information technology (IT), IT can facilitate the storing, sharing, and implementing of KM.

To begin with, this study investigated the impact of information technology as a significant enabler of innovation through KM. It focuses on the IT tools for the implementing of KM learning applications to assist companies in developing internal ventures. The research was conducted on 187 Italian electronic companies. A knowledge management system based on IT should be utilized through methods and techniques that enable users to communicate with and support each other. Communication tools can be chat rooms and online forums. Implementing new IT tools for knowledge management is essential for the current innovative corporate culture as well as for analyzing alternatives in order for organizational performance to become significant. Consequently, this can lead to the conclusion that IT could create a set of opportunities and advantages that enhance a learning attitude and affect all factors involved in the process of creating an internal venturing climate as well as supporting innovation within an organization.

This can be in the form of activities of generating, acquiring, storing, using and applying knowledge to business processes so as to lead a profitable business. 72% of companies ensured that KMS would support their projects. The results confirm that there is a positive impact of adapting IT based on a KM system of variables such as the knowledge sharing of internal venture organizational performance; it also indicates that there is a positive impact of knowledge sharing on innovation. They present that IT considers the critical factor of achieving innovation through knowledge management (Giudice & Peruta, 2016). Another study examined the impact of information technology infrastructure on innovation in six Iraqi private universities and 75% responded represented the faculty members of universities Jabbouri et al. (2016). SPSS was utilized to analyze the statistical data, and the regression analysis shows that there is a positive relationship between IT infrastructure and innovation performance. The study highly recommends that academicians should use IT as a strategic innovation. Moreover, one empirical study was conducted regarding the adoption of technology in enhancing innovation. A qualitative approach was used by conducting 17 structured

interviews. The study concluded that implementing technology is beneficial for enhancing innovative and administrative processes (Miranda et al., 2016).

Another study indicates that KM-supportive IT practices have a positive impact on organizational innovation. IT practices can be implemented to make a difference in innovation performance. Having a great amount of information available can be seen as either a threat or an opportunity. Companies can exploit IT in searching, gathering, and analyzing to support decision-makers and innovative performance. Exploiting IT in enhancing innovation by providing platforms to achieve joint innovation with external parties and establish various communication channels for internal and external stakeholders. Therefore, managers should take IT into consideration as a means to achieve and improve innovation in the performance of an organization. It indicates that IT implementation can enhance innovation and facilitate the analysis of knowledge to make better decisions. It concludes KM can be a managerial tool that can advance innovation. It concludes KM implementation is considered as an organizational tool to achieve innovation (Vanhala et al., 2015). According to Obeidat et al. (2015), IT is one of the highest positive impact factors of KM infrastructure on innovation at mobile telecommunication companies, so investing more in IT is crucial.

Based on such empirical studies that assert that information technology has a significant positive impact on enhancing organizational innovation, the following hypothesis on how information technology impact innovation is proposed:

H3 Information technology has a statistically significant impact on service innovation.

2.4.4 Community of Practice

The concept of a community of practice (CoP) appears to provide a useful perspective on knowing and learning. This concept has been used in a number of empirical applications such as business, organizational design, government, education, professional associations, and development projects. Due to the recognition of knowledge as a critical asset that must be managed strategically, the concept of CoP has been adopted by organizations. Communities of practice (CoPs) are defined as a group of people who share the same concern or passion for doing something, and they want to do those things perfectly by exchanging knowledge, information and experience amongst themselves.

What can be extracted from such definition is that not every community can be called a community of practice, so a community of practice must be based on the gathering and sharing of knowledge and information to achieve specific objectives. Neighbors, for instance, are a community, but they usually do not form a CoP. A community of practice is made up of members who are practitioners, and they develop and share knowledge to enable them to create a beneficial resource. A community of practice is only a group of friends, colleagues, or team members that are gathering to join activities and engage in discussion to help each other by sharing knowledge and information, whether they work in the same organization or not.

Communities of practice are not specifically classified as an organization, so they can be found under the titles of “learning networks,” “technology clubs,” and so on. People who work in the same organization and have the same titles do not make for a community of practice unless they interact to help one another in solving issues or improving a firm. Encouraging and building a community of practice can contribute positively in enhancing innovative activities in organizations. Researchers and practitioners have investigated communities of practice within different contexts, and they have found them to be a valuable method for learning. For instance, teachers or engineers who gather frequently to discuss how they can solve problems and have the main goal of sharing of knowledge and information can be called a community for practice (Wenger, 2011).

(Lim & Ong, 2019) focus on the impact of a community of practice in an organization that is concerned with innovation management. The findings indicate that communities of innovation play a significant impact on generating innovation within organizations. Furthermore, they provide innovation drivers such as organizational culture, time, money and opportunity to interact.

Another study found that universities should manage knowledge through communities of practice to achieve a competitive advantage. It examines the way that universities deal with CoPs to manage and produce knowledge that will be unique in relation to that of their competitors. It indicates that universities should exploit knowledge management within CoPs to enhance the sharing and protection of knowledge so that knowledge can play an effective impact on improving the productivity of the university.

Adopting CoPs in the university can help manage the knowledge assets of staff members who can apply and share knowledge amongst themselves and the university community. CoPs can lead faculty members to be more engaged and interactive when exchanging knowledge and expertise so that they can benefit from each other, which will enable them to adopt new approaches for solving problems and experience increased creativity. In such a way, they can achieve innovative methods. It is highly recommended that the leaders of universities should be informed of the significant impact of CoPs in promoting and protecting the new knowledge. They must pay attention to CoPs as a critical factor that enhances innovation as well as stimulates and supports CoPs to contribute effectively to their organizations. To achieve an effective contribution, top management should build a team that can collaborate with each other to enable the sharing of knowledge among them. Therefore, supporting and encouraging CoPs can assist universities to take advantage of KM as a strategic tool to accomplish innovation. The result indicates that due to a lack of understanding of the concept of CoPs, the impact of CoPs are treated as insignificant and there is a lack of systems to foster CoPs in universities (Dei & Walt, 2020).

Based on this discussion and results regarding the impact of CoPs in enhancing innovation within knowledge implementation, the following hypothesis is proposed to determine how CoPs impact innovation:

H4 Communities of practice have a statistically significant impact on service innovation.

2.4.5 Physical Environment

One of the key factors of KM infrastructure is physical space, so experiments that consider such an element should be considered by an organization during the process of adopting innovative policies. It is particularly important to consider features of such spaces that will facilitate the process of innovation as occurring through KM.

(Haner et al., 2007) indicate that many companies are interested in enhancing their physical spaces and making work environments more creative and innovative. Firms are keen to achieve innovation by providing innovative space, which encourages productive modes of working. However, although such a phenomenon has been increased, little academic attention has considered it. This study concentrates on both the literature about and authors experiences of observing firms in Europe. It focuses on the impact of design and the goals of such spaces. Designing a space is considered a key facilitator of innovation because it enables employees to communicate and interact with each other. Effective design of a workplace that facilitates communication among employees is critical. As a part of enhancing organizational innovation, an innovative space is essential because it facilitates the exchange of insights. Numerous companies are paying close attention to the infrastructure that facilitates the effective teamwork for distributed design teams and daily activities of product development teams (e.g., Cisco). Some firms are dedicated to designing an effective space that can lead to increased creativity among team members, which in turn will help achieve innovation. This indicates that teamwork can be increased to encourage formal and informal social interaction and motivate staff.

Innovative spaces can facilitate interaction among employees so that they can share creative ideas that promote an encouraging environment that reflects collaboration and mutual learning. Qualitative research is used to interview experts of innovative spaces regarding creative spaces and work environments. The analysis is concentrated on the distinguishing features of innovative spaces and how they can contribute to innovative service (Oksanen & Ståhle, 2013).

Enabling the exchange of knowledge and information between cross-functional teams is crucial, so paying attention to the physical environment of work is a critical factor in facilitating innovation. Increasing the amount of interaction among team members can lead to collaboration. Such interaction may occur in various forms, such as organizational community events, offices, or conference meeting rooms. Consequently, the exchange of knowledge and information is beneficial for cross-functional teams, so exposing such to knowledge and information can lead to collaboration among departments. The physical space is critical because it conveys a brand, a vision, and an outlook that can drive, define, and encourage innovation. Understanding the impact of space in enhancing innovative productivity is significant (Sayiner, 2015). According to Obeidat et al. (2015), physical environment has a positive impact on innovation, as was determined through KM research that was conducted on telecommunication companies in Jordan.

The following hypothesis can be formulated to test the impact of physical environment in innovation:

H5 Physical environment has a statistically significant impact on service innovation.

2.5 Private Professional Training Centers in Saudi Arabia

One of the strategic objectives of the Saudi Vision 2030 proposal, as developed in 2016, is to support the private and public sectors to enable youth to achieve the proposal's vision. One of the critical features of this transformation program is to increase Saudization in the private sector. Such transformation has led to plenty of opportunities in Saudi Arabia, which is why professional training centers are in high demand when compared to 6 years ago. Increasing demand for training courses has led to numerous centers offering training courses and exam-preparation courses. Such rapid growth of professional training centers has led to fierce competition. Therefore, innovation is significant to enable such organizations to have a sustainable and highly competitive advantage over competitors. One of the critical factors to achieve innovation is to adapt KM infrastructure.

Professional training centers provide professional qualifications for employees and nonemployees. Such centers have a significant impact on enhancing the skills of Saudi youth that are required for the labor market. Therefore, numerous initiatives have been adopted to enable these centers to be effective in the Saudi labor market. For instance, the Saudi Human Resources Development Fund (Hadaf) is supporting Saudi youth by covering the expenses of professional training courses and exams--whether the youth are employees or not. In 2021, according to the newspaper *Arab News*, Hadaf approved 33 new professional certificates by increasing the overall number to 78.

To conclude this chapter, the words that were defined in this literature review regarding KM infrastructure factors are as follows: organizational culture, organizational structure, information technology, community of practice, knowledge, and physical environment. However, numerous empirical studies were conducted in connection with KM infrastructure, and they focus on three factors of KM infrastructure, such as organizational culture, organizational structure, and information technology. Other studies concentrated on individual elements of KM infrastructure and its impact on innovation. One empirical study examined five factors of KM infrastructure (Obeidat et al., 2015), and the results of this study reveal that KM infrastructure (organizational

culture, information technology, physical environment, and human resource) has a significant positive impact on innovation, except the feature of organizational structure, which has a negative impact on innovation.

Therefore, the conceptual framework of this research was adapted from that of Obeidat et al. (2015); it illustrates the independent variables of KM infrastructure elements (organizational culture, organizational structure, information technology, community of practice, and physical environment). The dependent variable is innovation. This research extends Obeidat et al. (2015) by adding community of practice as an independent variable and excluding the variable of human resources. Adding the community of practice in this research and excluding human resource is because this study focuses on professional training centers which deal with knowledge and information directly. Furthermore, the community practice in such professional training sector is essential. Moreover, Obeidat et al. (2015) telecommunication sector which might be slightly different in process of implementing knowledge management infrastructure to enhancing innovation. Additionally, communities of practice in professional training centers can build in many segments according to their specialty. For instance, communities of practice can build programs such as Finance, Leadership, Accounting.

Chapter 3: Research Methodology

3.1 Introduction

This chapter illustrates the methodology used to achieve the study's research objectives by investigating the critical factors of KM infrastructure and their impact on innovation in the private professional training centers in Saudi Arabia. These elements are organizational culture, organizational structure, information technology, the community of practice, and the physical environment. The chapter focuses on the methodology utilized regarding the quantitative approach in terms of gathering data and analysis. The target population is all employees in PPTCs, including the top management level (head of the department and above), middle management level (managers and supervisors), administrative level (below the supervisory level), teaching staff (Prof., Dr., lecturer, instructor, trainer, teacher), and others. The primary research was conducted to collect data through the questionnaire to obtain the essential resources to test hypotheses and reach results, while the secondary data was gathered from scientific research, journals, theses, and books. To determine the validity and reliability of the questionnaire, a pilot study was conducted. Moreover, the tools and techniques were used in this chapter for data collection and the process of data analysis, as well as the target population and sample of population for this study.

3.2 Research Design

The study's research design was intended to achieve the objectives of the study. This strategy can be classified as a deductive approach. The research's aim is to test the hypotheses that were chosen based on previous literature reviews and empirical studies. Moreover, the cross-sectional method of data collection is conducted at a single time. The research was designed specifically to test hypotheses to answer the research questions. Therefore, the research was designed to follow and use a quantitative research method to collect and analyze the data. The research design was considered as a way to cover the entire group of employees who work in PPTCs. The first section of

the survey included questions asking about the employee's rank position in the organization to make sure the survey was covering the target population.

The quantitative research method of the study was conducted through a questionnaire (refer to Appendix A). The survey was adapted and selected from numerous research and empirical studies, as is explained in Appendix C.

Figure 3.1 shows the procedure of research methodology and research design that were used.

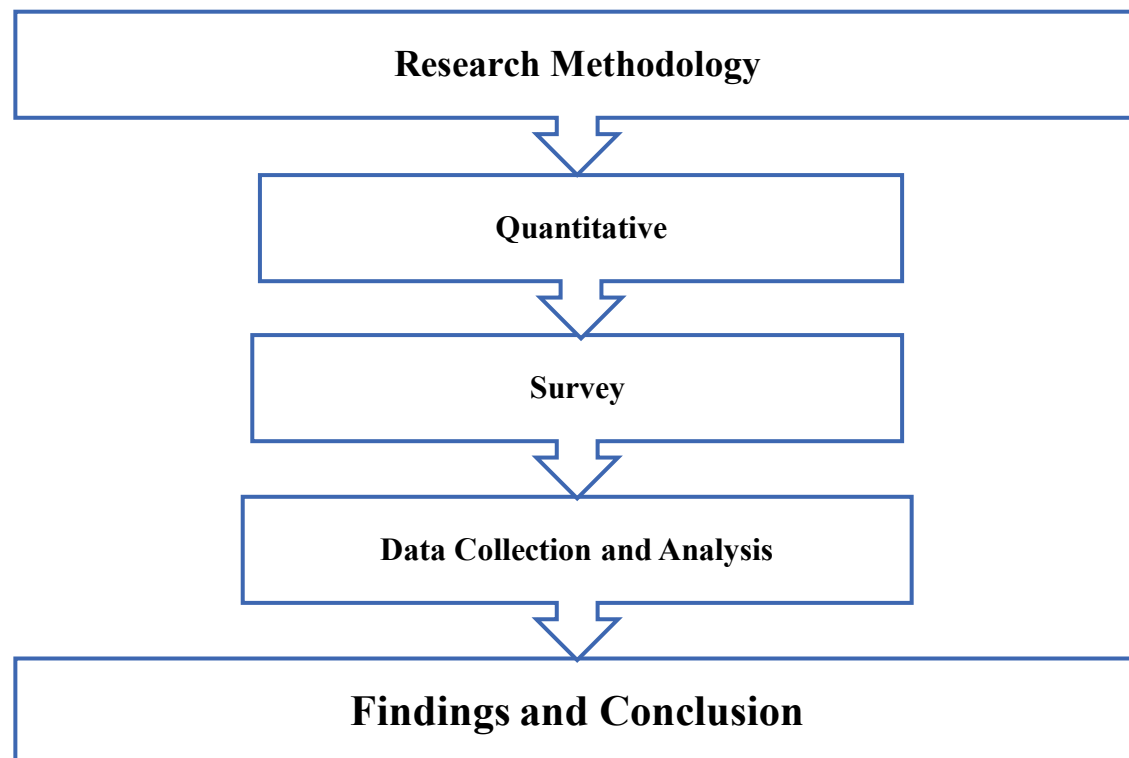


Figure 3.1 Procedure of Research Methodology

3.3 Research Framework

Based on the literature reviews mentioned in chapter two that investigate each independent variable and its impact on service innovation. The conceptual framework of the research is adapted from Obeidat et al. (2015). It illustrates the independent variables of KM infrastructural elements (organizational culture, organizational structure, information technology, the community of practice, physical environment, and human resource); the dependent variable is innovation and the independent variables were considered in their impact on innovation. In this conceptual framework, the community of practice was replaced by “human resource” as an independent variable. The Obeidat et al. (2015) study was applied in the telecommunications sector, whereas this study was conducted on private professional training centers in Saudi Arabia. Therefore, modifying such a factor is a significant approach because the community of practice might have a positive significant impact in enhancing service innovation. Adapting such a conceptual framework can address a gap in previous studies in terms of covering the five key variables and considering their impact on innovation as well as on the target sector of private professional training centers in Saudi Arabia.

Therefore, the conceptual framework of this research was adapted from that of Obeidat et al. (2015); it illustrates the independent variables of KM infrastructure elements (organizational culture, organizational structure, information technology, community of practice, and physical environment). The dependent variable is innovation. This research extends Obeidat et al. (2015) by adding community of practice as an independent variable and excluding the variable of human resources.

Adding the community of practice in this research and excluding human resource is because this study focuses on professional training centers which deal with knowledge and information directly. Furthermore, the community practice in such professional training sector is essential. Moreover, Obeidat et al. (2015) telecommunication sector which might be slightly different in process of implementing knowledge management infrastructure to enhancing innovation. Additionally, communities of practice in professional training centers can build in many segments according to their specialty. For instance, communities of practice can build programs such as Finance, Leadership, Accounting.

In terms of the research question(s), the conceptual framework can be represented as follows:

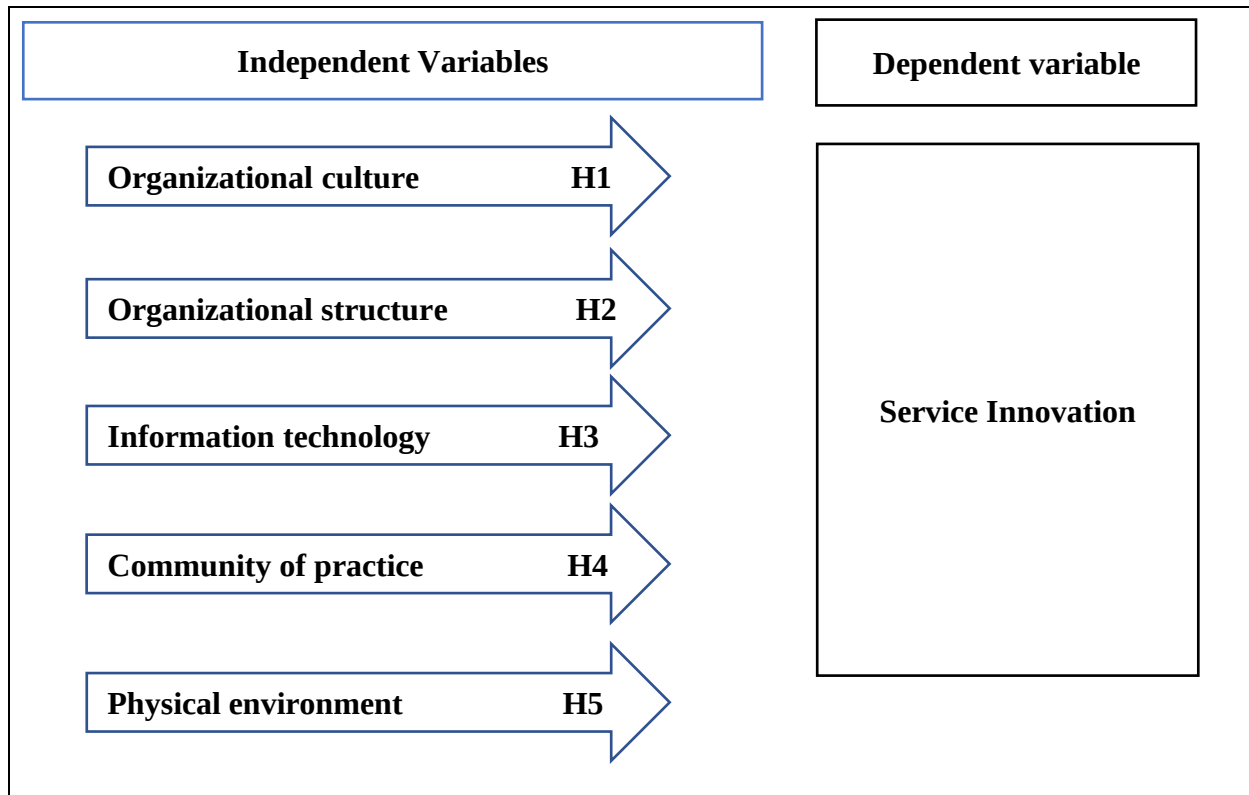


Figure 3.2 Theoretical Framework

Source: Adapted from Obeidat et al. (2015)

3.4 Research Variables

The variables included in the research are categorized into independent variables and a dependent variable, as explained in Figure 3.2.

- a) **Independent variables:** adapted from Obeidat et al. (2015) by adding the community of practice instead of the human resource factor. The independent variables are then as follows: organizational culture, organizational structure, information technology, a community of practice and the physical environment.
- b) **Dependent variable:** the dependent variable of the research is innovation.

3.5 Research Hypotheses

Based on the research questions, hypotheses were formulated regarding innovation. The hypotheses are as follows:

- H1 Organisational culture has a statistically significant impact on service innovation.**
- H2 Organisational structure has a statistically significant impact on service innovation.**
- H3 Information technology has a statistically significant impact on service innovation.**
- H4 Communities of practice have a statistically significant impact on service innovation.**
- H5 Physical environment has a statistically significant impact on service innovation.**

3.6 Research Instruments

A Likert scale with five intervals was used to determine respondents' degree of agreement. To calculate the score intervals, the following formula was executed:

$$\begin{aligned}\text{Score interval} &= (\text{Maximum score} - \text{Minimum score}) / \text{Number of Levels} \\ &= 5-1 / 5 = 0.8\end{aligned}$$

Table 3.1 illustrates the rating scale of score used for measuring the degree of agreement.

Likert Scale of Agreement				
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1-1.8	1.81-2.6	2.61-3.4	3.41-4.2	4.21-5

The correlation between the factors was computed to measure the direction of the relation that ran between -1 and +1. The positive values indicate a positive relationship, whereas the negative ones mean a negative relationship. Hair et al. (2011) indicate that a scale can measure the strength of a correlation, and they present a rule of thumb for interpreting a correlation coefficient size; it is shown in Table 3.2.

Table 3.2 A rule of thumb for interpreting a correlation coefficient

Correlation	Strength of Relationship
±0.91 to ±1.00	Very strong positive/ negative correlation
±0.71 to ±0.99	Strong positive/ negative correlation
±0.41 to ±0.70	Moderate positive/ negative correlation
±0.21 to ±0.40	Weak positive/ negative correlation
±0.00 to ±0.20	No significant correlation

Source: Hair et al. (2011)

3.7 Data Collection

The method of collecting quantitative data was through distributing questionnaires to target population. The target population of this research is 245 employees of private training centers in Saudi Arabia. Such target population consists of the top management level (head of department and above), middle management level (managers and supervisors), administrative level (below supervisory level), and teaching staff (Prof., Dr., lecturer, instructor, trainer, teacher). The target population all employees who work in private professional training centers in Saudi Arabia. The questionnaires (refer to Appendix A) were distributed to 245 respondents in PPTCs in Saudi Arabia. The total completed responses were 200. The questionnaire consisted of two main sections. The first is about demographics and the rank of the respondent's position, whereas the second is 30 questions with a 5-point Likert scale response

3.8 Validity and Reliability of the Questionnaire

Validity and reliability are essential to test the questionnaire in the pilot study, so the questionnaire was checked for such factors:

3.8.1 Validity

A validity test confirms that the measurement tools that are being used are actually measuring the intended research concept. Therefore, achieving such a high standard for the questionnaire, reviewing the statements of the questionnaire was essential so that it was done from the beginning until the statements were ready to be distributed to the sample of the target population. For instance, five respondents from the target population read the statements in advance and provided feedback before the pilot study was disseminated; some statements were edited, and others removed because they had a duplicate meaning. Such a method is considered as a pre-pilot study, which was significant.

The sample of the target population was selected to test the validity and reliability carefully. Consequently, the researchers selected and wrote questions from previous studies and literature reviews to measure each independent variable and its impact on the dependent variable. The first stage of reviewing this questionnaire was discussing it with the supervisor, and the supervisor sent it to a professor who is a specialist in statistical analysis. An online meeting was conducted through Teams, the questionnaire was discussed, and the professor provided constructive remarks and comments, which were considered. Editing of the questionnaire was done based on the professor's feedback. In this review stage, an online mentor checked and proofread the research after the editing. He also provided feedback and recommended adding the qualifying question mentioned above to enable only the target population to fill out this survey.

Therefore, data analysis examined the correlation of the questionnaire to exhibit the correlation significance of the questionnaire after data were collected. The process of examining the questionnaire correlation was implemented through SPSS to display the significance of the correlation and consistency of the questionnaire (refer to Appendix G).

As indicated in Appendix G, measuring statements were executed by examining the correlation between each statement with the other variables' statements. It also presents the results that show that all questionnaire statements have a strong correlation coefficient and statistical p-value of less than 0.05, which confirms that the internal consistency of the questionnaire is of very high validity.

3.8.2 Reliability

The reliability of the questionnaire means the degree of consistency that it measures as providing consistent results of questionnaires that affirm that the search can be replicated by using such measurement procedures and providing similar outcomes when it is replicated. The questionnaire was disseminated and presented to the respondents in the same manner to confirm the consistency of the research. SPSS was used to testing the reliability coefficient by determining that the result is reliable if it is above 0.7 (George & Mallery, 2006). The total number of questions is 30 items to test the variables. The Cronbach's Alpha value is .931, which means the questionnaire is reliable and consistent, so the researcher can continue the research study as it shows in Table 3.4 further details in (refer to Appendix D). The reliability test of the questionnaire is critical in scientific research. Simply, it measures the degree of consistency, which means if the questionnaire was conducted at different times, the results would be consistent.

3.9 Pilot Study and Questionnaire Reviewers

Based on previous studies and literature reviews, the questionnaire was selected and written. Therefore, writing the questionnaire is done through many phases. First of all, writing questions to measure each independent variable and its impact on the dependent variable. The second stage of reviewing this questionnaire is discussing it with my supervisor Prof Adel, and he sent it to Professor Muwafaq AlKubaisi is a specialist in statistical analysis. The meeting was conducted online through Teams and discussed the questionnaire, and Prof Muawafaq provided constructive remarks and comments, which is considered. Based on the feedback of Professors Muwafaq, the questionnaire was modified. In this reviewing stage, an online mentor Dr. Lawrence Ness checked and proofreaded the research questions and conceptual framework and added some valuable comments for the questionnaire which is considered. Additionally, Dr. Nehal reviewed the questionnaire and provided constructive feedback approved (refer to Appendix C).

The pilot study was conducted to test the questionnaire's reliability and note any suggestions and comments. Before conducting the pilot study, the questionnaire was provided to four professors and experts to be reviewed and approved.

The survey sent to employees of the private professional training centers in Saudi Arabia, which was the target population. The total pilot study sample is 20 employees from the same target population to test the reliability. The reliability test shows in the table 3.4 below, and it is reliable above 0.7.

Reliability Test of Pilot Study

Table 3.4 Reliability Test Questions of Pilot Study Test

Case Processing Summary		
		N
		%
Cases	Valid	20
	Excluded ^a	0
	Total	20
		100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.931	.933	30

3.10 Data Analysis

A quantitative research method was used to determine the relationship and impact between variables. The data analysis was implemented through Microsoft Excel and SPSS after collecting data from the questionnaire using Google Forms and as well as by collecting paper copies. The data was exported from Google Forms to Excel as raw material, and the codes of questions were created so they could be analysed properly. Then, the data were exported into SPSS. Furthermore, descriptive statistics of data were executed to describe the characteristics of the sample and to address specific items.

The following analytical and statistical analysis methods were implemented:

- Descriptive
- Frequencies and percentages of analysis
- Alpha coefficient stability to test the degree of credibility of answers
- Mean average and standard deviation, frequencies, and percentage
- Normality test
- Nonparametric test
- Bivariate
- The correlation analysis results of the nonparametric Spearman correlation tests
- Simple Regression Analysis

3.11 Population and Sample

The population can be defined as a group of people or items that the researcher needs to understand, whereas sampling is the process of selecting a segment of this population for research. Convenience sample was used in this research. The sample of the study concentrated on private professional training centers in Saudi Arabia so that the target was all employees from all levels in these centers.

In terms of reaching these centers, the research through google was used in the process of research to get their contact information so that contacting and explaining the research's aim to such target centers was useful in enabling them to understand it and share it with their employees and coworkers. Contact with centers' executives by phone was an initial step before distributing the questionnaire to some centers physically. Another method of sending the questionnaire was through official emails and social media accounts. The introductory page of the questionnaire was a clear statement that the answers would be strictly confidential and would only be used for research aims; this was done to encourage a respondent to express their opinion frankly.

The total number of employees of this target population was 245 males and females. The completed responses were 200, as was explained in the data collection section. The sample size was calculated with a .95 level of confidence and 0.05 margin of error. Therefore, the targeted sample size was achieved, as it was above 160 responses. The applicability of this measure was confirmed by Krejcie & Morgan (1970) (refer to Appendix F: Sample Size Table).

Chapter 4: Data Analysis, Findings and Discussion

Introduction

This chapter covers the study's data analysis in detail regarding the research method that was used for data collection, and the analysis to accomplish the research objectives of this study by investigating the elements of KM infrastructure and their impact on service innovation in PPTCs in Saudi Arabia. The data were collected by utilizing the quantitative research method through questionnaires that were distributed to the target population in PPTCs in Saudi Arabia, and it covers all employees including top management, middle management, administrative level, and teaching staff. Excel and SPSS were used to analyze the data. At the beginning of this chapter, the descriptive analysis of a sample will be implemented, and the rest of the analysis will be concentrated on the tools and techniques used to obtain the findings in this research. In addition, it provides an analysis of the findings of the use of this research method to consider the five factors of KM infrastructure and how they impact innovation. These factors are organizational culture, organizational structure, information technology, a community of practice, and physical environment.

4.1 Questionnaire Design and Analysis

The research method of this study is quantitative, so a questionnaire was used. The first section concentrates on the descriptive analysis that covers respondents' demographic factors. The second focuses on techniques and tools used to test the research hypotheses and answer the research questions.

4.2 Respondents' Demographic Information

As indicated in Appendix E, the descriptive statistics of the study regarding the respondents' characteristics showed in the first section of the data analysis segment using the available data. These characteristics include age, gender, educational level, and job title. The total number of responses was 200 employees from the targeted private professional training centers in Saudi Arabia.

- **Age**

The objective of collecting demographic variables is to gain a basic understanding of the respondents in the sample. Table 4.1 presents the sample distribution based on age and illustrates the frequency of employee types. To identify the age of respondents, five options were created to make sure that all employees were included: between age 20 but less than 30, 30 and less than 40, 40 and less than 50, 50 and less than 60, and 60 and above. The highest percentage of respondents was in the category of being older than 30 but less than 40, representing 44% of the employees. Following the high rate representing the other two groups of participants, those of age 40 but less than 50 and 50 but less than 60, both represented roughly 19% of the sample, respectively. The remaining two groups include those 20 and less than 30 years old, indicating 14%, and the group of respondents above 60, which is about 3%.

Table 4.1 Age

Details	Frequency	Percentage
20 and less than 30	28	14.0
30 and less than 40	88	44.0
40 and less than 50	39	19.5
50 and less than 60	38	19.0
60 and above	7	3.5
Total	200	100%

- **Gender**

Table 4.2 indicates the characteristics of respondents according to their gender. The majority of participants are males, and they represent 94% of the sample of the study, while the females represent 6% of the responses.

Table 4.2 Gender

Gender		
Details	Frequency	Percentage
Male	188	94%
Female	12	6%

- **Educational Level**

The study categorized educational levels into four levels (Table 4.3). The table indicates that more than half of the participants are carrying a BSc degree, with a percentage of 57.5% in that group, whereas the holders of an MSc degree make up 36%. Ph.D. holders make up 3%, and 3.5% are at other educational levels. This indicates the high level of education of professional training center employees in Saudi Arabi.

Table 4.3 Educational Level

Educational Level		
Details	Frequency	Percentage
BSc	115	57.5%
MSc	72	36%
PhD	6	3%
Other	7	3.5%
Total	200	100%

- **Job title**

Table 4.4 presents that 6.53% of respondents are from top management (head of department and above), followed by middle management (managers and supervisors) representing 21.11%, then the administrative level (below the supervisory level) at

11.56%, and then teaching staff (Prof., Dr., lecturer, instructor, trainer, teacher) representing 60.80%. This is an indication that the highest percentage of responses were from teaching staff in professional training centers in Saudi Arabia.

Table 4.4 Job title

Job Title		
Details	Frequency	Percentage
Top Management Level (Head of Department and above)	13	6.53%
Middle Management Level (Managers and Supervisors)	42	21.11%
Administrative Level (Below Supervisory level)	24	11.56%
Teaching staff (Prof., Dr., lecturer, instructor, trainer, teacher)	121	60.80%
Other		
Total	200	100%

4.3 Descriptive Analysis

The mean and standard deviation were estimated using the survey answers and assess the responses to each question. The mean shows the central tendency of the data, and standard deviation indicates the dispersion or variability in the data. The small standard deviation of the set values shows that such values are clustered closely around the mean, whereas the large standard deviation shows the opposite. Table 4.5 illustrates the measure of agreement of response for each question and a composite question of each variable.

Five intervals of the Likert scale were used to interpret respondents' degree of agreement. To calculate the score intervals, the following formula was executed:

$$\text{Score interval} = (\text{Maximum score} - \text{Minimum score}) / \text{Number of Levels} \\ = 5-1 / 5 = 0.8$$

Table 4.5 illustrates the rating scale of score used for measuring the degree of agreement.

Likert Scale of Agreement				
Strongly Disagree	Disagree	Neutral	Agree	Strongly agree
1-1.8	1.81-2.6	2.61-3.4	3.41-4.2	4.21-5
Very low	Low	Moderate	High	Very high

➤ 1. Organizational Culture

This element measured the significance of organizational culture in enhancing service innovation in private professional training centers in Saudi Arabia. This factor has five statements presented in Table 4.6. It shows the mean and standard deviation with a ranking of mean results.

Table 4.6 Ranked statements for organizational culture

Statement	Mean	SD*	Level	Rank
Encouraging co-workers to exchange their knowledge and expertise leads to innovation.	4.225	.9481	Very high	1
Understanding the importance of sharing knowledge for corporate success leads to innovation.	4.155	1.0030	High	3
Friendly support between employees improves innovative activities.	4.180	1.0113	High	2
Building culture that motivates employees to ask for help leads to innovation.	4.090	1.0282	High	4
Participating in seminars and group discussions is important to enhance innovative activities.	4.010	1.1208	High	5

SD* Standard Deviation

As explained in Table 4.6, the average mean value of the responses to the statements of this factor ranged between 4.01-4.22, and the standard deviation ranged between .948-1.12. The statement that indicates the impact of teamwork in sharing knowledge and its impact on innovative activities has the highest mean score, so that is ranked first. The

result's mean value scores are above 3.41 based on the data measurement of this study, which means that these statements impact on innovation.

➤ 2. Organizational Structure

This element measured the significance of organizational structure in enhancing service innovation in private professional training centers in Saudi Arabia. This factor has 5 statements presented in Table 4.11, which shows the mean and standard deviation with a ranking of the mean results

Table 4.7 Ranked statements for organizational structure

Statement	Mean	SD*	Level	Rank
Participating employees in the process of decision-making improves innovation.	3.900	1.0890	High	3
Allowing employees to make their own decision leads to innovative activities.	3.620	1.0777	High	4
Being able to meet and discuss ideas and exchange knowledge with top management leads to innovation.	4.040	.9814	High	1
Innovation can be achieved if activities are not covered by formal procedures.	3.500	1.1386	High	5
Reward systems for sharing knowledge helps employees to be innovative	3.985	1.1669	High	2

SD* Standard Deviation

Table 4.7 shows the statements that measured organizational structure and its impact on service innovation in private professional training centers in Saudi Arabia. It indicates that the correlation between organizational structure and service innovation is high, which means that there is a strong relationship between organizational structure and innovation. The mean score is between 3.500 and 4.040 and the standard deviation is between .9814 and 1.1669. The highest mean score is the statement that measured the impact of enabling employees to reach top management to discuss and exchange knowledge on innovation. The rest of the statements' scores are close to each other to a high degree.

➤ 3. Information Technology

This element measured the significance of information technology in enhancing service innovation in private professional training centers in Saudi Arabia. This factor has 5 statements that are presented in Table 4.8, which shows the mean and standard deviation with a ranking of the mean results.

Table 4.8 Ranked statements for information technology

Statement	Mean	SD*	Level	Rank
Using technology for information searching and discovery is essential for innovative activities.	4.075	1.0794	High	2
Using technology for sharing knowledge within all departments in an organization improves innovation.	4.080	.9738	High	1
Adopting software in doing tasks leads to innovative activities.	3.840	1.1228	High	5
Adopting new applications for enhancing communication improves creating creative ideas.	3.935	1.0129	High	4
Encouraging staff to use applications to communicate with each other for sharing knowledge fosters innovation.	3.950	1.0406	High	3

SD* Standard Deviation

Table 4.8 presents the statements that tested the relationship between information technology and innovation. The mean score is between 3.840 and 4.080, with a standard deviation of .9738 and 1.1228. Such scores based on data measurement are high, which means that the relationship between IT and service innovation is high. The highest mean score of statements indicates that technology can be a useful tool for sharing knowledge within all departments in an organization to encourage innovative activities.

➤ 4. Community of Practice

This element measured the significance of a community of practice in enhancing service innovation in private professional training centers in Saudi Arabia. This factor has 5 statements presented in Table 4.9. The table shows the mean and standard deviation scores with the ranking of mean results.

Table 4.9 Ranked statements for community of practice

Statement	Mean	SD*	Level	Rank
Trust among community members for sharing knowledge leads to innovation.	4.035	1.0532	High	2
Informal assistance from community experts to the other community members creates innovative projects.	3.850	1.0063	High	4

Achieving innovation is more likely if the community members all have the necessary expertise to get the job done.	3.780	1.1080	High	5
Community members meeting for sharing knowledge leads to innovative activities.	3.940	1.0007	High	3
Encouraging the sharing of knowledge between team members leads to innovation	4.115	.9832	High	1

SD* Standard Deviation

As explained in Table 4.9, the five statements that measured the relationship between community practice and service innovation in private professional training centers in Saudi Arabia indicate that the relationship between community of practice and organizational innovation is strong. The mean scores of statements are between 3.780 and 4.115, with a standard deviation of .9832 and 1.1080. The two statements have the highest mean scores amongst the statements. The encouragement of sharing knowledge between team members leads to innovative activities and trust among co-workers in sharing the knowledge to achieve innovation. The rest of the statements' scores are high, which means they are above 3.41 as that is the classified score according to the data measurement of this study

➤ 5. Physical Environment

This element measured the significance of physical environment in enhancing service innovation in private professional training centers in Saudi Arabia. This factor includes 5 statements, which are presented in Table 4.10. It shows the mean and standard deviation with the ranking of mean results.

Table 4.10 Ranked statements for physical environment

Statement	Mean	SD*	Level	Rank
Physical space fosters innovative organizations.	3.795	1.0481	High	5
Places such as cafeterias and coffee rooms promote informal meetings between employees to enhance creative ideas.	3.870	1.0858	High	4
Innovation can be achieved if the interior design of an organization facilitates the exchange and sharing of knowledge.	3.905	1.0543	High	3
Adjusting physical space to meet the diverse needs of different people improves innovative activities.	3.910	1.0379	High	2
Suitably designed offices that facilitate the exchange of knowledge impact innovation.	3.920	1.0192	High	1

SD* Standard Deviation

As indicated in Table 4.10, these statements measure the relationship between physical environment and service innovation in private professional training centers in Saudi Arabia. The results show that the mean scores are between 3.795 to 3.920, with a standard deviation of 1.0192 to 1.0858. The result demonstrates that the correlation between the physical environment and service innovation is high. The highest mean score of the statement is that innovative activities can be achieved through appropriate design offices that facilitate the exchange of knowledge. The rest of the mean scores are above 3.41.

➤ Innovation

Table 4.11 presents the result that assesses the service innovation in private professional training centers in Saudi Arabia based on respondents' responses. It has five statements presented in the table.

Table 4.11 Ranked statements for innovation

Statement	Mean	SD*	Level	Rank
Our organization's vision considers innovation an essential factor.	3.415	1.2249	High	1
Our work environment motivates the generation of creative ideas.	3.365	1.2079	Moderate	3
Our organization responds to environmental changes quickly.	3.370	1.2085	Moderate	2
The organization has new or improved internal administration.	3.315	1.1759	Moderate	4
The organization has new or improved development activities.	3.235	1.1903	Moderate	5

SD* Standard Deviation

Table 4.11 indicates that the average mean value of the statements of this factor is between 3.23 – 3.41, with a standard deviation ranged between 1.17 – 1.22, and a high mean value (3.41), which is the highest mean score of the statements related to the first

statement that indicates that service innovation is considered a vital factor of an organization's vision. The rest of the statements, such as having an inspired work environment for creating creative ideas and responding to environmental changes rapidly, had mean values that ranged between 3.36 – 3.37, which are considered a moderate level of the mean value. The last two statements with the lowest mean value score are the statements that assess the creation of new or improved internal administration and activities with a mean score 3.23 – 3.31, and they are still in the moderate average range.

4.4 Normality Distributing Test

It was critical to conduct the normality assumption test before implementing inferential analysis to identify the analytic tools and techniques that should be utilized for this study.

Table 4.12 indicates that the results of the Kolmogorov-Smirnova and Shapiro-Wilk normality test were significant for all composite variables at 1% significant levels, which means that the normality test confirmed that the collected data was not normally distributed; therefore, the sample distribution of this study was not normal. The researcher implemented a nonparametric statistical test for further inferential analysis and hypotheses testing based on this result. As explained in the table, each variable's level of confidence is less than .05, so that affirms that the distribution is not normal.

Table 4.12 Tests of Normality

Composite Variable	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	df	p-value	Statistic	df	p-value
Organizational culture	.202	200	.000**	.793	200	.000**
Organizational structure	.144	200	.000**	.905	200	.000**
Information technology	.145	200	.000**	.887	200	.000**
Community of practice	.134	200	.000**	.885	200	.000**
Physical environment	.125	200	.000**	.894	200	.000**
Innovation	.101	200	.000**	.962	200	.000**

* Significant at 5% (p-value < 0.05); ** significant at 1% (p-value < 0.01); not significant at 5% (p-value ≥ 0.05)

4.5 Outliers check

An outlier is an odd value compared to the other data values of a variable. Checking for outliers is essential as a statistical consideration and it must be done before implementing the inferential analysis. Box plots were used for detecting outliers.

Examining the box plots shown in Appendix K reveals that there were no outliers found in the service innovation variable, whereas there were a few outliers found in the study's other variables. However, the detected outliers were small in proportion to the sample size of 200. Because such a small number of outliers cannot cause a severe shift in the distribution of the composite variables, the researcher decided to ignore them.

4.6 Hypotheses Testing

The aim of this research is to investigate the impact of knowledge management infrastructure (organizational culture, organizational structure, information technology, community of practice, and physical environment) in enhancing service innovation in private professional training centers in Saudi Arabia. Consequently, to test the hypotheses developed for this research, correlation and simple regression were used. Furthermore, the level of significance (α -level) was selected to be a 0.05 probability value (p -value), so that the null hypothesis will be rejected if the p -value is equal to or less than 0.05, and the alternative hypothesis will then be supported. However, if the p -value is greater than the α value (α -level) of 0.05, the null hypothesis cannot be rejected and the alternative hypothesis will not be supported (Creswell, 2009).

4.6.1 Correlation

Linear correlation analysis tests whether there is a statistically significant linear correlation (or association) between two variables (pairwise). The correlation coefficient computed through the correlation analysis assesses two things: the strength (poor or strong) and direction (positive or negative) of the association. The strong correlation occurs when the numeric value of the computed correlation coefficient is close to 1 (or -1), whereas a correlation coefficient close to 0 is considered weak. The sign of the correlation coefficient determines if it is positive or negative.

The correlation analysis results of the nonparametric Spearman correlation tests are indicated in Table 4.13

Table 4-13 shows that there was:

- a statistically significant, moderately positive correlation between Organizational Culture and Service Innovation at the 1% significance levels (Spearman correlation coefficient = 0.486**);

- a statistically significant, fairly moderate positive correlation between Organizational Structure and Service Innovation at the 1% significance levels (Spearman correlation coefficient = 0.381**);
- a statistically significant, moderate positive correlation between Information Technology and Service Innovation at the 1% significance levels (Spearman correlation coefficient = 0.528**);
- a statistically significant, fairly moderate positive correlation was found between Community of Practice and Service Innovation at the 1% significance levels (Spearman correlation coefficient = 0.440**);
- a statistically significant, fairly moderate positive correlation between Physical Environment and Service Innovation at the 1% significance levels (Spearman correlation coefficient = 0.417**).

Table 4.13 Spearman Correlation Matrix Results Among Composite Variables Studied

		Innovation	Organizational Culture	Organizational Structure	Information Technology	Community of Practice	Physical Environment
Innovation	Spearman Correlation Coefficient	1.000					
	p-value	.					
Organizational Culture	Spearman Correlation Coefficient	.486**	1.000				
	p-value	.000	.				
Organizational Structure	Spearman Correlation Coefficient	.381**	.554**	1.000			
	p-value	.000	.000	.			
Information Technology	Spearman Correlation Coefficient	.528**	.586**	.526**	1.000		
	p-value	.000	.000	.000	.		
Community of Practice	Spearman Correlation Coefficient	.440**	.594**	.587**	.630**	1.000	
	p-value	.000	.000	.000	.000	.	
Physical Environment	Spearman Correlation Coefficient	.417**	.526**	.587**	.615**	.720**	1.000
	p-value	.000	.000	.000	.000	.000	.

* Significant at 5% (p-value < 0.05); ** significant at 1% (p-value < 0.01); not significant at 5% (p-value ≥ 0.05)

4.6.2 Regression analysis

In reference to the research hypothesis, the dependent variable Service innovation was modeled with the independent variables of Organizational Culture, Organizational Structure, Information Technology, Community of Practice, and Physical Environment. This was to test hypotheses H1 to H5.

The regression analysis was performed as simple regression where only one independent variable is analyzed.

The P-P normality plots of all regression models showed a close to normal distribution pattern, which indicates no departure from the normality assumption (refer to Appendix L)

- The simple regression results show that Organizational Culture was found to have a statistically significant positive impact on Service innovation at the 1% significance level ($\beta = 0.594^{**}$). This implies that when Organizational Culture increases by one unit, the dependent variable Service innovation is expected to increase on average by 59.4%. This statistical evidence supports the research hypothesis H1, so H1 is accepted.
- The simple regression results show that Organizational Structure was found to have a statistically significant, positive impact on Service innovation at the 1% significance level ($\beta = 0.523^{**}$). This implies that when Organizational Structure increases by one unit, the dependent variable Service innovation is expected to increase on average by 52.3%. This statistical evidence supports the research hypothesis H2, so H2 is accepted. The result of this research is based on organizational structure should be decentralized. The distinctions between types of organizational structure were explained in the literature review in Chapter Two to clarify the different research results of previous empirical studies.

- The simple regression results show that Information Technology was found to have a statistically significant, positive impact on Service innovation at the 1% significance level ($\beta = 0.654^{**}$). This implies that when Information Technology increases by one unit, the dependent variable Service innovation is expected to increase on average by 65.4%. This statistical evidence supports the research hypothesis H3, so H3 is accepted.
- The simple regression results show that Community of Practice was found to have a statistically significant, positive impact on Service innovation at the 1% significance level ($\beta = 0.592^{**}$). This implies that when Community of Practice increases by one unit, the dependent variable Service innovation is expected to increase on average by 59.2%.
- The simple regression results show that Physical Environment was found to have a statistically significant, positive impact on Service innovation at the 1% significance level ($\beta = 0.545^{**}$). This implies that when Physical Environment increases by one unit, the dependent variable Service innovation is expected to increase on average by 54.5%. This statistical evidence supports the research hypothesis H5, so H5 is accepted.

4.7.3 Summary Testing Hypotheses Findings

A summary of the hypothesis testing is shown in Table 4-14 and Figure 4.1.

All five research hypotheses were found to be supported at the 99% confidence level since they were statistically significant at the 1% significance level based on the simple regression analysis.

Moreover, the simple regression coefficient can be used to sort the statistically significant impact found due to the independent variables in descending order as follows:

1. Information Technology (65.4%),
2. Organizational Culture (59.4%),
3. Community of Practice (59.2%),
4. Physical Environment (54.4%), and
5. Organizational Structure (52.3%)

Table 4.14 Summary of hypothesis testing

Hypothesis	Statistical Evidence
H1	Supported with 99% confidence level
H2	Supported with 99% confidence level
H3	Supported with 99% confidence level
H4	Supported with 99% confidence level
H5	Supported with 99% confidence level

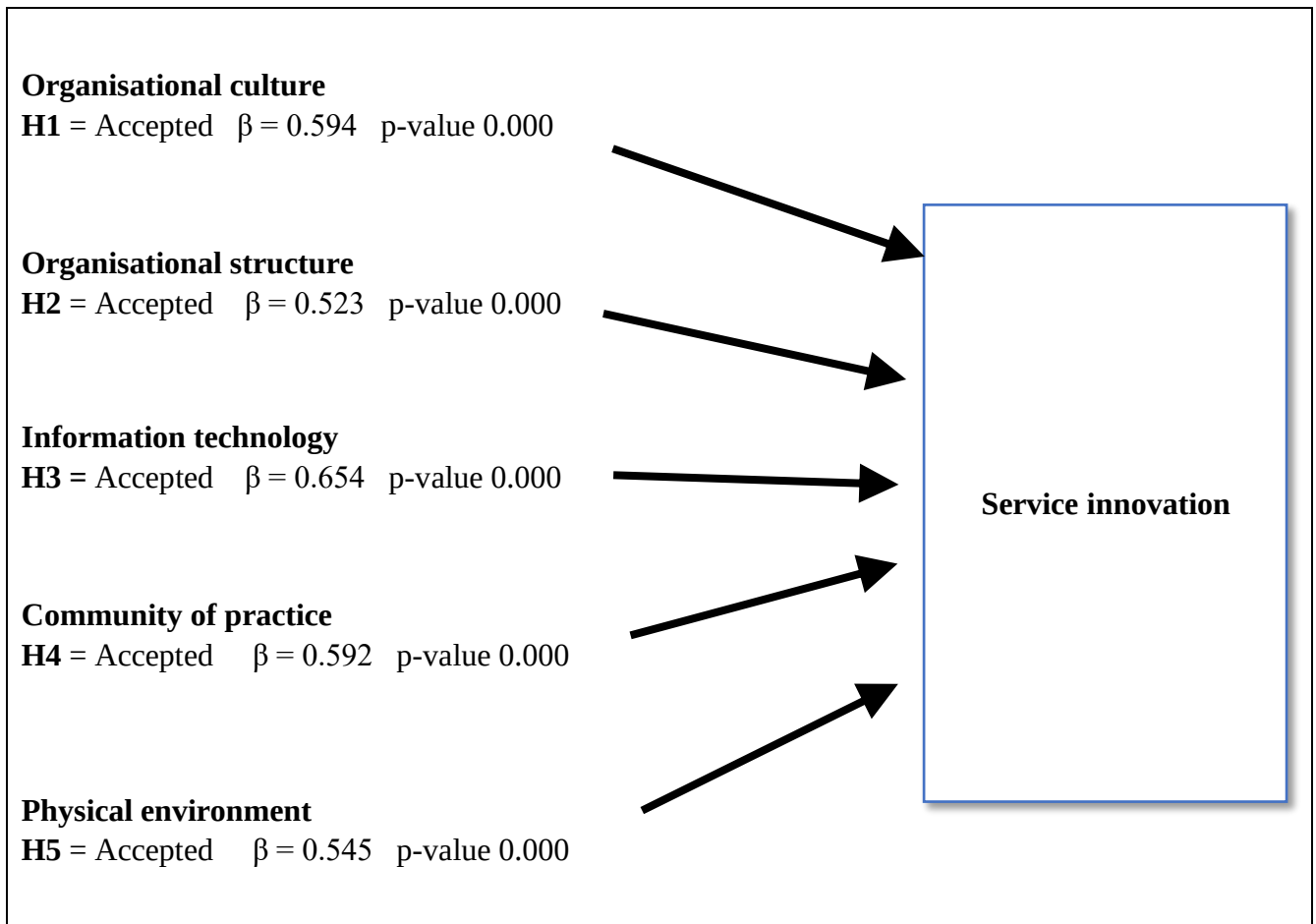


Figure 4.1 Hypotheses Results of the Service innovation Questionnaire

Chapter 5: Recommendations, Limitations, Future Studies and Conclusion

Introduction

This chapter will shed light on all significant points in this research and provide the critical research findings concerning research aims, objectives, and questions, and it will consider how the results can contribute to and add value to organizations. Consequently, the recommendations will be based on such results that can be utilized to achieve service innovation in organizations. Furthermore, it will indicate the limitations of this study and propose suggestions for how future studies can enhance research in this area in the future.

5.1 Recommendations

Based on result of this research regarding the impact of KM infrastructure elements and their impact on service innovation, the researcher recommends the following steps that can lead to implementing such factors as enablers for achieving service innovative.

Organizational culture

This research shows that the organizational culture has statistically significant positive impact on service innovation. Based on such result, organizations may achieve service innovation through building the culture that stimulates exchanging and sharing knowledge among cross-functional team members. Top management can offer training programs that can add value and enhance having a culture that motivates the sharing of knowledge among team members. This study can be a good indicator how building the culture can contribute to innovation so that the

organizations may invest more in building the culture that motivates sharing knowledge. Training and coaching leaders and managers can a great investment.

Organizational structure

Some previous empirical studies showed that organizational structure has a negative impact on service innovation, while others reached the opposing conclusion. Therefore, before providing recommendations regarding organizational structure and their impact on service innovation through KM, awareness of types of organizational structures is crucial because of the differing results of those studies.

Two common types of structures are centralization and decentralization. Centralization means the organization has a vertical structure and communication follows a chain of command, whereas decentralization is a flat structure, which means reaching top management is possible.

This study is concentrated on the decentralisation structure in formulating questions that were tested in the hypotheses. This can be the clarification of different empirical studies' results. Consequently, the results of this study showed that organizational structure has a statistically significant positive impact on service innovation in PPTCs in Saudi Arabia. Organizations should concentrate on decentralization concerning organizational structure to accomplish service innovation. It simply means all of the workforce can meet and discuss top management without constraints such as following formal procedures to meet with top management in an organization. Particularly, this study focused on the training sector that deeply deals with information and knowledge, so adopting such an organizational structure will enhance the sharing and exchange of knowledge between cross-functional team members and top management. Therefore, it can improve innovative activities of an organization. Top management should be keen on providing professional training for leaders and managers by informing them of the impact of employees in enhancing innovative activities by allowing them to suggest and contribute so that leaders and managers should be informed and aware of organizational structure that encourages employees to share and exchange knowledge among each other.

Information technology

The result showed that the highest statistically significant impact on service innovation is information technology. Consequently, information technology is a significant enabler of sharing and disseminating information and knowledge among team members. It is considered one of the most crucial enablers of service innovation in organizations. Organizations should adopt IT in the process of innovative activities through sharing and exchanging information and knowledge. Organizations should utilize and implement IT in formal and informal procedures to keep employees updated and constantly communicating. Organizations should build a robust IT infrastructure that facilitates the process of innovative activities in terms of accomplishing daily work tasks and that facilitates communication between team members within an organization. Top management and decision-makers in the organization should consider IT as a significant enabler of innovativeness.

Community of practice

This study indicates that having a community of practice is a crucial factor for achieving organizational service innovation. Simply, having a community of practice means having team members work as a team and assist each other to accomplish specific goals. Organizations should consider the community of practice as an enabler for service innovation. Training programs for managers and leaders enable them to stimulate their team members to work together. The focus should be on creating rewarding systems in an organization that reward team achievement instead of rewarding individuals, which can lead to motivation between members of the community of practice that can then lead to innovative activities. These days, many organizations are mainly interested in implementing training programs focused on topics such as inclusion and diversity in the workplace. Such a training program underlies the community of practice, so implementing such a training program is like creating a community of practice that can facilitate the process of service innovation.

Physical environment

This study shows that the physical environment has a statistically significant positive impact on service innovation. The physical environment can contribute positively to enhancing service

innovation. It is essential in the process of sharing and exchanging knowledge with cross-functional team members. Organizations under construction should rethink the design of their buildings as a whole in order for them to be a good fit and comfortable spaces that enable employees to meet each other conveniently. Furthermore, it is vital to design and arrange offices that make sharing and exchanging knowledge between team members be efficient and convenient. Suitable spaces that enable workforce meet conveniently can contribute positively enhancing innovative service because they can share and exchange knowledge between them in a comfortable manner.

5.2 Limitations

In terms of the limitations of this research, it concentrated only on the private professional training sector, which might impact the generalizability of this study to other sectors. Therefore, the findings might not be generalizable to other industries or other countries. Moreover, the sample size is small and the convenience sample technique that was utilized might not represent the entire population which in turn impact on the generalizability of the results. The quantitative research method was utilized in this study so that combining both research methods quantitative and qualitative methods are recommended for future studies.

Another limitation is the time of the data collection, particularly the impact of Covid-19, which might impact on the consistency of the findings if this study were to be replicated at a different time. Remarkably, the pandemic has led organizations to rethink the significance of knowledge management infrastructural elements, which could lead them to prioritize such factors depending on the situation. For instance, the degree of statistically significant positive impact may differ if such research is replicated in different circumstances.

5.3 Future Studies

In terms of future studies, conducting further studies regarding the same factors of KM infrastructure in enhancing service innovation in professional training centers in different countries can confirm whether such elements impact service innovation or not, especially in the training sector. Conducting further studies by utilizing the same theoretical framework of this research in other sectors and industries will contribute to our understanding of the topic by affirming the results of this study or providing other results that could help scholars to determine the generalizability of this study. Moreover, the researcher believes that further empirical studies concerning KM infrastructure elements and their impact on service innovation will benefit academicians, researchers, and practitioners. Furthermore, conducting further empirical studies in regard by using different types of sampling techniques.

5.4 Conclusion

The aim of this research is accomplished by examining the impact of knowledge management infrastructure elements and their impact on service innovation in PPTCs in Saudi Arabia. The knowledge management infrastructure factors are organizational culture, organizational structure, information technology, community practice, physical environment. The main question of this study is to examine the impact of KM infrastructure on service innovation so that answering such question five hypotheses are formulated and tested regarding each KM infrastructure factor and its impact on service innovation. The results of this research show all KM infrastructure elements have statistically significant positive impact on service innovation PPTCs in Saudi Arabia. In terms of the organizational structure that was tested was decentralized organization structure so that the findings of this research based on decentralization of organizational structure indicates the significant positive impact on service innovation. Professional training centers competition is high so that to be sustainable and a highly competitive advantage among competitors adopting service innovation is essential. Particularly, such centers deal with information and knowledge directly. Therefore, KM infrastructure elements are vital to be examined in such training centers to explore the impact of KM infrastructure elements on service innovation. Such elements of KM infrastructure may contribute positively to enhancing service innovation so that based on such result the recommendations were provided. The recommendations section in this chapter mentioned some strategies that can be adopted to achieving service innovation through implementing strategies that may exploit KM infrastructure elements in innovative services. Furthermore, the proposal for further empirical studies as well as the limitations of this research has been explained this chapter.

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Appendices

Appendix A Questionnaire



UNIVERSITY OF BAHRAIN
College of Business Administration
Department of Management and Marketing
Questionnaire Covering Letter

Dear Sir / Madam,
Greetings

Subject: Your participation in the Questionnaire on “**The Role of Knowledge Management Infrastructure in Enhancing Innovation of Private Professional Training Centers, in Saudi Arabia.**”

We are conducting a field study related to The Role of Knowledge Management Infrastructure in Enhancing Innovation of Private Professional Training Centers, in Saudi Arabia. In order to complete this study, the work includes a field survey that has to be filled out by employees of Private Professional Training Centers, in Saudi Arabia. The survey will take approximately 5 to 10 minutes to complete. The target population of this survey is all employees of Private Professional Training Centers, in Saudi Arabia. The aim of this research is to determine the relationship between knowledge management infrastructure and innovation of Private Professional Training Centers, in Saudi Arabia. The collected data and information through this questionnaire will represent one of the main sources of my research work and findings. The questionnaire is completely anonymous; therefore, we hope that you will feel comfortable about giving your answers as frankly as possible. All your answers will be treated in the strictest confidence and will be used only for this study. We would therefore be very grateful if you could spend a few minutes completing the questionnaire as thoroughly and as comprehensively as possible, the outcome of this study will depend significantly on how accurate your responses are.

Please feel free to contact me for any further information, assistance, and clarification.
jazza1403@gmail.com

Thank you for your time and assistance.

Yours faithfully,

Student Name: Jazza Mafaleh Al-Risheedi

Supervisor Name: Prof. Adel Ismail Al-Alawi

Knowledge Management Infrastructure

It includes organizational culture, organizational structure, information technology, community practice, and the physical environment.

Innovation

Innovation consists of many processes which enable organizations to transforming ideas into new or improved products, services, or processes so that organizations can advance, compete, and differentiate themselves in the marketplace (Baregheh et al., 2009).

Professional Training Centers, in Saudi Arabia

The target population is Private Professional Training Centers, in Saudi Arabia. Focusing on only private professional training centers that provide Professional Qualifications in the field of Business Studies, Training, Management, Computer Skills, for example, PMP, SHRM, CIPD, L&D, CPA, etc.

This question was added for online respondents.

Do you currently work in Private Professional Training Institutions in Saudi Arabia?

☐ Yes

☐ NO

(If the answer is No, the respondent will be stopped here)

Please place (✓) at the appropriate answer:

Section One: Personal and Organizational Data

1.1 Age:

☐ 20 and less than 30 ☐ 30 and less than 40 ☐ 40 and less than 50 ☐ 50 and less than 60 ☐ 60 and above

1.2 Gender:

☐ Male ☐ Female

1.3 Education Level: University Degree:

☐ BSc. ☐ MSc. ☐ PhD. ☐ Other Specify _____

1.4 What is the rank of your position?

☐ Top Management Level (Head of Department and above)
☐ Middle Management Level (Managers and Supervisors)
☐ Administrative Level (Below Supervisor level)
☐ Teaching staff (Prof., Dr., lecturer, instructor, trainer, teacher)
☐ Other Specify _____

Section Two: The Study Variables/Factors

1-Organizational Culture. H1 There is a significant impact of organizational culture on innovation.

Based on your opinion and facts, please place a tick (✓) at the appropriate response.

	Descriptions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.1.1	Encouraging co-workers to exchange their knowledge and expertise leads to innovation					
2.1.2	Understanding the importance of sharing knowledge for corporate success leads to innovation.					
2.1.3	Friendly support between employees improves innovative activities.					
2.1.4	Building culture that motivates employees to ask for help leads to innovation.					
2.1.5	Participating in seminars and group discussions is important to enhance innovative activities.					

2. Organizational Structure. H2 There is a significant impact of organizational structure on innovation.

Based on your opinion and facts, please place a tick (✓) at the appropriate response.						
	Descriptions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.2.1	Participating employees in the process of decision-making improves innovation.					
2.2.2	Allowing employees to make their own decision leads to innovative activities.					
2.2.3	Being able to meet and discuss ideas and exchange knowledge with top management leads to innovation.					
2.2.4	Innovation can be achieved if activities are not covered by formal procedures.					
2.2.5	Reward systems for sharing knowledge helps employees to be innovative.					

3. Information Technology. H3 There is a significant impact of information technology on innovation.

Based on your opinion and facts, please place a tick (✓) at the appropriate response.						
	Descriptions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.3.1	Using technology for information searching and discovery is essential for innovative activities.					
2.3.2	Using technology for sharing knowledge within all departments in an organization improves innovation.					
2.3.3	Adopting software in doing tasks leads to innovative activities.					
2.3.4	Adopting new applications for enhancing communication improves creating creative ideas.					

2.3.5	Encouraging staff to use applications to communicate with each other for sharing knowledge fosters innovation.					
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4. Community of Practice. H4 There is a significant impact of community of practice on innovation.

Based on your opinion and facts, please place a tick (✓) at the appropriate response.

	Descriptions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.4.1	Trust among community members for sharing knowledge leads to innovation.					
2.4.2	Informal assistance from community experts to the other community members creates innovative projects.					
2.4.3	Achieving innovation is more likely if the community members have all necessary expertise to get the job done.					
2.4.4	Community members meeting for sharing knowledge leads to innovative activities.					
2.4.5	Encouraging sharing knowledge between team members leads to innovation.					

5. Physical Environment. H5 There is a significant impact of physical environment on innovation.

Based on your opinion and facts, please place a tick (✓) at the appropriate response.

	Descriptions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.5.1	Physical space fosters innovative organizations.					
2.5.2	Places such as cafeterias and coffee rooms promote informal meetings between employees to enhance creative ideas.					
2.5.3	Innovation can be achieved if the interior design of an organisation facilitates the exchange and sharing of knowledge.					
2.5.4	Adjusting physical space to meet the diverse needs of different people improves innovative activities.					
2.5.5	Suitably designed offices, that facilitate the exchanging knowledge, impact on innovation					

Innovation

Based on your opinion and facts, please place a tick (✓) at the appropriate response

	Descriptions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
2.6.1	Our organization's vision considers innovation an essential factor.					

2.6.2	The work environment motivates the generation of creative ideas.					
2.6.3	Our organization responds to environmental changes quickly.					
2.6.4	The organization has new or improved internal administration.					
2.6.5	Our organization has new or improved development activities.					

Any comments or suggestions, please note them here:

Thank you for participating in this survey.

Student Name: **Jazza Mafaleh Al-Risheedi**

Supervisor Name: **Prof. Adel Ismail Al-Alawi**

Appendix B: Reference of the Questionnaire Statements

Refence of the Questionnaire Statements

Variable	Source
Organizational Culture	Adapted by Al-dalahmeh et al. (2015)
Organizational Structure	Adapted by Al-Alawi et al. (2007). Adopted by Al-dalahmeh et al. (2015).
Information Technology	Vanhala et al. (2015). Adapted by Miranda et al. (2016). Adapted by Al-dalahmeh et al. (2015)
Community of practice	Adapted by Cross et al. (2004). Extracted from literature review Wenger (2011).
Physical Environment	Adopted by Al-dalahmeh et al. (2015). Oksanen & Ståhle (2013).
Innovation	Adapted by Al-dalahmeh et al. (2015) Adapted by Pang (2011)

Appendix C: Reviewers of the Questionnaire

Names of Professors, professionals who evaluate the Questionnaire

No	Reviewer Name	Job Title
1	Prof. Adel Ismail Al-Alawi	Professor of Management and Information Systems, University of Bahrain.
2	Prof. Muwafaq Mohammed AlKubaisi	Professor of Quantitative Method and Statistics, Department Management and Marketing, University of Bahrain.
3	Dr. Lawrence Ness	Senior Dissertation Coach, Doctoral-level Professor.
4	Dr. Nehal El Naggar	Assistant Professor, College of Business & Financial Sciences, Royal University for Women

Based on previous studies and literature reviews, the questionnaire was selected and written. Therefore, writing the questionnaire is done through many phases. First of all, writing questions to measure each independent variable and its impact on the dependent variable. The second stage of reviewing this questionnaire is discussing it with my supervisor Prof Adel, and he sent it to Professor Muwafaq AlKubaisi is a specialist in statistical analysis. The meeting was

conducted online through Teams and discussed the questionnaire, and Prof Muawafaq provided constructive remarks and comments, which is considered. Based on the feedback of Professors Muwafaq, the questionnaire was modified. In this reviewing stage, an online mentor Dr. Lawrence Ness checked and proofreaded the research questions and conceptual framework and added some valuable comments for the questionnaire which is considered. Additionally, Dr. Nehal reviewed the questionnaire and provided constructive feedback.

Appendix D: Reliability Test of Pilot Study

Scale: ALL VARIABLES's Questions of Pilot Study Test

Case Processing Summary

		N	%
Cases	Valid	20	100.0
	Excluded ^a	0	.0
	Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.931	.933	30

Summary Item Statistics

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.712	3.000	4.200	1.200	1.400	.100	30

Item-Total Statistics

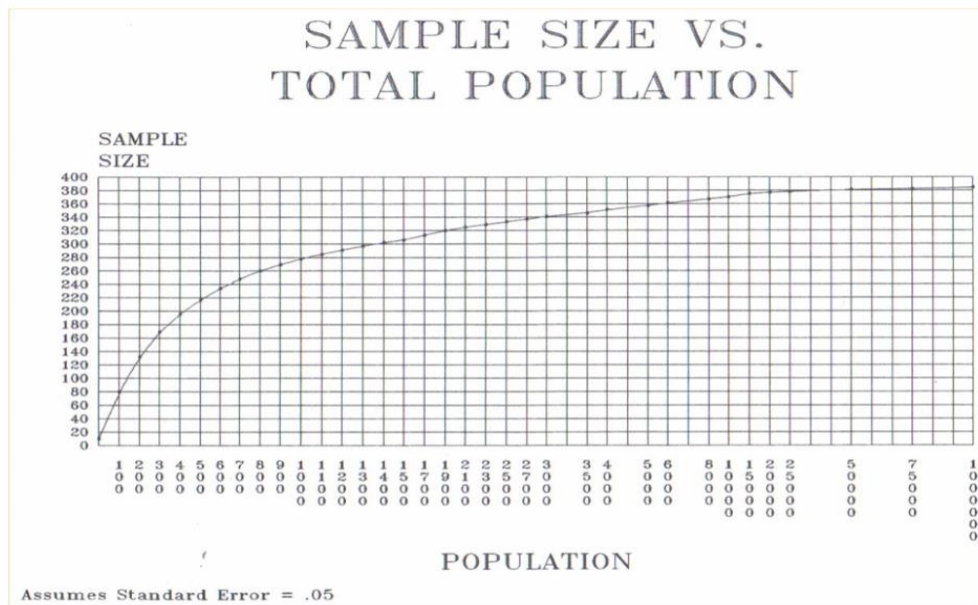
	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item- Total Correlation	Cronbach's Alpha if Item Deleted
1-OC1	107.150	289.187	.873	.925
1-OC2	107.150	294.029	.767	.927
1-OC3	107.250	295.671	.557	.929
1-OC4	107.300	290.326	.752	.926
1-OC5	107.450	304.682	.302	.932
2-OS1	107.400	300.989	.370	.932
2-OS2	107.800	302.274	.370	.931
2-OS3	107.250	293.039	.694	.927
2-OS4	107.700	302.853	.343	.932
2-OS5	107.500	290.789	.677	.927
3-IT1	107.450	296.471	.593	.928
3-IT2	107.550	302.892	.509	.930
3-IT3	107.750	310.197	.258	.932
3-IT4	107.700	295.905	.672	.928
3-IT5	107.700	295.905	.541	.929
4-CP1	107.400	301.516	.563	.929
4-CP2	107.850	313.397	.121	.934
4-CP3	107.700	304.747	.391	.931
4-CP4	107.750	305.671	.418	.930
4-CP5	107.550	307.313	.388	.931
5-PH1	107.650	303.924	.543	.929
5-PH2	107.250	300.303	.638	.928
5-PH3	107.650	301.818	.571	.929
5-PH4	107.700	294.221	.726	.927
5-PH5	107.650	288.661	.776	.926
INN1	108.350	293.924	.575	.929
INN2	108.100	300.411	.430	.931
INN3	108.100	290.832	.586	.929
INN4	108.200	283.958	.741	.926
INN5	108.150	289.503	.624	.928

Appendix F: Sample Size Table

TABLE 1
Table for Determining Sample Size from a Given Population

<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>	<i>N</i>	<i>S</i>
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	100000	384

Note.—*N* is population size.
S is sample size.



Assuming Error = .05
 Level of Confidence .95
Reference: Krejcie & Morgan (1970).

Appendix G: Validity of Questionnaire, (Pearson Correlation Coefficient)

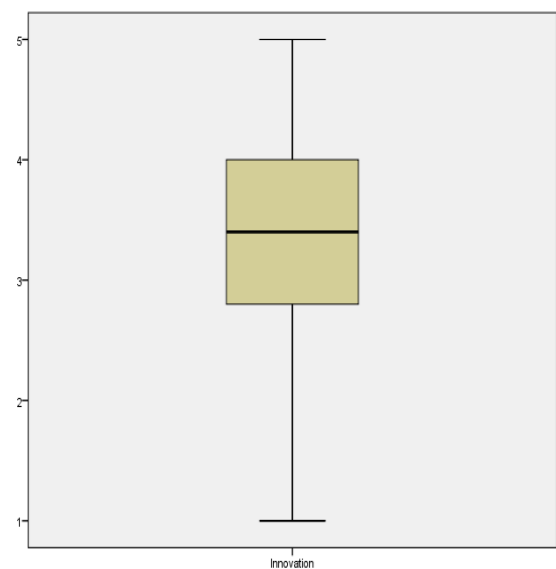
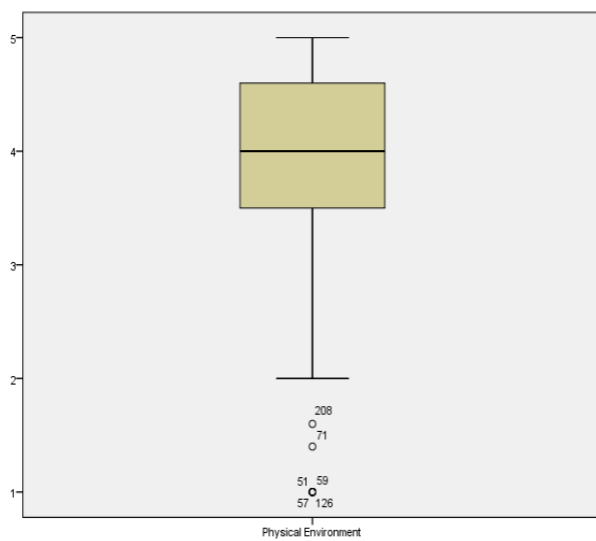
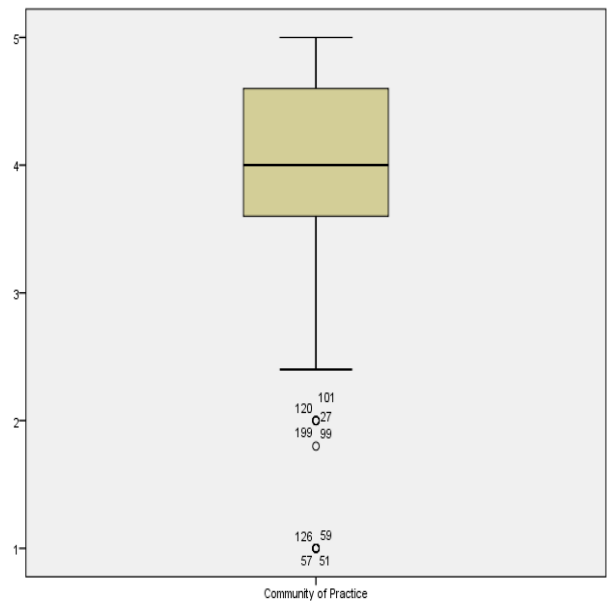
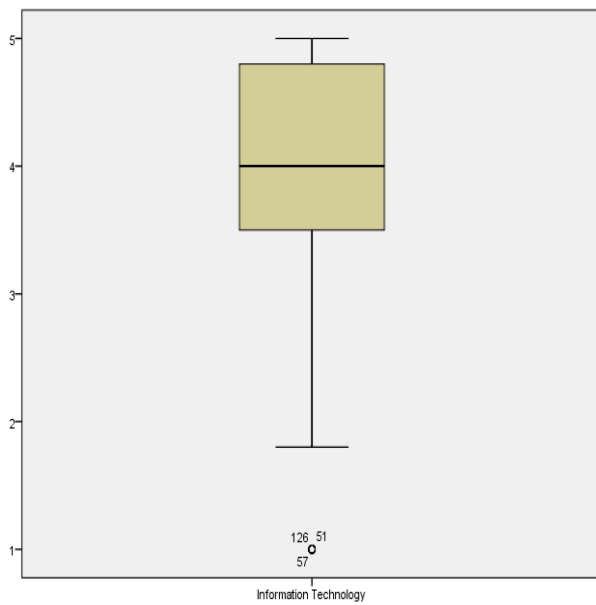
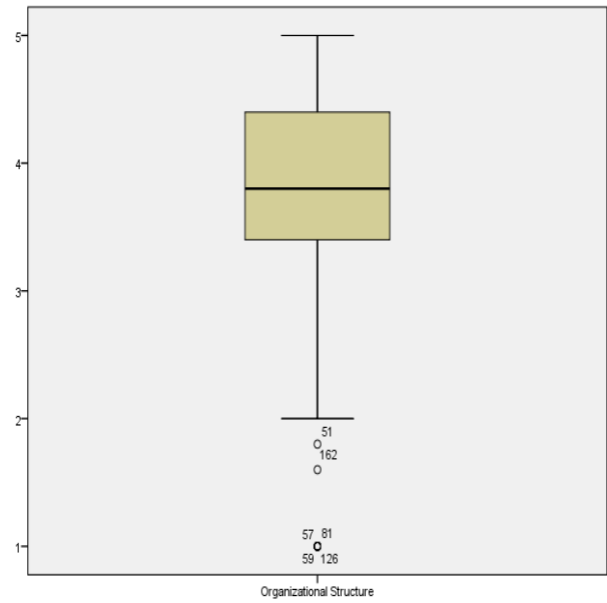
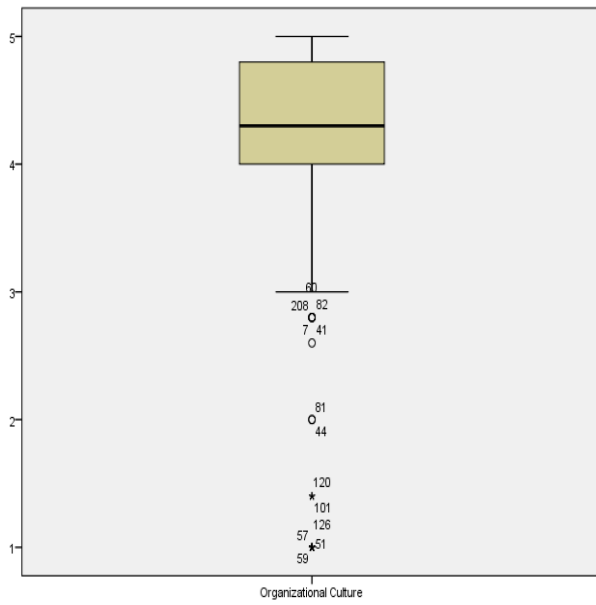
Table 4.6: correlation coefficient of each statement with correlating with total statements, (n 200)

	Statement	Pearson Correlation Coefficient	Sign
1	Encouraging co-workers to exchange their knowledge and expertise leads to innovation	.704**	.000
2	Understanding the importance of sharing knowledge for corporate success leads to innovation.	.767**	.000
3	Friendly support between employees improves innovative activities.	.797**	.000
4	Building culture that motivates employees to ask for help leads to innovation.	.723**	.000
5	Participating in seminars and group discussions is essential to enhance innovative activities.	.739**	.000
2. Organizational Structure.			
1	Participating employees in the process of decision-making improves innovation.	.736**	.000
2	Allowing employees to make their own decision leads to innovative activities.	.581**	.000
3	Being able to meet and discuss ideas and exchange knowledge with top management leads to innovation.	.763**	.000
4	Innovation can be achieved if activities are not covered by formal procedures.	.546**	.000
5	Reward systems for sharing knowledge helps employees to be innovative	.665**	.000
3. Information Technology.			
1	Using technology for information searching and discovery is essential for innovative activities.	.708**	.000
2	Using technology for sharing knowledge within all departments in an organization improves innovation.	.790**	.000
3	Information Technology. 3. Adopting software in doing tasks leads to innovative activities.	.730**	.000
4	Adopting new applications for enhancing communication improves creating creative ideas.	.777**	.000
5	Encouraging staff to use applications to communicate with each other for sharing knowledge fosters innovation.	.792**	.000
4. Community of Practice.			
1	Trust among community members for sharing knowledge leads to innovation.	.754**	.000
2	Informal assistance from community experts to the other community members creates innovative projects.	.742**	.000
3	Achieving innovation is more likely if the community members have all necessary expertise to get the job done.	.628**	.000
4	Community members meeting for sharing knowledge leads to innovative activities.	.800**	.000
5	Encouraging sharing knowledge between team members leads to innovation	.786**	.000
5. Physical Environment.			
1	Physical space fosters innovative organizations.	.732**	.000

2	Places such as cafeterias and coffee rooms promote informal meetings between employees to enhance creative ideas.	.688**	.000
3	Innovation can be achieved if the interior design of an organization facilitates the exchange and sharing of knowledge.	.740**	.000
4	Adjusting physical space to meet the diverse needs of different people improves innovative activities.	.759**	.000
1	Physical space fosters innovative organizations.	.732**	.000
Innovation.			
1	Our organization's vision considers innovation an essential factor.	.576**	.000
2	Our work environment motivates the generation of creative ideas.	.614**	.000
3	Our organization responds to environmental changes quickly.	.619**	.000
4	The organization has new or improved internal administration.	.647**	.000
5	The organization has new or improved development activities.	.618**	.000

****.** Correlation is significant at the 0.01 level (2-tailed), ***** Correlation is significant at the 0.05 level

Appendix K: Outliers



Appendix L: Regression analysis

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.517 ^a	.267	.264	.88462

a. Predictors: (Constant), Organizational Culture

b. Dependent Variable: Innovation

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	p-value
1	Regression	56.575	1	56.575	72.296	.000 ^b
	Residual	154.945	198	.783		
	Total	211.520	199			

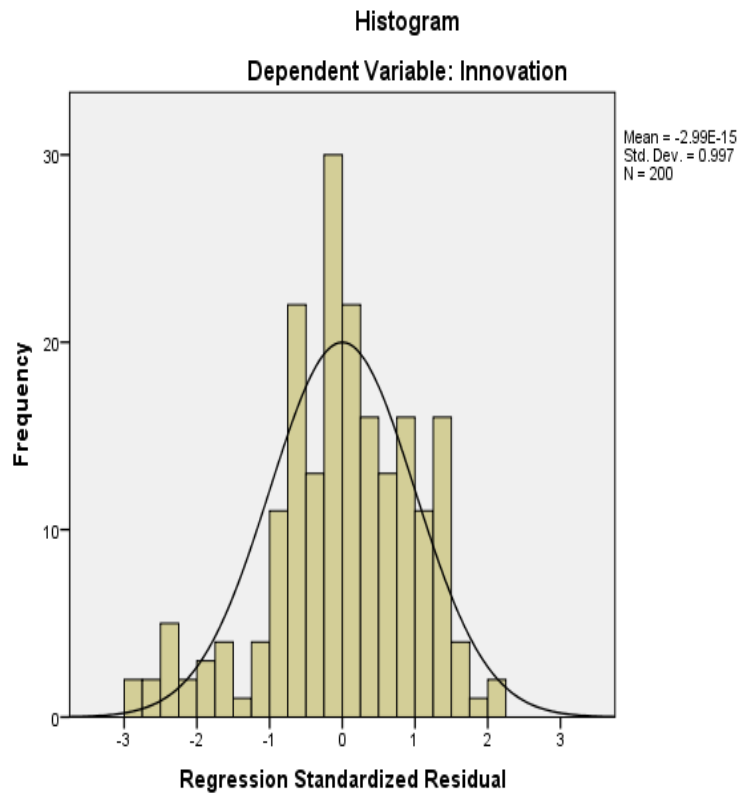
a. Dependent Variable: Innovation

b. Predictors: (Constant), Organizational Culture

Coefficients^a

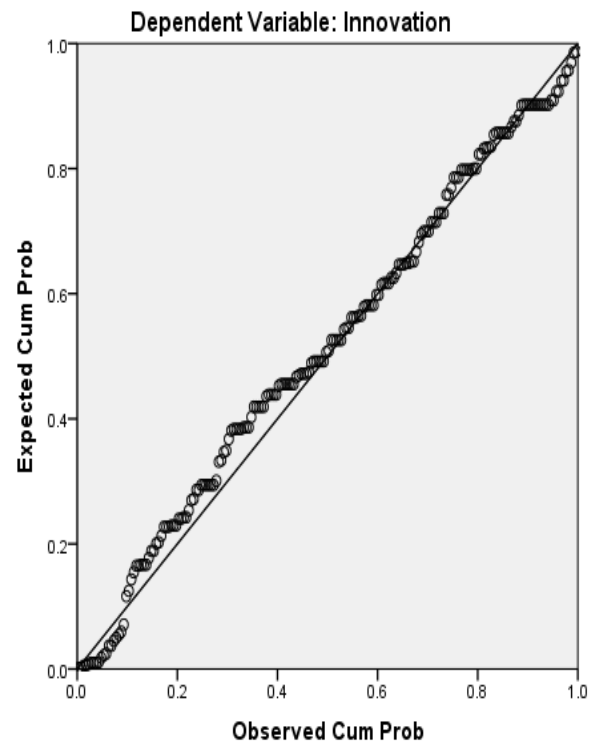
Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		B	Std. Error	Beta		
1	(Constant)	.885	.295		2.996	.003
	Organizational Culture	.594	.070	.517	8.503	.000

a. Dependent Variable: Innovation



Charts

Normal P-P Plot of Regression Standardized Residual



Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.437 ^a	.191	.187	.92943

a. Predictors: (Constant), Organizational Structure

b. Dependent Variable: Innovation

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	p-value
1	Regression	40.479	1	40.479	46.859	.000 ^b
	Residual	171.041	198	.864		
	Total	211.520	199			

a. Dependent Variable: Innovation

b. Predictors: (Constant), Organizational Structure

Coefficients^a

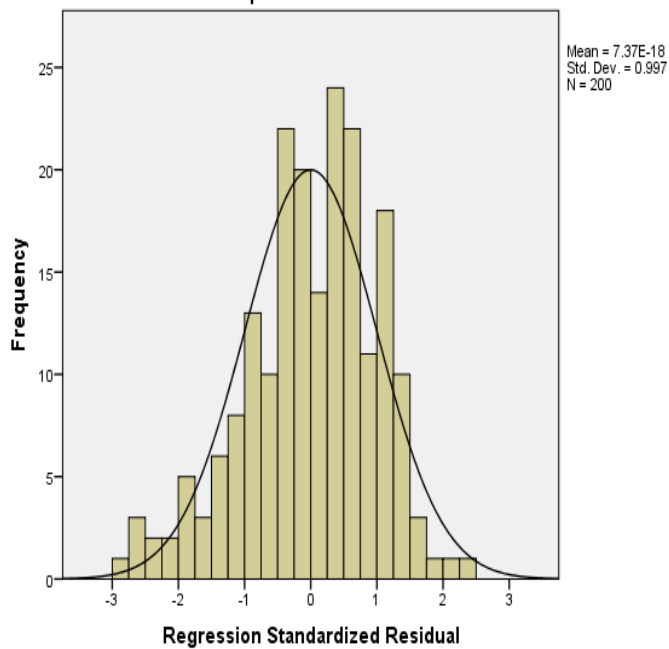
Model	Unstandardized Coefficients		Standardized Coefficients	t	p-value
	B	Std. Error	Beta		
1 (Constant)	1.349	.298		4.522	.000
Organizational Structure	.523	.076	.437	6.845	.000

a. Dependent Variable: Innovation

Charts

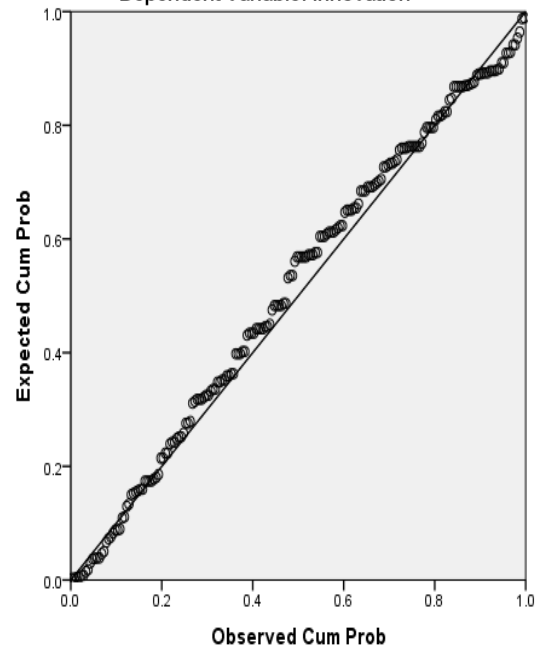
Histogram

Dependent Variable: Innovation



Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Innovation

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.581 ^a	.338	.334	.84121

a. Predictors: (Constant), Information Technology

b. Dependent Variable: Innovation

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	p-value
1	Regression	71.409	1	71.409	100.912	.000 ^b
	Residual	140.111	198	.708		
	Total	211.520	199			

a. Dependent Variable: Innovation

b. Predictors: (Constant), Information Technology

Coefficients^a

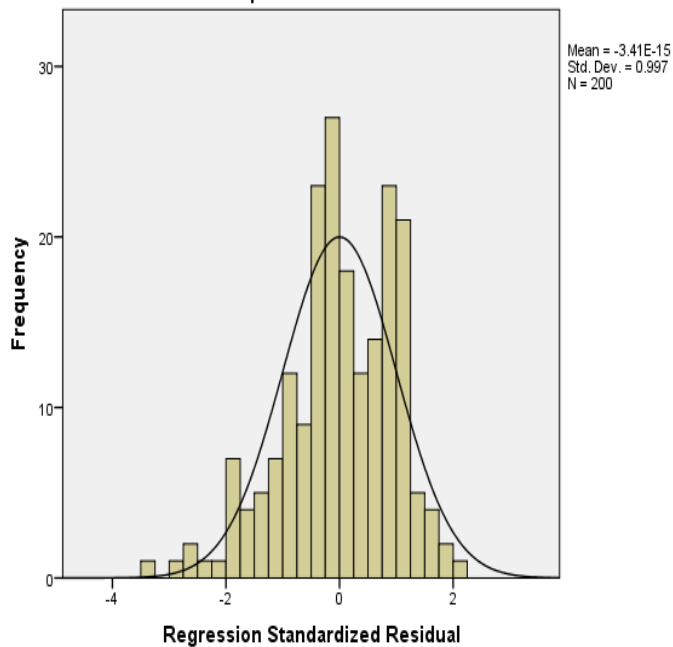
Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		B	Std. Error	Beta		
1	(Constant)	.739	.266		2.781	.006
	Information Technology	.654	.065	.581	10.045	.000

a. Dependent Variable: Innovation

Charts

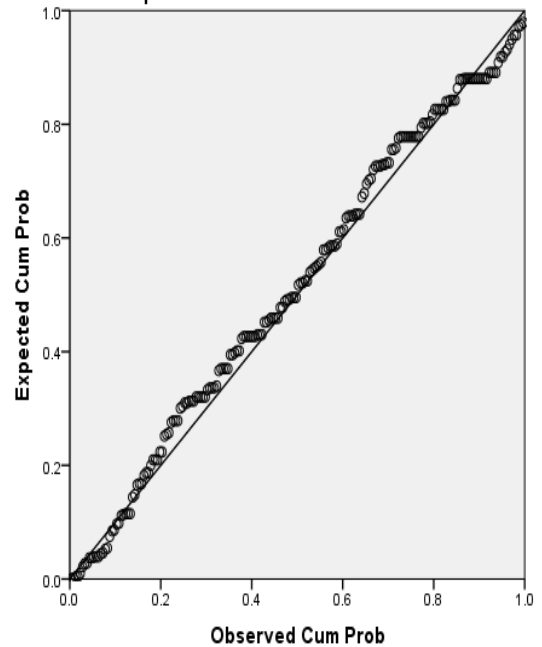
Histogram

Dependent Variable: Innovation



Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Innovation



Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.498 ^a	.248	.244	.89613

a. Predictors: (Constant), Community of Practice

b. Dependent Variable: Innovation

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	p-value
1	Regression	52.517	1	52.517	65.397	.000 ^b
	Residual	159.003	198	.803		
	Total	211.520	199			

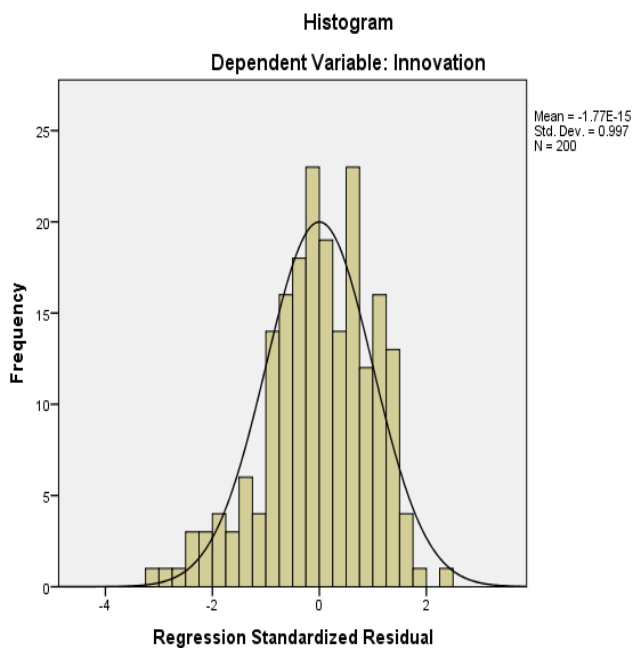
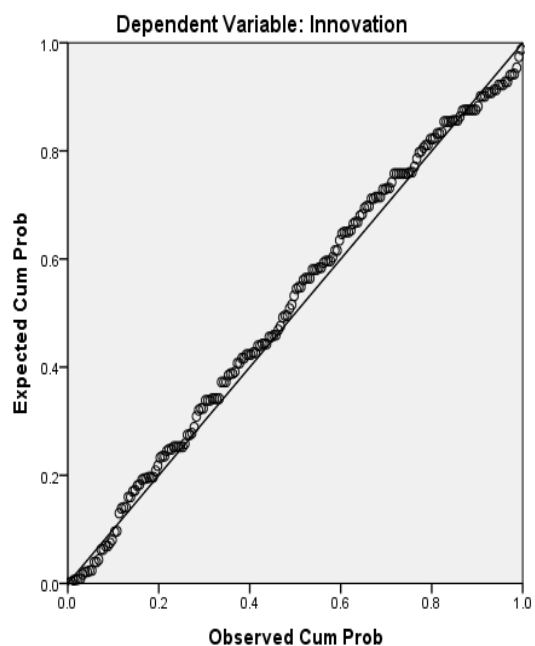
a. Dependent Variable: Innovation

b. Predictors: (Constant), Community of Practice

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		B	Std. Error	Beta		
1	(Constant)	1.005	.296		3.398	.001
	Community of Practice	.592	.073	.498	8.087	.000

a. Dependent Variable: Innovation

**Normal P-P Plot of Regression Standardized Residual**

Charts

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.465 ^a	.216	.212	.91495

a. Predictors: (Constant), Physical Environment

b. Dependent Variable: Innovation

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	p-value
1	Regression	45.767	1	45.767	54.670	.000 ^b
	Residual	165.753	198	.837		
	Total	211.520	199			

a. Dependent Variable: Innovation

b. Predictors: (Constant), Physical Environment

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	p-value
		B	Std. Error	Beta		
1	(Constant)	1.227	.293		4.188	.000
	Physical Environment	.545	.074	.465	7.394	.000

a. Dependent Variable: Innovation

