Enhancing Knowledge Sharing Among Computer Science Academics: Implementing a Web-Based Teaching Experience Platform in Saudi Higher Education Institutions

Thesis by

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Declaration

I declare that this thesis is my own work unless otherwise stated. No part of this thesis has previously been submitted for a degree or any other qualification at Newcastle University or any other institution.

Malak Bakheet Alharbi

I dedicate this thesis
To my lovely parents, ***Bakheet*** *and* ***Hamidah****,*
To my loving husband, ***Ahmad****,*
To my beloved children, ***Sadan****,* ***Sadeen*** *and* ***Abdullah***

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Abstract

Knowledge sharing is crucial for organisations to obtain a competitive advantage, especially in knowledge-intensive environments like higher education institutions (HEIs). Knowledge sharing enables institutions to generate and maintain knowledge. Academics are a key source of knowledge in HEIs. HEIs' success relies heavily on the quality and expertise of its faculty members and knowledge sharing between them is essential for the success of universities. To make better use of their academic knowledge and expertise, academics should thus be encouraged to share their knowledge with peers. However, many universities face difficulties in improving the sharing of knowledge accumulated by academics due to geographical and social constraints. Lack of knowledge sharing can impede the effective application of teaching skills, potentially impacting academic performance and leading to lower student achievement levels than could have been accomplished with better knowledge sharing. Although knowledge sharing management (KSM) has garnered substantial attention and implementation in numerous business entities in the Saudi context, the application of KSM within HEIs has been comparatively underexplored.

This thesis examines the effective exchange of teaching-related knowledge through the incorporation of KSM in a web-based platform in Saudi HEIs. It focuses on facilitating teaching-related knowledge exchange among Computer Science (CS) academics in a virtual context.

This research involves three phases. The first phase is problem identification. The literature reviews and three research investigation studies were conducted in this phase. The literature review findings indicate that most existing knowledge management systems (KMS) in HEIs have been developed for a generic knowledge context, leading to a lack of KSM related to teaching experience. The three research investigation studies assessed CS academics' perceptions of knowledge sharing related to teaching at different Saudi universities. The first study investigated knowledge sharing related to teaching and learning through social media applications in by collecting quantitative data via questionnaires. The second study investigated CS academics' perspectives on the factors that affect their willingness to share knowledge (WSK), again using questionnaires. The third study involved collecting qualitative data through interviews. It aimed to understand the perspectives of CS academics regarding sharing teaching-related knowledge among colleagues. It also examined factors influencing knowledge sharing, such as motivation, barriers, and the technology used for knowledge sharing within the CS faculties at Saudi Arabian universities.

The findings show that CS academics believed that exchanging teaching experiences can benefit them by resolving teaching issues, enhancing work procedures, and aiding the university in attaining its performance goals. However, they face a significant barrier in exchanging their teaching experiences with colleagues, as there is no efficient means of communication other than in-person engagement, which their substantial teaching responsibilities make hard to do.

To address this issue, a prototype system was designed in the design phase, using a combination of soft systems methodology (SSM) and the joint application design (JAD) technique. A Teaching Experience Platform (TEP) system was successfully implemented and deployed in this phase. The TEP system enables CS academics to effectively record, store, access, and evaluate teaching experiences. In addition, it includes social and gamification tools to motivate CS academics to use the platform and share their knowledge with others.

In the evaluation phase, the TEP system was tested in a real-world context within a community of CS academics in an experiment that took seven weeks. In the end, questionnaires and workshops were conducted to evaluate CS academics' experience and perceptions relating to the TEP system's usefulness. The empirical results show a highly favourable agreement on using the TEP system and the effectiveness of its functions and features to facilitate and motivate CS academics to share their knowledge among peers. Future research directions and recommendations are discussed at the end of the thesis.

List of Publications

The research discussed in this thesis has been published in the following publications:

1- Alharbi, M., Warrender, J.D. and Devlin, M., 2023. Examining the Feasibility of Incorporating Social Media Platforms into Professional Training Programs. In WEBIST (pp. 464-471) ISBN: 978-989-758-672-9; ISSN: 2184-3252, DOI: 10.5220/0012234100003584. [**Covered in CHAPTER 4, section 4.2**]

2- Alharbi, M., Devlin, M. and Warrender, J., 2024. TEACHING EXPERIENCES SHARING AMONGST ACADEMICS IN SAUDI UNIVERSITIES: COMPUTER SCIENCE ACADEMICS'PERSPECTIVES. In INTED2024 Proceedings (pp. 2759-2768) ISBN: 978-84-09-59215-9 ISSN: 2340-1079, doi: 10.21125/inted.2024.0751. IATED. [**Covered in CHAPTER 4, section 4.3**]

3- Alharbi, M., Devlin, M. and Warrender, J., 2024. COMPUTER SCIENCE ACADEMICS'PERSPECTIVES REGARDING THE SHARING OF THEIR TEACHING-RELATED KNOWLEDGE: QUALITATIVE STUDY. In INTED2024 Proceedings (pp. 4137-4144). ISBN: 978-84-09-59215-9 ISSN: 2340-1079 doi: 10.21125/inted.2024.1061IATED. [**Covered in CHAPTER 4, section 4.4**]

4- Alharbi, M., Devlin, M. and Warrender, J., 2024, May. Synergizing User's-defined Requirement Design for Crafting a Knowledge Sharing Management System. In 2024 International Conference on Development and Application Systems (DAS) (pp. 136-142). Electronic ISBN:979-8-3503-4929-0 Print on Demand(PoD) ISBN:979-8-3503-4930-6 DOI: 10.1109/DAS61944.2024.10541250 IEEE. [**Covered in CHAPTER 5**]

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List of Abbreviations

ATKS Attitude towards knowledge sharing

CS Computer Science

EC Expected contribution

ERA Expected rewards and associations

HEI Higher education institution

IT platform Information technology platform

JAD Joint application design

KM Knowledge management

KMS Knowledge management system

PU Perceived usefulness

SSM Soft systems methodology

TEP Teaching Experience Platform

vCoP Virtual community of practice

WSK Willingness to share knowledge

Chapter 1 Introduction

1.1 Problem Overview

The Kingdom of Saudi Arabia's Human Capability Development Program is part of the Vision 2030 programme. It aims to expand vocational training by providing funds for the integration of technologies into training institutions and other educational domains and thus to improve learning outcomes. The programme 'focuses on upskilling citizens by providing lifelong learning opportunities, supporting innovation and entrepreneurship culture, and developing and activating policies and enablers to ensure KSA competitiveness' [1]. The integration of virtual communities in educational institutions is one of the goals of the Human Capability Development Program.

Higher education institutions (HEIs) are specialised communities that generate and share knowledge. They play a crucial role in producing new insights through extensive research [2, 3]. The development of higher education ranks among the topmost priorities of the Saudi Ministry of Education as part of its contribution to the Vision 2030 goals [1]. There are 42 universities in Saudi Arabia, distributed across the country. Most universities in Saudi Arabia have two separate campuses, one for men and one for women, because Saudi Arabia is a Muslim country, and Islamic values are reflected in university structures and university life [4]. Each campus has its own academics and their experience varies. As a result of this separation, each campus offers a different learning experience for its students. There is limited communication between academics, which can lead to imbalances in teaching quality. For this reason, Saudi universities seek innovative ways to enhance their academic performance and stay ahead of the competition [5] and [6]. HEIs' success relies heavily on their faculty members' quality and expertise. This, in turn, largely depends on the effectiveness of professional development programmes. In other words, the quality of professional development offered to faculty members is instrumental in ensuring the growth and success of HEIs. One approach being considered is to make better use of the knowledge and expertise of academics. Knowledge sharing is immensely important in higher education and academic performance can be improved by managing the sharing of teaching-related knowledge among academics [7-9]. Saudi universities are exploring various avenues to promote this. By tapping into their academics' vast reservoir of knowledge and experience, the institutions hope to optimise their investment in human resources, resulting in more significant institutional achievements and better student outcomes.

Almuqrin et al. [10] recommended that each department or college create an official online platform for knowledge sharing among its academics, because each discipline has different requirements for knowledge and skills [11]. Knowledge sharing among academics may help to improve their teaching and enhance their innovation and thus could influence their performance positively [6, 12-14]. This might lead to increased success for their institutions. One of the ways being considered is virtual communities of practice (vCoP). However, thus far, little attention has been paid to studying knowledge sharing in Saudi higher education [6, 8, 15]. This is a gap the current research begins to fill.

The Computer Science (CS) discipline plays a fundamental role in developing our societies in the digital era [11]. This has led to a growing interest in CS education [16]. As a result of the technology developing quickly, CS teaching is constantly changing, especially in HEIs, which aim to provide quality education and knowledge for CS students to prepare them for competitive careers [11]. CS academics are often trained as researchers and may not be aware of good teaching practices, which they need to develop. While academics may possess core knowledge of their discipline, they often lack the teaching skills that are required to deliver their knowledge effectively to students. CS academics need to update the content of their courses each year, which will improve their teaching practices and skills in CS education as well as enhance the overall quality of learning. The teaching skills that come from their experience impact their students and affect their success in obtaining a competitive career. CS academics need to keep expanding their professional knowledge and develop their teaching methods and strategies [17]. However, some academics prefer to stick to the same teaching methods they have used for many years, which is not an effective way to enhance student skills [18]. It is thus clear that there is a need to develop teaching practice among CS academics. Therefore, this research project addresses knowledge sharing among CS academics in HEIs in terms of barriers that prevent knowledge sharing and how to encourage the sharing of teaching practices through a virtual teaching practices exchange management system, the TEP.

The research by Andrews et al. [19] showed that interaction among academic colleagues through exchange of ideas, resources, and information can change their teaching views and practices and support improved teaching in their college. Similarly, a study by Pifer et al. [20] demonstrated that academics in HEIs can gain knowledge and become better instructors by interacting with peers and having conversations about teaching that might influence their teaching practices and skills, especially for early-career faculty. The lack of effective knowledge sharing

among academics means that they will repeat their practices over the years, thus impeding their creativity and teaching innovation, ultimately affecting the effectiveness of teaching and the overall educational environment [9, 21]. Teaching-related knowledge sharing is thus important to develop teaching practices, leading to effective and successful teaching to improve university outcomes.

HEIs will have to rely on technology-enhanced tools to ensure they can develop effectively in the future by managing teaching experiences. Therefore, it would be useful to develop a teaching-related knowledge-sharing management (KSM) system for HEIs in Saudi Arabia to manage academics' teaching experiences and document them into course-related resources. By using knowledge management (KM) processes that include capturing, storing, transferring and reusing the knowledge [10], enhanced sharing of knowledge and improved teaching practices might be facilitated. This would improve the overall performance of all disciplines [22].

The current state of research on knowledge sharing in Saudi universities in the teaching context is characterised by a significant lack of investigation [21, 23]. Therefore, the current study explores the factors influencing teaching-related knowledge sharing among university academic staff. The motivation behind this project is to facilitate the sharing of teaching-related knowledge among CS academics through an online interactive community in order to enhance the teaching practice of CS academics in HEIs, especially for novice academics.

1.2 Research Objectives

This research project aims to facilitate teaching-related knowledge sharing, which could be used to improve teaching practices among CS academics by incorporating KSM in a virtual vCoP. The objectives of the research are:

1. To investigate knowledge sharing related to teaching and learning purposes through social media applications in HEIs.

2. To explore the importance of sharing knowledge (of teaching practices) among colleagues and their motivations, barriers, and factors that influence knowledge-sharing behaviour from CS academics' perspectives.

3. To develop a prototype system, called the Teaching Experience Platform (TEP), to be deployed in the Faculty of Computer Science.

4. To evaluate the TEP using user experience, focusing on perceived usefulness (PU).

1.3 Research Questions

This research aims to facilitate the sharing of teaching-related knowledge among CS academics by incorporating a vCoP with a KM approach. To address the research problem, this research aims to answer the following research questions:

1. How can existing social media applications be used to share knowledge for teaching and learning purposes in HEIs?
2. To what extent are CS academics in HEIs aware of the importance of knowledge sharing?
3. What features and functions will CS academics require in the proposed platform to encourage knowledge sharing?
4. To what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics?

1.4 Thesis Structure

The rest of the thesis is structured as follows:

Chapter 2. Research Methodology

This chapter presents the research methodology and outlines the data collection methods employed to address the research questions. The overall methodology is discussed in this chapter, and the specific methodologies for individual studies are discussed in their respective chapters.

Chapter 3. Literature Review

This chapter reviews the existing literature that is relevant to the research. It includes previous research studies related to knowledge, types of knowledge, KM processes and their relevance to HEIs. Previous research studies on KM within HEIs and knowledge sharing are discussed, as are categories of knowledge in HEIs and different types of knowledge specific to HEIs. The chapter also discusses previous research on the role of academics in HEIs, with a specific focus on CS academics. In addition, it covers the academic journey in Saudi HEIs in comparison with the UK. Technologies used in KM are covered. Furthermore, existing knowledge management systems (KMS) in HEI as well as KMS methodologies are discussed.

Chapter 4. Investigation of Knowledge Sharing Related to Teaching and Learning in HEIs

This chapter explores knowledge-sharing in HEIs for learning and teaching purposes. The first study, discussed in Section 4.2, examines knowledge sharing for learning and teaching purposes through social media applications at Saudi HEIs from the perspective of CS pre-service teachers to address answer RQ1. It was conducted using an online questionnaire distributed at Jeddah and Umm Al-Qura Universities.

The second study, discussed in Section 4.3, investigates the perspectives of CS academics regarding the factors that contribute to an academic's willingness to share knowledge (WSK). These factors include attitude towards knowledge sharing (ATKS), expected rewards and associations (ERA), expected contribution (EC), and the information technology platform (IT platform) that is used for knowledge sharing in a school of computing. This study was conducted via an online questionnaire distributed to Jeddah and Umm Al-Qura Universities.

The third study, discussed in Section 4.4, explores the perspectives of CS academics about the sharing of teaching-related knowledge among colleagues, as well as the elements that influence knowledge sharing, such as motivation, barriers, and the current technology utilised for knowledge sharing within the CS faculty in Saudi Arabian universities. It employed online interviews with CS academics at Jeddah University. The second and third studies answer **RQ2**.

Chapter 5. Design of the Teaching Experience Platform (TEP)

This chapter describes the design of the TEP. The chapter describes the proposed system, the TEP's conceptual model using soft systems methodology (SSM), the system architecture, and the use case diagram to illustrate the system functionality. Joint application design (JAD) is used to validate the feasibility of the proposed solution. This chapter answers **RQ3**.

Chapter 6. Implementation of the Teaching Experience Platform (TEP)

This chapter covers the implementation of the system. It includes an overview of the system implementation, application architecture, and technical details. In addition, it discusses users' interactions with functions of the system's specific features.

Chapter 7. Evaluation of the Teaching Experience Platform (TEP)

This chapter evaluates the TEP with actual users. It includes an overview of the experiments with end users (CS academics). It also details the evaluation methods using mixed methods, such

as an online questionnaire and workshops. In addition, it discusses the empirical results of the evaluation.

Chapter 8. Discussion

This chapter comprehensively discusses the research findings according to research questions and how the findings relate to the literature.

Chapter 9. Conclusion and Future Work

This chapter concludes the thesis, provides the research contributions in more detail, and discusses the limitations of the work. In addition, it suggests future research directions.

Chapter 2 Research Methodology

2.1 Introduction

This chapter discusses the research design and methodology applied in the thesis, which was employed over three phases to address RQ1-RQ4, in addition to data collection methods and tools.

2.2 Research Methodology, Methods and Tools

Figure 2.1 below depicts a summary of the thesis phases and the tools and methods used in each phase.

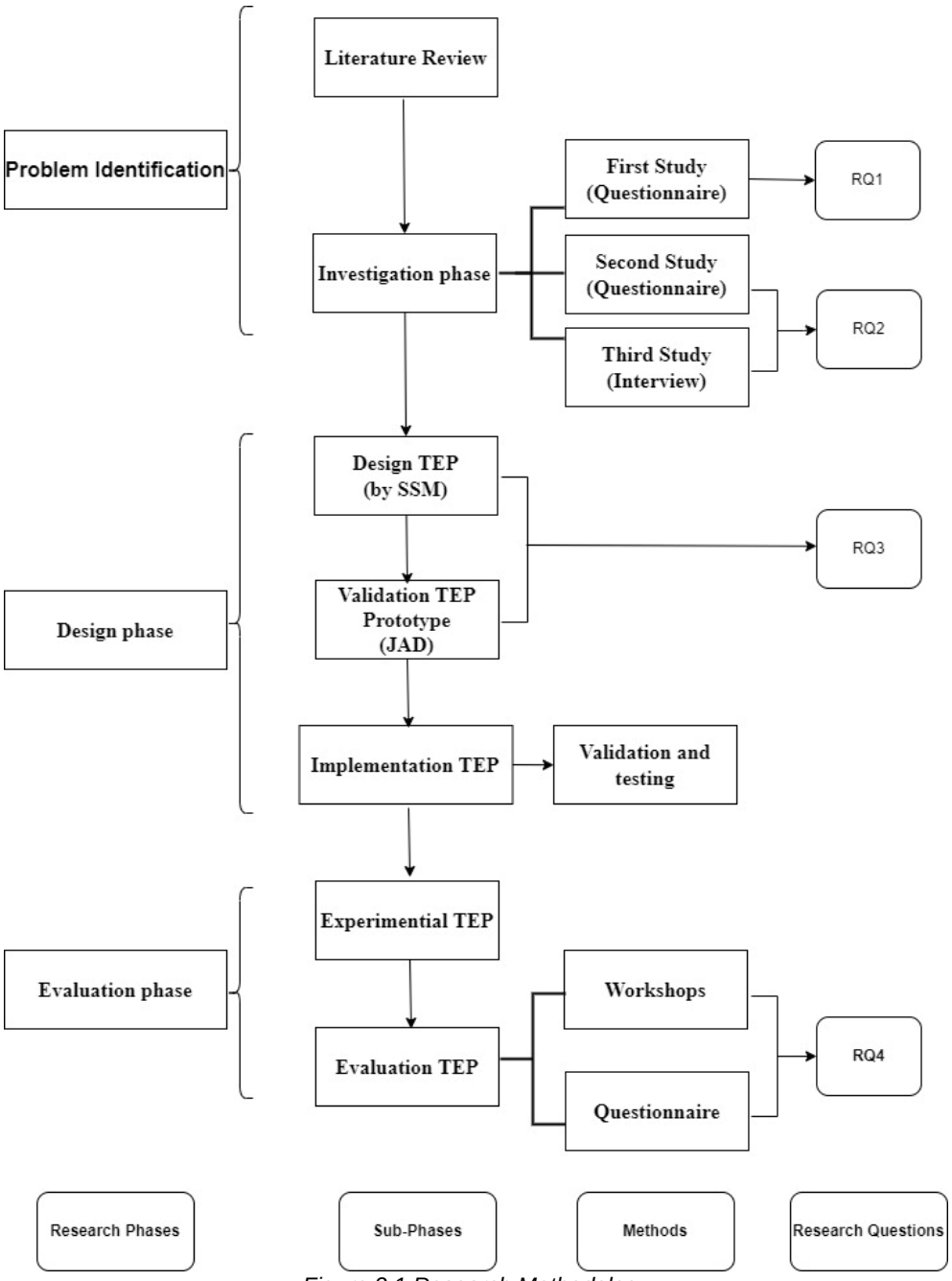


Figure 2.1 Research Methodology

2.2.1 Phase 1: Problem Identification

Below, the research methodologies, methods, and tools used in the research problem identification phase are discussed. This phase consists of the literature review and three investigative studies.

2.2.1.1 Literature review

The literature review was conducted over three stages. 1) The initial literature review, inspired by an interest in the education and knowledge sharing field. This stage provided a glossary, research

sources, research gaps to be investigated and future research directions to be followed 2) The exploratory literature review, which was guided by basic research questions and natural observations with regard to the field of education and knowledge sharing in HEIs. It covered specific research conference and journal papers. 3) The focused literature review. In this stage, the research questions were better formulated, and the final review of the literature was documented, which provided guidance for the three investigative studies.

2.2.1.2 Investigation studies

Three investigation studies were conducted on knowledge sharing in HEIs for learning and teaching purposes, all reported in Chapter 4. The research methodology used for the three studies followed the correlational research approach, which aims at exploring and assessing correlations and connections between variables with no manipulation [24]. It was used to answer RQ1 and RQ2. A mixed-method approach comprising questionnaires and interviews was utilised, as discussed below.

Questionnaires

A questionnaire is a research tool with questions to gather quantitative data from respondents. The questionnaire helps the researcher gather a wide variety of data from large populations within a limited time to produce a generalisable result [25]. This tool can measure variables, test hypotheses, predict future results, or investigate causal relationships [26, 27]. The data collected by questionnaire is often analysed statistically [26] to prove research hypotheses or answer research questions. There are three types of questionnaires, closed ended, open ended, and mixed. Closed-ended questionnaires provide limited responses to facilitate easier data analysis [28]. However, the weakness of this type is that it provides only limited data. Open-ended questionnaires allow respondents to answer the questions in more detail, resulting in a significant level of diversity and more difficulties in analysing results [29]. Finally, mixed-method questionnaires are a mixture of closed-ended and open-ended questions to gain quantitative and qualitative data. These questionnaires enable participants to elaborate on specific answers with more detail, providing more context and insights. For this reason, mixed-method questionnaires are the most appropriate data collection method for this research. To facilitate ease of access to respondents in different locations and within a limited timeframe, for this research, online questionnaires were used. The online questionnaire was created using Survey Monkey [30], an online survey software. This has several advantages. First, Survey Monkey enables users to answer the questionnaire on any device,

such as laptops, PCs, tablets or smartphones. Second, there is a low cost of preparation, distribution and collection of data. In addition, the cost of collecting data from geographically dispersed populations is low. Finally, the data collected from the online questionnaire can be directly imported into the statistical software package SPSS.

In this thesis, questionnaires were used in the first study, Section 4.2, to answer RQ1, which aims to explore knowledge sharing through social media applications at Saudi HEIs, and in the second study, Section 4.3, to explore the perception of CS academics related to the factors that influence knowledge sharing behaviour, including WSK, ATKS, ERA, EC and IT platform at Saudi HEIs, which partly answers RQ2.

Interviews

An interview is a common tool in qualitative research used to collect data. The goal of interviews is to gather information directly from participants, which provides an in-depth understanding of a given topic or phenomenon [26, 31]. The interviews can be one-to-one or group meetings, either face to face or online. Interviews are goal-orientated conversations [32]. However, the interviewer has to control the interview to obtain the desired information related to the research questions [33]. Due to COVID-19 restrictions, this research used online interviews to interact with the interviewees.

Online interviews were conducted in the third investigation study, Section 4.4, to gain an understanding of CS academics' perceptions of teaching-related knowledge sharing among peers and the factors that impact their sharing, such as motivation and barriers, in addition to the current technology used for knowledge sharing in HEI. The findings of this interview partially answer RQ2, as discussed in Section 4.4.

Data analysis

The data collected was analysed both quantitatively and qualitatively. Merging quantitative and qualitative approaches allows for generating a mixed-methods approach that provides insights into a deeper understanding of the research problem [34]. It enables the generation of new insights by integrating numerical and verbal data [35]. Applying this approach makes it possible to avoid the limitations posed by using quantitative or qualitative approaches independently, thus minimising bias. Moreover, the researcher can gain an in-depth understanding of a problem from the participants' perspectives, thus enhancing research outcomes based on their perspectives [26].

2.2.2 Phase 2: Design and Implementation of the Solution

Below, the research methodologies, methods, and tools used in the research design phase, which consists of the design, validation, and implementation of the TEP, are discussed.

2.2.2.1 The design of the TEP

In this phase, the proposed TEP was developed using a user-centred design, based on the findings of the three investigative studies. This task entails defining the requirements and software functionality for the TEP prototype to address objective RO3, thereby answering RQ3. In this phase, SSM [36] was used to analyse the requirements needed to build a conceptual model, with a special focus on the "human activity" that necessitates the assistance of a computer system. SSM is explained in detail in Section 3.5.1.

2.2.2.2 The validation of the TEP design

JAD was used to validate the prototype of TEP. JAD is a system development method that requires the involvement of users, stakeholders, and developers to capture the requirements of the system [37]. This approach provides insights into the comprehensive and user-centred system development process that addresses both the problem domain and the specific needs of users. JAD is explained in detail in the Section 3.5.2. More details about the system design itself are provided in Chapter 5.

2.2.2.3 The implementation of the system

After the prototype was validated, the system was implemented. The system was tested to identify and correct errors in the early phases to verify the implementation. More details about the system implementation are provided in Chapter 6.

2.2.3 Phase 3: Evaluation

In this phase, the system was evaluated via a user-centred approach in order to address objective RO4, thereby answering RQ4. The main aim of the evaluation was to examine CS academics' experience related to the PU of the system to facilitate the sharing of knowledge. An experiment was designed to collect CS academics' experience with the system. A questionnaire was used to evaluate the TEP in terms of the PU of each function in the TEP, as discussed in Section 7.3.1. In addition, online workshops were conducted to ascertain academics' perceptions and feedback on the usefulness and effectiveness of the TEP's functions and features, as discussed in Section 7.3.2. More details about the evaluation phase are discussed inChapter 7.

This mixed-method approach employed in this research provides rigorous findings and effective feedback related to the system's functions to facilitate knowledge sharing through a vCoP.

2.3 Summary

This chapter discussed the methodology for the various phases of the research. Phase 1 consists of the literature review and three investigative studies. The investigative studies used a combination of quantitative (questionnaires) and qualitative (interviews) methods. Phase 2 consists of the design and implementation of the TEP, using SSM and JAD. Finally Phase 3 evaluated the TEP, using a workshop and questionnaires with actual end users.

Chapter 3 Literature Review

3.1 Introduction

This chapter presents an overview of the existing literature concerning knowledge definitions, types of knowledge, and KM processes. This is followed by a discussion on KM practices, knowledge sharing and knowledge sharing factors within HEIs. Categories of knowledge in HEIs and the role of academics in KM, specifically focusing on CS academics, are also discussed. In addition, this chapter demonstrates the academic journey in Saudi Arabia and the UK, as well as the technologies they use in KM. The review explores the existing KM systems used for managing knowledge in HEI and identifies gaps in the literature. Finally, KMS development methodologies are discussed.

3.2 Knowledge

Knowledge has become a valuable resource in today's information-based communities, especially in universities. To understand the concept of knowledge, it is essential to distinguish between knowledge, information, and data. There are differences and similarities between these three concepts in the Information Systems literature [38-40]. Some scholars state that there is a need for a unified concept to distinguish between knowledge, information, and data [38, 41]. Researchers indicate that in order to distinguish them, they must be placed in a specific context to understand the meaning [42, 43]. In this thesis, the context is KM. Therefore, the following definitions apply in this research. Data can be defined as a collection of numbers, characters, and symbols without context and interpretation or information that is unprocessed [44], while information has been defined as 'data organised to produce meaning' [40]. Knowledge can be defined as data, contextual information or experience that can be gained from resources such as websites, books or experts. Thus, it can be used as concepts, principles, facts, and judgments [45]. A commonly held view is that knowledge comes from information and that information comes from data [38, 40]. However, some researchers refer to knowledge as a mix between data and information. The following sub-section outlines the various knowledge types.

3.2.1 Types of Knowledge

The knowledge taxonomy literature uses many classifications of knowledge. Polanyi [46] suggests that knowledge can be divided into tacit (subjective) and explicit (objective), and this division is

the most widely used in the literature [47-49]. According to Nonaka [43] and Von Krogh [50], explicit knowledge is knowledge that can be created and easily shared with anybody in an institution in formal language. For example, content such as course material, syllabuses, and exam questions might be shared between professionals in higher education. Explicit knowledge can be easily stored, transferred, shared, and accessed through commonly available methods. In contrast, tacit knowledge is rooted in an individual's actions and experiences. As a result, tacit knowledge is complex and difficult to transfer [50]. According to Nonaka [43], 'tacit knowledge is a personal quality, which makes it difficult to formalise and communicate'. Moreover, tacit knowledge resides within the human mind and encompasses a broad range of experiences, such as cultural beliefs, personal values, expertise, and acquired capabilities [51], which makes it difficult to be clearly expressed by systematic and formal language [43] such as teaching practices. Explicit knowledge might be less important to organisations, whereas tacit knowledge is knowledge based on know-how and experience and, therefore, more valuable [52]. As Leonard and Sensiper [53] state, tacit knowledge is a valuable source of competitive advantage and plays a significant role in fostering innovation. While the discussion about the nature of explicit and tacit knowledge is ongoing, Von Krogh [50] proposes that these two forms of knowledge are complementary and essential for knowledge creation.

A more detailed classification of knowledge is introduced by Lundvall and Johnson [54], with four knowledge categories based on the utilisation of knowledge, as follows:

Know-what is knowledge about facts, information, and concepts. It is similar to information that can be broken down and communicated as data. Databases can store know-what in a user-friendly format, making it easier to access and understand.

Know-how refers to skills and knowledge related to successfully completing a task. It represents a form of knowledge cultivated and retained within the confines of individual organisations or specific research teams to facilitate sharing among organisation employees. In this context, knowledge tends to prioritise practical expertise (know-how) over theoretical understanding (know-why).

Know-who is the requisite knowledge for identifying a suitable individual to undertake a particular task. Know-who is the most effective way to obtain relevant information through social relationships. This involves collaborating and effectively communicating with diverse individuals and experts. Thus, the social environment may facilitate the acquisition of know-who knowledge.

Knowing the right people becomes crucial for accessing and leveraging the necessary expertise to solve problems and innovate effectively as know-how becomes more specialised and complex [55].

Know-why refers to knowledge employed to determine the cause of something. This knowledge often minimises errors in procedures that rely on trial and error. The type of knowledge in this category enables know-how, know-what, and know-who.

The first category of knowledge can be obtained by accessing databases, books or lectures, which is explicit knowledge. Know-how, know-who and know-why rely more on practical experience, typically tacit and frequently context-specific [56]. It can be noted that explicit knowledge can be shared through leveraging available resources to gain the necessary information for tasks or roles, while tacit knowledge often requires collaboration and learning from peers and through social networks. In this case, the balance between explicit and tacit knowledge is crucial in developing comprehensive knowledge and practical skills.

All kinds of knowledge are used to facilitate the transfer of knowledge through an organisation's activities. It is essential for universities to support the production and reproduction of know-why knowledge by recording it to reuse when they need it in order to reduce the frequency of errors and facilitate sharing. Knowledge thus has a powerful role in educational institutions' development to obtain a competitive advantage [57, 58].

For knowledge to be effectively utilised by others, it must be managed and shared in a systematic way that is understandable and accessible to individuals and groups [59]. For this reason, organisations have started to work on KM practices, which incorporates the use of KMS. A comprehensive KM strategy should cover different types of knowledge in terms of competitive contexts, such as a codification strategy and a personalisation strategy [60]. In a codification strategy, knowledge is carefully codified and stored in databases, making it easily accessible to anyone in the company. This strategy relies on information technology to capture and disseminate knowledge. It involves incentivising employees to write down what they know and contribute to the electronic repository through performance reviews. A personalisation strategy involves knowledge closely tied to the person who developed it and is mainly shared through direct person-to-person contact. In this strategy, managers need to reward people for sharing knowledge directly with others. Performance evaluations may include assessments of the quality and quantity of person-to-person knowledge sharing.

These approaches represent different ways of managing and sharing knowledge within an organisation. The codification strategy is more appropriate for know-what and know-why knowledge. It focuses on documenting and storing knowledge in databases that can be easily articulated and standardised. In contrast, the personalisation strategy is well suited for know-how and know-who. It focuses on direct person-to-person knowledge sharing, often tacit and context-specific [61]. This thesis will apply these approaches, crucial for understanding how knowledge is shared and transferred among individuals within organisational settings, especially in universities.

3.2.2 Knowledge Management Processes

According to the literature, the main processes of KM include knowledge capture or creation, knowledge storage and documentation, knowledge retrieval (reuse), and knowledge sharing [62, 63]. Effective KM processes have a positive impact on an organisation's innovation performance [64-66].

Knowledge creation involves generating new ideas or content within an organisation to transform tacit knowledge into explicit knowledge that can be shared with individuals and groups [67].

Knowledge storage and documentation encompasses preserving and storing tacit or explicit knowledge in a repository or database for retrieval and future reuse. Olivera [68] emphasises the significance of knowledge storage for enhancing an organisation's performance, which can be instrumental in addressing recurring challenges [69]. Furthermore, it can protect the organisation from losing good employees [70]. As a result, this process can provide substantial benefits for the organisation. The organisation can utilise computer-based technologies to store, retrieve and access substantial knowledge effectively [68, 71, 72]. For instance, a KMS can efficiently store, retrieve, and access knowledge, ensuring seamless KM and easy information retrieval.

Knowledge Sharing could be considered the main component of KM processes, whereby people exchange experience with each other [73, 74]. Other terms used for knowledge sharing in the literature are knowledge exchange and knowledge transfer [21, 59, 75]. People cannot share knowledge without creating, disseminating, and applying it [74]. The knowledge is likely to fade if the individuals in the organisation do not effectively share it [76]. Moreover, knowledge sharing contributes to the development of the organisation and the individual [77]. The definition of knowledge sharing continues to be a much-debated topic among academics and practitioners,

depending on the context and perspective. Several definitions of knowledge sharing have been put forward [78]:

In the context of work, knowledge sharing can be described as data, experiences, ideas, and technologies, whether explicit or tacit, that are exchanged or spread among people such as academics, employees, or experts, as individuals or groups [79, 80]. It can be seen as a collection of behaviours that include sharing work-related knowledge with another employee to achieve organisational goals [81].

Bart van den Hooff [82] defined knowledge sharing as 'the process where individuals mutually exchange their (implicit and explicit) knowledge and jointly create new knowledge'. Similarly, Chua [83] states: 'Knowledge sharing is the process by which individuals collectively and iteratively refine a thought, idea, or suggestion based on their experiences'.

Knowledge sharing thus has benefits at both the organisational and individual levels. On organisational levels, knowledge sharing greatly helps in the achievement of continuous organisational growth, as well as the achievement of organisational goals and objectives. Also, knowledge sharing within the organisation leads to the transfer of personal knowledge to organisational knowledge [43], which may resolve problems and improve the organisation [84]. On an individual level, knowledge sharing contributes to an individual's learning, awareness, and innovation [85] to enhance their performance [86, 87]; develop their skills and competencies, such as decision making and problem solving [88]; and to enable knowledge transfer between individuals within the same unit or between units [89]. Practicing knowledge sharing results in increased organisational effectiveness [90], including new knowledge creation, innovation, and performance improvement [90, 91]. Knowledge sharing contributes to the success of an organisation through knowledge dissemination and distribution to communities of practice, such as professional communities [92]. Effective knowledge sharing practices are the key to all successful organisations aiming to achieve their objectives, regardless of the type of services or products they provide. In this thesis, it is important to recognise that the terms 'knowledge exchange' and 'knowledge transfer' may all be utilised to denote knowledge sharing.

Knowledge reuse can be described as the process of retrieving knowledge that has been captured and stored in repositories for future use [93, 94]. Knowledge reuse activities encompass defining the search question, the search for and location of experts or expertise, selection of an appropriate expert, and applying the knowledge—a process sometimes called the

'recontextualisation' of knowledge that was decontextualised when it was captured and codified [94]. Oshri [95] defines knowledge reuse as 'processes [which] emphasise the centrality of knowledge within an organisation by aligning information systems and communication technologies with human activity and organizational mechanisms, such as learning processes and organizational structures'.

3.3 Context of Higher Education Institutions (HEIs)

3.3.1 Knowledge Management

In educational settings, KM forges connections between individuals, technologies, and processes to promote a robust system of knowledge sharing among employees [96]. Research on KM has been extensively discussed in commercial environments to improve profitability. According to Omerzel [97], HEIs are unique establishments with knowledge as their input and output. Universities play major roles in creating knowledge through research and distributing it through publications and social interactions. This is considered the traditional aim of HEIs [2, 98]. HEIs are dedicated to delivering education, advancing research, and contributing services to their communities [99].

Academics are essential to HEIs, because they generate, disseminate, and transfer knowledge through their universities. This aligns with the KM processes, as discussed by Rowley [100] in the context of enhancing KM in HEIs. The success of HEI depends significantly on the quality and expertise of its faculty members, which is influenced by the effectiveness of professional development programmes. The professional development can be enhanced by KM, which involves the management of both explicit knowledge related to subject expertise and tacit knowledge related to educational expertise [101]. Therefore, the quality of professional development offered to faculty members is instrumental in ensuring the growth and success of HEIs. Faculty need a chance to develop their skills through training courses or workshops for professional development, especially for new academics who did not have training for teaching in higher education. Professional development in higher education should be focused on up-to-date teaching and pedagogical practices to prepare academics to be good teachers and enhance engagement with their students and colleagues. Departments can improve teaching practices by developing a community of practice around teaching and by encouraging collegial interactions and collaboration [102, 103]. A number of studies have shown that applying KM in HEIs could improve research and learning processes [104, 105] and contribute to the development of academic staff

through professional development programmes [106]. Effective KM in HEIs could improve the quality of university courses and curricula. Additionally, novice academics can benefit from the knowledge stored centrally so that they can browse curriculum design and best practices in teaching [107]. Although the importance of managing knowledge in higher education environments is recognised [108], the application of KM in HEIs has received comparatively limited attention in the literature and practice [9, 109].

HEIs face challenges due to the substantial changes in the technological environment [110] and the rapid evolution of the global marketplace in which increasingly entrepreneurial HEIs operate [111, 112]. In addition, Bushry and Ranjan [113] highlighted that the main challenge in HEIs is creating a knowledge environment in which knowledge is recognised as intellectual capital to make it widely and easily available and shared with any faculty member, staff member or other actors.

To face these challenges, HEIs need to implement the key elements of KM using online community-based KM techniques, such as vCoP [114], to improve and achieve innovative development [111, 115]. VCoPs are groups where individuals with shared interests or professions collaborate and share knowledge related to their professions. This thesis develops a vCoP as a KMS tool.

3.3.2 Knowledge Sharing in HEIs

Knowledge sharing is crucial in academic institutions, as it fosters collaboration and the reuse of individuals' knowledge. Knowledge sharing occurs when academics share their knowledge with peers [116], thereby contributing to the advancement of their universities' achievements [117]. Knowledge sharing in HEIs is crucial in maintaining long-term success [118-120], especially when knowledge is effectively used and shared among academics [121, 122]. Many studies emphasise the importance of sharing knowledge because of its role in enhancing the quality of work and thus providing competitive advantages [123, 124]. In addition, it could help solve problems and challenges quickly and increase innovation [125].

HEIs are a platform for academics to engage with each other [126] and share their resources and knowledge for the overall benefit of their universities [127]. Implementation of knowledge sharing in HEIs assists and supports faculty members in creating new ideas and improves the standard of the university [128]. Nonaka and Takeuchi [129] suggested that effective knowledge

sharing occurs when new tacit knowledge is created, shared, and distributed within the organisation.

Moreover, effective knowledge sharing among academics has valuable benefits for teaching, since it allows academics to refine and generate knowledge through interaction between expert and novice academics [130]. Novice academics learn from experts, which leads to them developing insights beyond their own experience. Additionally, it can offer opportunities for academics to enhance the quality of courses [127] and improve teaching skills and instructional effectiveness [10, 13, 131].

The available literature shows that knowledge-sharing practices are beneficial for both experienced and novice academics [130, 132, 133]. Interestingly, knowledge-sharing activities or practices could affect the professional development of novice academics indirectly, because experienced academics provide guidance and mentorship on relevant know-how tasks, e.g., teaching, to novice academics [2, 134]. This then improves the overall performance of their institutions [135]. Although more recognition has been given to the importance of knowledge sharing in HEIs [136, 137], it does depend on an academic's attitude and perception towards knowledge sharing. Jarrah [92] emphasises that successful knowledge sharing relies on individual behaviours.

However, it is difficult to encourage members to share their knowledge, because they may believe that their knowledge has value and thus is the source of their power [138]. This knowledge hoarding and a lack of WSK are identified as challenges within HEIs [2, 139-141]. Knowledge hoarding is due to the risks involved in sharing. Academics may believe that knowledge sharing will cause them to lose status or power [9]. This would be a threat to their position, power or their competitive advantage [142, 143] in their organisation and even a loss of leadership position opportunities. Academics may also consider their knowledge as their property, which they do not want to share with others. A reluctance to share knowledge among academics will likely negatively impact HEIs' performance [9, 99, 128].

Although there are many studies globally that have discussed knowledge sharing in HEIs, such as Howell [130], Norulkamar and Hatamleh [134], Ramayahet al. [117], Othman [118], Fullwood et al. [13] and Akosile and Olatokun[140], there have been only a small number of local studies conducted in Saudi Arabia to examine the extent of knowledge sharing within HEIs. A study by Alsuraihi [144] focused on understanding the current level of knowledge sharing among

academics at King Abdulaziz University. Another study by Ghabban et al. [6] identified the factors that lead to enhanced levels of knowledge sharing in Saudi universities. They conducted an online questionnaire of 374 academic staff in Saudi universities and found that the use of information and communication technology and the nature of the knowledge involved are the primary factors that positively affect knowledge sharing in Saudi universities. Alammari [145] investigated the factors of knowledge sharing adoption for eLearning communities in Saudi Arabia. They found that attitude significantly impacts behavioural intention toward knowledge sharing adoption in Saudi universities' eLearning communities. They stated that there is a need to create an online platform to share knowledge among academic staff, including various social tools and motivation systems. They found that although there is a strong positive ATKS among Saudi academics, there are also significant barriers, such as time constraints and lack of rewards. Previous studies thus show that there are challenges for knowledge sharing among academics in Saudi HEIs due to time constraints, lack of rewards and the absence of a social academic community. Therefore, it is necessary to explore the factors influencing knowledge sharing among university academic staff, as they contribute to facilitating the knowledge-sharing process.

3.3.3 Knowledge Sharing Factors

Previous research has identified various factors that can influence the success of knowledge sharing initiatives [15, 90, 146]. According to Al-Kurdi et al. [78], technological and individual factors can affect knowledge-sharing activities. These factors play a significant role in determining the success of knowledge sharing. In particular, individual behaviour plays a significant role in knowledge sharing, making it challenging for organisations to change and create a competitive edge. ATKS vary significantly among individuals. However, there are certain fundamental characteristics that typically shape these attitudes, such as the perceived value of knowledge or personal motivation. Some studies have shown that how an individual perceives their contribution is a crucial factor in shaping ATKS [147, 148]. Mills [149] further argues that variations in perceived contribution among employees can bring about advantages for organisations, such as a competitive edge and improved performance.

Numerous studies have explored the connection between individual attitudes and knowledge sharing [150-152]. One study investigated the attitudes and intentions of UK academics towards knowledge sharing in universities [12]. They showed that UK academics held positive ATKS, because they believe it can enhance relationships with other members and offer more internal and external opportunities and rewards.

Positive associations and expected rewards can greatly influence an individual's knowledge sharing behaviour. Conversely, some studies stated that a lack of motivators and reward systems can hinder knowledge sharing in organisations [153, 154]. For example, Jeon et al. [153] conducted empirical research to identify factors that impact the attitudes, intentions, and behaviours of a community of practice members towards knowledge sharing. The results of their research show that extrinsic and intrinsic motivational factors significantly impact ATKS behaviours. Intrinsic motivational factors include the internal desire to learn and contribute. However, extrinsic motivations are related to tangible benefits, e.g. rewards, acknowledgment and certificates. To encourage knowledge sharing within HEIs, more investigation is necessary to understand how knowledge-sharing behaviour can be promoted effectively [92, 100, 153, 155].

Technological factors play an important role in facilitating knowledge sharing; these factors are tools and systems, as well as how knowledge is shared in virtual communities via the internet, although knowledge sharing does not depend on technology alone [90]. Several studies have concluded that IT supports KM, especially knowledge sharing, through promoting various types of communication among members in an organisation [93, 156]. For example, Ghabban et al. [6] found that IT positively impacts knowledge sharing in HEIs.

Comprehensive reviews by Al-Kurdi et al. [78] and Zhenyu et al. [8] recommended exploring the factors that influence knowledge-sharing behaviour in HEIs in diversified cultural contexts. They encouraged examining the role of IT in facilitating knowledge sharing in HEIs using a KMS. Zhenyu et al. [8] recommended using diversified approaches to explore these factors for more profound insights. This thesis focuses on the individual and technological factors.

One of the objectives of this thesis (RO2) is to explore the factors influencing the WSK among CS academics at two Saudi universities: ATKS, expected rewards and associations and IT. In this way, the thesis fills the gap related to CS academics in the context of Saudi HEIs.

3.3.4 Categories of knowledge in HEIs

HEIs have two main categories of knowledge: administrative or organisational knowledge and academic knowledge [157]. Administrative or organisational knowledge pertains to the knowledge related to the activities of administrative units, such as finance and administrative communications, which the university implements to accomplish its goals. Academic knowledge includes teaching- and research-related knowledge. Research-related knowledge encompasses academics' experience in research methodology and skills. Teaching-related knowledge represents content knowledge of

curricula, which refers to course-related materials such as lectures, seminars, tutorials, and lab practicals. This can be considered explicit knowledge (know-what) that is easy to express and record in sentences and words. It is also known as subject matter (content knowledge). Usually, these materials are created, saved and organised by academics. These materials have both significant scholarly value and practical benefits. Teaching-related knowledge also refers to how academics deliver curricula to their students, and it reflects the accumulation of their expertise and skills in their subject, which is known as pedagogical knowledge. This can be considered tacit knowledge (know-how), because the expertise in teaching is shaped by teaching practices accumulated over the years. It resides in the minds of academics and is difficult to express or record, involving their cognitive skills, problem-solving ability, effective teaching skills, teaching methods, and their own learning to deliver knowledge to students [127].

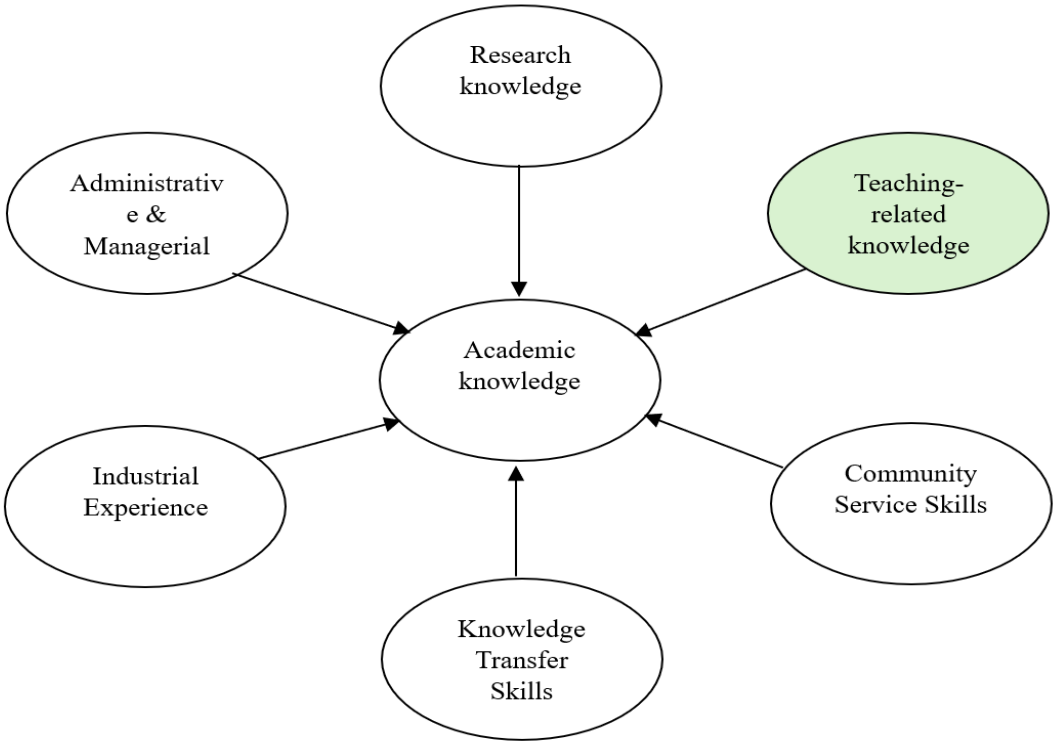


Figure 3.1 Knowledge Domains of a Faculty Member (Adapted from [1]). The focus of the Thesis is Teaching-Related Knowledge, Highlighted in Green

Figure 3.1 above shows the different types of academic knowledge. This thesis focuses on teaching-related knowledge, which is the main role of academics in HEIs. Effective teaching in HEIs occurs when academics combine content knowledge of curricula with teaching expertise [158, 159]. Academic resources are often not efficiently shared among colleagues teaching the same courses, leading to the repeated creation of materials over the years. In addition, throughout

their teaching activities and interactions with students, academics generate a significant amount of valuable teaching-related knowledge. This knowledge must be properly managed to ensure it is saved and can be reused in the future when needed [160].

One of the core goals of HEIs is to provide high-quality teaching, which requires a commitment to continuous improvement and innovation in teaching practices [161]. The effective management of teaching-related knowledge within HEIs can significantly enhance academic performance, improve teaching quality, and, subsequently, improve the institution's overall performance. Teaching-related knowledge can be tacit or explicit. The terms 'teaching experience', 'teaching practice', and 'teaching expertise' all refer to teaching-related knowledge in this thesis.

3.3.5 Academics in HEIs

HEIs are seen as knowledge-intensive communities that are involved in both knowledge generation and dissemination [2, 9]. Academics are a key component of HEIs and play a vital role in determining their success. In Saudi HEIs, teaching is an essential responsibility of academics in addition to research; thus, they have a vast reservoir of knowledge and experience [162]. In addition, they are involved in promoting knowledge sharing and fostering the university's learning culture [77, 142]. Disseminating knowledge that has been acquired through taught methods and experience is what teaching is all about, and it is an extremely important factor in determining the quality of outcomes in institutions [163]. This, in turn, largely depends on the effectiveness of professional development programmes. Academics in HEIs are defined as knowledge workers [90, 164].

Academics in higher education are often in contact with their colleagues in order to discuss and acquire a good teaching practice, in addition to sharing materials and syllabuses, especially when the academic is new or it is their first time teaching a particular course. This contact takes place through informal communication such as conversations and other forms of informal interactions. Thus, in order to promote the adoption of effective teaching methods, it is essential for experienced faculty members who have successfully adopted these techniques to share them with their colleagues [165]. There is a strong requirement that HEIs retain their knowledge, especially when experienced or knowledgeable academics leave and novices come in [165-167]. For this reason, HEIs seek innovative ways to enhance their academic performance and stay ahead of the competition through facilitating knowledge sharing between academics [104, 168].

3.3.6 Computer Science Academics

In a digital era, the CS discipline plays a fundamental role in developing society, which increasingly demands having good computational skills. This has led to a growing interest in CS education from other disciplines [16]. CS is known to be difficult to learn and teach due to fast changes in technology [169, 170]. One significant difficulty of teaching CS is that numerous fundamental concepts must be taught to all students, and they require a new way of thinking [171]. For instance, CS students often need to solve problems by learning to think in terms of algorithms, abstraction, and precise logical reasoning in a series of steps. This involves the analysis process of breaking down a complex problem into smaller parts, which makes it easier to solve while also considering its efficiency.

Moreover, teaching CS courses in HEIs differs from teaching other majors [169]. This again due to the fast changes in the CS field compared to other disciplines, such as sciences or literature, which have relatively stable foundational content that does not change as frequently. For this reason, CS academics continually update their knowledge and possess a diverse skill set to teach these topics effectively. CS academics not only teach CS subjects but also develop a variety of abilities in their students, including teamwork, problem solving, and critical thinking [23, 172].

CS academics are often trained as researchers but may not be familiar with good teaching practices [16]. CS academics must develop their teaching practices for effective and successful teaching that improves university outcomes. In addition, CS academics need to update the content of their courses each year [11] , which improves their teaching practices and skills in CS education and enhances the overall quality of learning. Teaching is a skill that may require a variety of methods, such as addressing different learning styles, effectively engaging students, and knowing when and how to apply them effectively.

CS academics in their early careers in HEIs encounter difficulties in maintaining a balance between research, teaching, and professional growth [173]. In order to better promote the growth of CS academics, HEIs should address these difficulties and work to cultivate diverse communities of practice. Academics' teaching skills impact their students, affecting their success in obtaining a competitive career in the future [16]. Teaching-related knowledge sharing among CS academics in their communities needs to be promoted and facilitated. Academics can leverage each other's expertise to fill their knowledge gaps and offer students a well-rounded educational experience by exchanging teaching-related knowledge.

A study by Andrews et al. [19] investigated how academic interactions within departments influence teaching practices using a mixed-methods approach. They found that interaction among academic colleagues through the exchange of ideas, resources, and information can change their teaching views and practices and thus support improved teaching in their college. It can be concluded that there is a need to build a community of practice among CS academics [173].

3.3.7 Context of Saudi Arabian HEIs

Saudi Arabia's Vision 2030 aims to improve the quality of higher education. This can create opportunities for aspiring academics through the introduction of programmes supporting academic development, such as workshops, lectures, and training.

Pre-service teachers in Saudi Arabian Higher Education Institutions (HEIs) are undergraduate students who are undergoing training to become teacher assistants in HEIs or CS teachers in the schools. Their training involves a combination of academic courses, practical experience, and skill-building activities, all aimed at equipping them with the necessary tools and knowledge to succeed in competitive careers. They frequently receive guidance from experienced mentors or supervisors during their training.

The requirements and expectations for becoming an academic in the UK vary compared to Saudi Arabia. In the UK, the journey typically involves completing a Bachelor's degree, a Master's degree and a Ph.D. degree. After completing a PhD, a person often engages in postdoctoral research or teaching fellowships before securing a permanent academic position. Common starting positions include lecturer or research fellow roles, as well as high positions such as senior lecturer, reader, or professor.

To become an academic in Saudi HEIs, one should gain the necessary qualifications, which is a Bachelor's degree in their chosen field of study from a recognised institution. Then the person can become a teaching assistant in the faculty. To teach in HEIs and to become a lecturer, one should obtain a Master's degree in a specialised area, which serves as a foundation for research-oriented careers. However, if one wants to secure a position as a faculty member at a university in an assistant professor role, one should obtain a PhD in a specialised area. After that, the higher rank promotion, such as associate professor and professor, is based on the research output, the person's achievement in the institution, and teaching effectiveness. The two systems are compared in Figure 3.2.

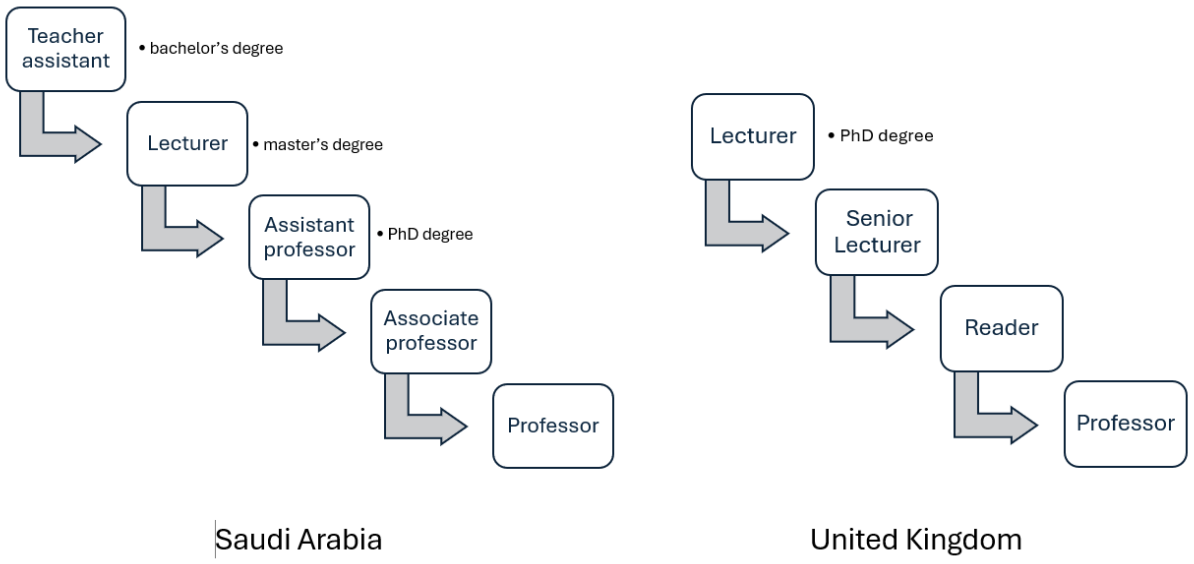


Figure 3.2 Comparison of the Academic Journey between Saudi Arabia and the UK

In both Saudi Arabia and UK universities, teaching experience is preferred but not compulsory. Universities require academics with little teaching experience to take additional teaching courses. There are teaching development courses to help those new to a teaching role in academia. These courses aim to provide new academics with essential teaching skills such as effective teaching strategies, classroom management, and student engagement methods. These courses' focus tends to be on delivering content rather than encouraging sharing of ideas and learning from the experiences of their peers. Therefore, they often lack sufficient opportunities for knowledge sharing and community building among academics; which could help them to address the complexities of teaching in higher education.

3.3.8 Technologies Used in Knowledge Management

With the continuous development of information technology, many studies emphasise that technology is used as a tool to enable the sharing of knowledge, encourage communication among academics, and enhance their professional communities [174-176]. Even though it is widely accepted that KM revolves around people, technology plays a central role in supporting knowledge sharing through online social interaction, providing access to knowledge and reducing geographical constraints [67, 177, 178].

For example, Holsapple [179] stated that contemporary KM can be considered a computer-based technology. It is now common to use Web 2.0 technologies for knowledge sharing. 'Web

2.0' refers to the 'social web', which is a web-based system that support users' interaction in creating, editing, and distributing their content [50, 180]. Examples of Web 2.0 technologies are social networking, Wikis, tagging, user-created websites, and blogs. Such technologies have distinctive technical features that support sharing knowledge and can overcome limitations in the traditional KM technologies employed by organisations [181]. According to Von Krogh [50], Web 2.0 for KM is a 'social software-based KM', targeting users' needs and often configured to fulfil a particular purpose in social practice. Web 2.0 technologies have significantly changed the way KM is approached. It has transitioned from a traditional knowledge storage approach to a more interactive approach that facilitates better communication and collaboration within a community or network [50]. Amin et al. [182] have sought to explore how Web 2.0 technologies influence knowledge sharing in HEIs. They employed a quantitative method by administering an online survey. They found that these technologies have supported and facilitated the exchange of knowledge in higher education through KMS, including creating, acquiring, storing, or disseminating knowledge [182]. In addition, they indicated that utilising a web-based system as a platform for knowledge sharing is well suited for facilitating the transfer of explicit and tacit knowledge among members of higher education communities [182]. Therefore, this approach has the potential to make learning and teaching easier and more flexible.

Social media is a platform for individuals to disseminate, engage in discourse, and exchange knowledge or concepts, thereby potentially revolutionising pedagogical approaches to foster a more amicable, inclusive, and collaborative learning environment. Social media applications facilitate the connection between academics and students within the educational sphere, regardless of geographical location or time constraints [183]. This is due to the inherent features of these applications, which have the potential to enhance the learning experience [184]. According to Castro-Romero [185], empirical evidence suggests that the utilisation of social media platforms can augment students' educational experiences and foster their engagement with both peers and academics. In addition, social media tools are effective catalysts for advancing teaching and learning practices, particularly in terms of enhancing receptiveness and fostering sociability. Research conducted by Sobaih et al. [186], Chugh and Ruhi [187], and Al-Maatouk et al. [188] has examined the utilisation of social media platforms as educational tools within HEIs. They recommend academics incorporate the use of social media platforms in order to enhance their educational objectives. According to Saini and Abraham [189], the utilisation of social media technologies has the potential to improve the teaching and learning process, thereby aiding the

career advancement of current academics and equipping prospective academics with the necessary skills for professional training. Hence, the enhancement of professional learning for pre-service teachers can be achieved through the integration of social media platforms within their professional training programmes, thereby facilitating the establishment of online communities for knowledge sharing [189-192]. According to the study conducted by Alyoussef et al. [193], the utilisation of social media platforms has the potential to positively enhance the process of teaching and learning. This is primarily attributed to their ability to enhance academic achievement and foster increased engagement among peers.

The incorporation of social media into a well-organised and inclusive KMS can facilitate a harmonious integration of the advantages offered by social media platforms and the regulated learning atmosphere essential for professional initiatives. This technology is especially important for communities of practice and can be utilised to establish what is known as a vCoP. A vCoP consists of individuals who are interested in improving their skills in a particular area and collaborate online to enhance their knowledge and abilities [194]. A vCoP can thus be considered a professional community through the internet. VCoPs have been shown to be effective in improving knowledge sharing and reducing professional isolation [195]. The professional learning community has encountered difficulties with regard to in-person engagement, as well as challenges related to time and location [196]. According to Tsiotakis et al. [197], the utilisation of social media technologies has the potential to overcome geographical and temporal limitations, thereby facilitating communication within an online professional community platform. This feature facilitates the ability of pre-service teachers and academics to engage in asynchronous communication and exchange teaching practices as necessary. Hence, it is evident that the utilisation of an online professional community for academics has the potential to address the challenges posed by geographical constraints and limited opportunities for collaboration, thereby enhancing professional development. Research is still required to develop a comprehensive understanding of the feasibility of incorporating social media platforms into professional communities in HEIs. This will enable them to make well-informed decisions regarding implementing such platforms [198]. Almuqrin and Mutambik [10] contend that there is a dearth of scholarly investigations concerning the effectiveness of extant social media platforms in knowledge sharing and their contribution to the advancement of professional development. Therefore, there is a need to investigate the extent of the effectiveness of social media in knowledge

sharing for teaching and education purposes and the feasibility of incorporating social media platforms into professional communities in HEIs.

It is likely that Web 2.0 technologies could effectively encourage and improve the sharing of knowledge among staff within universities. To verify this claim, Levy [199] conducted a comparison of KM and Web 2.0, focusing on four distinct themes: (a) concepts, (b) principles, (c) functional skills of tools and applications, and (d) organisational culture. It was concluded that Web 2.0 tools are suitable for KM of any organisation. Web 2.0 features can provide a user interface, the ability to create and edit contents, collaboration and communication, and social networks. Thus, universities need to change the traditional KMS approach to take benefit of Web 2.0 features. A KMS in which Web 2.0 features are embedded can be referred to as KMS 2.0. KMS 2.0 focuses on facilitating collaboration among users by integrating Web 2.0 features [200, 201]. As a result, KMS 2.0 has the potential to broaden the possibilities for academics to engage in casual interactions within a higher education environment. This could create more chances for social learning and enhance the quality of academic teaching.

Nevertheless, knowledge-sharing platforms face challenges that can prevent them from being effective in HEIs. First, it is not easy to encourage academics to share their experience with their colleagues in a virtual community—this is due to some academics' fear of losing ownership over their intellectual contributions, thus losing their professional power. In addition, a lack of trust among academics in virtual worlds could affect their willingness to share their knowledge [12]. Thus, more insight is required into the behaviour of academics in higher education as they share teaching practices with peers using knowledge-sharing platforms [6]. Exploring online knowledge sharing among academics will provide valuable knowledge that might be exploited to enhance overall academic performance [202].

3.4 Existing Knowledge Management Systems in Higher Education

Although there is no uniform definition of a KMS, most definitions concur that it is an IT-based system which is designed to manage an organisation's knowledge. For instance, Alavi and Leidner [93] defined a KMS as a type of information system which is applied to managing the knowledge of the organisation. Similarly, Rahmatia and Surendro [203] defined a KMS as an information system that is used to run KM. It is 'a complex socio-technical system that encompasses various forms of knowledge generation, storage, representation, and sharing' [204]. A KMS is deemed valuable to an HEI for recording academics' knowledge, thus avoiding any loss of knowledge

capital resulting from academics leaving the institution or no longer being available for normal activities. In addition, KMS create new knowledge networks that facilitate quick and straightforward internal sharing of good practices (principally by academics) [205, 206]. KMS help organisations improve their knowledge-focused processes; they may also help a community of practice to identify best knowledge practices in terms of achieving their goals [207].

A review of the literature shows some of the existing KMSs in use in HEIs. A summary of these existing KMS is provided in Table 3.1 and they are discussed below.

Rajalakshmi et al. [208] created Info-Ca-Sh, a dynamic web content knowledge portal. This is a platform for sharing and capturing knowledge among academics and students. Info-Ca-Sh focuses on improvement in knowledge codification and collaboration of HEIs. Similarly, Svetsky et al. [209] developed a BIKE (Batch Information and Knowledge Editor) using the Writing-Pad supportive informatics tool at the Faculty of Materials Science and Technology. Writing-Pad is applied as a tool for recording and sharing knowledge within the system. The aim of this system was to support academics who were teaching Bachelor students to facilitate converting tacit knowledge into explicit knowledge.

Jessy et al. [210] developed a web portal as a tool for KM in academic libraries. The portal was designed to support the transfer, storage, retrieval, creation, integration, and application of knowledge within academic institutions.

A study by Irawan et al. [211], developed a KMS process, which includes capturing, processing, and utilising tacit and explicit knowledge within universities by combining SSM and Becerra's approach [212]. Becerra considers the problem by determining the contingency factors in a structured way, while the SSM approach views the problem holistically, in both structured and unstructured ways. The results of this research led to a KMS model that can be used as a reference for the development of KMS for universities. The KMS includes features such as chats, discussion forums, an online library, and document management.

Maligat et al. [213] developed a KMS that is capable of knowledge creating, sharing and storage at Camarines Norte State College. A usability test was conducted to evaluate its efficiency and effectiveness. The average score from the usability test was 4.55, with strong agreement, indicating that the system possesses the necessary functionality for users, is user friendly, and highly useful.

Sensuseet et al. [214] conducted a study to create a KMS designed to the needs of assistant teachers at the Faculty of Computing Science at the University of Indonesia. They used a JAD approach in the requirement-gathering phase to develop the KMS, following Fernandez's methodology [212]. The prototype of the system was assessed by measuring user satisfaction using the Post-Study System Usability Questionnaire.

Rowley [98] studied the implementation of KM in higher education in the UK and reported that the existing facilities like libraries, electronic collections of learning materials, networks for e-mail communication, and management information systems provide data on the student profile. With the help of the JANET network [215], researchers and academic staff have access to electronic documents, email, access to network resources, training and awareness and so on.

Abdel et al. [216] implemented a customised KMS integrated into the Lebanese International University's existing university management system. The goal was to enhance the university's academic and administrative processes for academics and administrative staff. They included knowledge capture, storage, and retrieval functions in their system.

Dneprovskaya and Shevtsova [217] developed a KMS prototype in order to update the content of curricula at the Moscow State University of Economics, Statistics and Informatics. This prototype included capture, storage, and retrieval functions. The KMS users were academic staff, institution management, technical support personnel, and students.

Soliman et al. [157] proposed a KMS for engineering institutes, encompassing the creation, storage, and retrieval of data. The system was designed to manage research knowledge effectively among researchers.

A study by Zhang [218] implemented the prototype of web-based KM to assist in teaching database design courses at Massey University. This prototype allowed students and academics to access the system via all computers. The main functions in this prototype were capture, storage and retrieval. A survey was conducted to evaluate the prototype in terms of helping teaching and learning. The total number of participants was 20, both students and academics.

A study by Cabrera et al. [219] introduced InEdUn (Innovación Educativa Universitaria) for academics. This is a website that aims to improve learning by enabling academics to share and collaborate on educational resources and engineering ideas. It incorporates features such as capture, storage, search and retrieval. A usability test was conducted to list the most serious problems in the portal.

In Table 3.1 below, these studies are summarised. The relationship of these studies, and any gaps still to be filled, is discussed following the table.

Table 3.1 Existing KMS in HEIs

Publication Title	**Primary purpose**	**Participants**	**Evaluation**	**Location**
Analysis of Tacit Knowledge Sharing and Codification in Higher Education [208]	Info-Ca-Sh web portal Enables faculty members and students to capture, storage and retrieval knowledge.	Academic staff and students	No evaluation	Unknown
Computer Support for Knowledge Management within R&D and the Teaching of Bachelor Students [209]	Uses WritingPad as a supportive informatics tool for the conversion of tacit knowledge into explicit knowledge.	Academic staff and students	No evaluation	Faculty of Materials Science and Technology
Web Portal: An E-Content Knowledge Management Tool [210]	The knowledge portal is designed to support KM, and it facilitates transfer, storage, retrieval, creation, integration and application of knowledge in libraries.	Library users (academics and students)	No evaluation	Unknown
Hybrid Soft System Methodology (SSM) and Becerra Approach for Modeling Knowledge Management System [211]	The design of a KMS model to support web-based e-learning.	Employees and lecturers	Evaluated using expert judgment using a questionnaire	Unknown
Web-Based Knowledge Management System for Camarines Norte State College [213]	System designed to manage knowledge objects (KOs) among academics at Camarines Norte State College	Academic staff	Questionnaire	Philippines
Knowledge Management System Design Method with Joint Application Design (JAD) adoption [214]	To design a KMS for assistant teachers at the faculty of computing science, University of Indonesia	Assistant teachers	Interview for user requirements and questionnaire to evaluate the prototype.	Indonesia
Is Higher Education Ready for Knowledge Management? [98]	Researchers and academic staff have access to electronic documents, email, network resources, training and	Researchers and academic staff	No evaluation	UK

	awareness, digitisation, pre-prints and grey literature. (using theJANET network)			
University customized knowledge management system (KMS) [216]	suggests the integration of a customised KMS into the current university management system of the Lebanese International University	Academic staff and administrative staff	No evaluation	Lebanon
The Knowledge Management System Development for Smart Education [217]	proposes the KMS prototype in order to update the content of curricula at the Moscow State University of Economics.	academic staff, institution management, technical support personnel, and students	No evaluation	Russia
A Framework for Constructing and Assessing Knowledge Management Systems for Engineering Institutes [157]	the Knowledge Management System (KMS) for engineering researchers	Researchers	No evaluation	Unknown
Developing A Knowledge Management Support System for Teaching Database Normalization[218]	proposes a prototype of a web-based KM to assist in teaching database design courses at Massey University.	Academic staff (database design)	Survey	New Zealand
A higher education social network to share and promote teaching innovation experiences [219]	InEdUn is a web portal designed to enhance learning by allowing academics to share and collaborate on educational materials.	Academic staff	Usability test	Spain

Regarding the related work discussed above, it should be observed that the available KMS platforms have been developed for generic knowledge contexts and purposes in HEIs. Although some were designed for a specific purpose, they are not adaptable to other university activities. In addition, the existing KMS in HEIs focus on managing knowledge which is transferred between academics and administrative staff or students and academics. There have been a few attempts to develop knowledge-sharing management systems for academics related to the teaching profession,

but no one has experimented with them. Even though sharing teaching-related knowledge is important for HEIs to enhance teaching quality, it remains underexplored. There is thus a need for a knowledge sharing system for academics in HEIs to facilitate sharing and effective communication among academics who teach the same module. In Saudi HEIs, there is a need for a knowledge sharing system in the form of a virtual interactive community for each college to facilitate the sharing of knowledge among academic [10].

Moreover, most of the existing KMS in HEIs do not deal with tacit knowledge, know-how, and this is often inadequately managed within these institutions to begin with. There is lack of appropriate tools for documenting tacit knowledge in a way that is easy to read for others and reuse in the organisation. Therefore, tacit knowledge will not be reused due to inconsistency [220, 221]. Most of the KMS in HEIs have focused on knowledge capture, storage and retrieval functions. Some existing KMS have a knowledge capture function. Some KMS are limited to knowledge storage and retrieval, which can be considered more of a content management system. However, tacit knowledge is essential for improving the university's performance and HEIs need to preserve and share tacit knowledge efficiently. Thus, existing KMS that focus on knowledge storage and retrieval are insufficient for successful KM in the organisation. In fact, documenting tacit knowledge can be a subset of the KM functions, and there is a need to integrate all the KM functions, including capturing, storing, retrieving, sharing, and reusing knowledge, to create a successful KMS that helps create more value for universities. The current study beings to fill that gap.

Interestingly, all systems reviewed above neglected to integrate motivational features into the KMS, which is a significant factor in enhancing the system and engaging the user in contributing their knowledge to the system. Schacht and Maedche [222] stated that existing KMS failed due to the system not creating an enjoyable user experience or high user satisfaction. Thus, it will likely fail to sustain user engagement over time. The current study integrates motivational features into the proposed KMS and considers user behaviour in some depth.

Moreover, existing KMS focused on the technology aspect while ignoring the social aspect [223]. This led to this system's failure due to a lack of consideration of human behavioural factors that affect systems success. In the systematic literature review conducted by Sensuse [224], adopting a more comprehensive approach to system design is recommended, considering both technological and social aspects [224]. Thus, as mentioned in Section 3.3.3, it is essential for knowledge-based organisations, such as HEIs, to understand their members' knowledge sharing behaviours if they are to be willing to share their knowledge with peers. To achieve this

understanding, there is a need for an investigation study of knowledge sharing behaviour from the knowledge seekers' and contributors' perspectives. There are a few studies that have explored knowledge sharing behaviours [92, 100, 153, 155]. However, no study explores CS knowledge sharing behaviour in HEIs. Therefore, there is a need to explore the knowledge-sharing behaviour of CS academics' perspectives in HEIs in order to establish an effective KMS that is compatible with academics' knowledge sharing behaviour.

In addition, existing KMS lack embedded social tools to create social, interactive learning environments. Some existing KMS have discussion forums, but these function only as a communication tool. There is a lack of interactive social tools in the system. The presence of these tools in the system proposed and studied in this thesis will lead to enhanced academic performance and encourage communication.

With regard to the review above, there are a few experiment-focused studies with quantitative and qualitative results about the effects of using KMS from users' perspectives [225, 226]. This limitation might reduce the ability to enhance and develop the KMS in order to ensure it meets the needs of its users better. There is thus a clear need for more rigorous, experiment-focused studies to provide empirical evidence on the effectiveness of these systems.

3.5 KMS Methodologies

Traditional KMS were focused solely on technological aspects and were considered information systems to support KM functions. Recently, KMS development has become focused on social aspects along with technological aspects. Therefore, a KMS should be a socio-technical system involving knowledge, which is the organisation's intellectual capital. The technology used must allow for the capture, storage and retrieval of information, and the human and organisational factors that influence how knowledge is created and used to fit an organisation's needs. There is a need for robust methodologies to develop a KMS aligned with their perspectives [224].

The literature reveals that most methods used in KMS development are traditional Information Systems IS development methods. Software development methods, such as Agile and Waterfall, focus on the technical aspect. In addition, these methods are concerned with delivering functional software products that meet user requirements and needs. However, KMS development methods, like SSM, emphasise understanding complex problems through stakeholder collaboration to define and structure problems effectively [227, 228]. This thesis applied SSM as a KMS development method, as discussed below.

3.5.1 Soft Systems Methodology (SSM)

SSM is a strategy that is used to investigate and solve difficult management and organisational problems. It was created in the 1970s by Professor Peter Checkland, and it has since found widespread application in the field of information systems [36]. When dealing with human perception, values, and social systems, SSM is especially helpful because of its practical application. It helps to capture the many perspectives and concerns that are held by the individuals concerned. Through the utilisation of a method known as 'root definitions', SSM is able to explain the nature and purpose of a system. To accomplish this, it is necessary to characterise the pertinent systems and subsystems, as well as their functions, owners, and the environment in which they function. 'Soft' problems are ill-defined, include various views, and are frequently characterised by human subjectivity. When it comes to addressing them, structured solution modelling is particularly useful. In order to assist organisations in exploring and comprehending the complexities of their circumstances prior to implementing changes, structured solution modelling offers a problem-solving strategy that is both structured and interactive. Analysis of system needs is performed by SSM, with a special focus on the 'human activity' that necessitates the assistance of a computer system [229]. SSM thus assists in identifying the problem and analysing the requirements for human activities.

A KMS is a tool used to improve the implementation of the process of creating, capturing, using and disseminating knowledge in organisations [212].

The outputs of SSM are primarily conceptual models of KMS tools to achieve the transformations defined in the root definitions, but the requirements are still unclear. Therefore, additional techniques are needed to obtain contextual requirements. Previous research stated that lack of participation from employees in the KMS development might be one of the failure factors of KMS [230-232]. Further methods are thus required in designing systems, and options are JAD and participatory design. Both these methods focus on the user's participation and accurate requirement gathering through facilitated workshops. Unlike the participatory design, the benefit of JAD is that it can accelerate the design of a system from a user's perspective, which is required in this research. In addition, there are studies that emphasise that using JAD for system development results in excellent results [233, 234]. The current research thus used JAD to identify the system requirements and validate the prototype.

3.5.2 Joint Application Design (JAD)

JAD is a method of system development that involves users, stakeholders, and developers to capture the requirements of the system [37]. JAD, which is well known for its collaborative and participatory nature, places a strong emphasis on the participation of stakeholders in the process of research and development. In the context of the academic environment, where a variety of viewpoints and roles are required, this methodology is especially pertinent, because it requires a participatory approach to the process of obtaining requirements. According to Avison et al. [234], the JAD methodology necessitates conducting a user requirements analysis as well as holding a workshop in which users and developers work together to determine and get approval for system requirements. The advantages of JAD include the fact that it speeds up the process of designing the system and enhances the quality of the system from the point of view of the consumers [37, 233]. JAD places an emphasis on the requirements and expectations of the user. Sensuse [214] found that the literature demonstrates that JAD is capable of producing accurate outcomes in the development of systems.

During the process of building a system, it is vital to determine the actual demands of the users. Using this information, it will be easier to identify the traits that are required in an organisation that has a variety of characteristics. According to Avison et al. [234], the findings of JAD are validated by the individuals who participated in the workshop and are the end users of the system. According to Duggan et al. [233], the implementation of JAD consists of the following five steps: First, determine the purpose of a JAD session; second, gather initial user requirements; third, prepare the session; fourth, implement the JAD session; and fifth, document the aspects approved in the JAD session. In this thesis, the JAD approach was used to evaluate the prototype of the proposed system.

The selection of SSM and JAD as the main design frameworks for this research demonstrates their effectiveness in tackling the intricate, human-centered issues associated with improving knowledge sharing within educational institutions. The iterative learning cycles and systemic approach of SSM, along with JAD's emphasis on stakeholder collaboration, established a strong basis for the design, implementation, and evaluation of the Teaching Experience Platform. In comparison, alternative methodologies like DSM, PD, and RAD demonstrated insufficient flexibility and comprehensiveness to meet the research objectives effectively. Recent methodological literature supports these decisions, highlighting the relevance and effectiveness of SSM and JAD in comparable contexts [36].

This research needed a way to handle educational institutions' human, cultural, and organizational diversity. SSM and JAD were chosen as design frameworks after much consideration. SSM solves "soft" or complicated problems with numerous parties and perspectives. This feature improves higher education knowledge sharing—the main issue. SSM encourages multiple learning cycles to help researchers and people address challenges. The human-centric and systemic research method is teachable [36]. Unstructured organizational difficulties are SSM's specialty. Because of its iterative and interactive nature, Checkland [36] suggests SSM for initiatives that balance stakeholder participation with systemic analysis. This framework assures the solution fulfills technological requirements and educational institutions' organizational and cultural dynamics.

JAD's collaborative nature helps design processes focus on user goals, reduce mismatched requirements, and create stakeholder ownership of the finished product. JAD helped the study gather user feedback and improve system prototypes for the optimal option. SSM and JAD were chosen over DSM, PD, and RAD for research goals and setting. These solutions help, but they don't solve the research's complexity. The Design Science Methodology (DSM) uses deliberate creation and evaluation of novel artifacts to solve technological problems. Artifacts trump human and organizational complexity in DSM. DSM is recommended for technical innovation by Peffers et al. [235], not culture and organization. DSM was unsuitable because these properties were vital to this investigation. User input is encouraged in Participatory Design (PD). In hierarchical educational institutions like Saudi Arabia, cultural norms constrain user participation and decision-making power [236]. Rapid Application Development emphasizes agility. Short-term projects benefit from this strategy but lack problem analysis and stakeholder consensus. Naz et al. [237] contend that RAD's brief iterations may produce solutions that don't match user demands or organisational goals, making it unsuitable for research that requires deep analysis and cooperation.

In this thesis SSM is complemented by adding JAD techniques to generate a comprehensive design of a KMS. The result of combining these methods is examined through a case study to design a knowledge sharing management system of CS academics at the Faculty of Computer Science at Jeddah University in Saudi Arabia.

3.6 Discussion

The literature has various definitions of knowledge, depending on the researchers' perspective and purposes. In this study Gobet's [30] definition was applied, which states that knowledge is data, contextual information or experience that can be gained from resources such as websites, books or

experts that can be used as concepts, principles, facts, and judgments. Various knowledge types and classifications were discussed, such as explicit and tacit knowledge and know-what, know-how, know-who, and know-why. Codification and personalisation strategies were also examined. The codification strategy is suitable for know-what and know-why knowledge. It involves documenting and storing knowledge in easily articulated and standardised databases. The personalisation strategy is suited for know-how and know-who, focusing on direct person-to-person knowledge sharing, which is often tacit and context-specific. The focus of this thesis lies on tacit knowledge, which plays a significant role in the development of educational institutions in order to gain a competitive edge [57, 58]. Effective KM processes, such as knowledge creation, storage and documentation, sharing, and reuse, have a positive impact on an organisation's innovation performance.

The literature review found that the quality of outcomes in universities depends significantly on the quality and expertise of their faculty members. Thus, their teaching skills play a crucial role in the success of HEIs. Effective teaching occurs when academics combine content knowledge of curricula with teaching expertise in HEI. Teaching can be improved through learned methods and experience, often in contact with colleagues to discuss and acquire a good teaching practice.

Even though improving teaching practices is required in all disciplines, teaching computer science is particularly challenging due to its unique requirements for teaching, computational, and problem-solving skills. Therefore, CS academics in HEIs face the challenge of becoming good teachers. To address this, HEIs should enhance and facilitate the growth of CS academics by encouraging them to share teaching-related knowledge, which includes practices and experiences, within their professional community. This fills their knowledge gaps and offers students a well-rounded educational experience. This thesis focuses on how to facilitate shared teaching-related knowledge among CS academics in Saudi HEIs.

The review indicated that Web 2.0 technologies play a central role in supporting knowledge sharing through online social interaction, providing access to knowledge and reducing geographical constraints. Social media is one example of Web 2.0 technologies that are widespread in HEIs for learning purposes among students and academics. There is a lack of assessments of the effectiveness of extant social media platforms in knowledge sharing in the advancement of professional development in Saudi HEIs. The first objective of this thesis (RO1) is to explore the effectiveness of social media in knowledge sharing for teaching and education purposes from CS pre-service teachers' perception, which is addressed in Section 4.2.

Moreover, the literature review found that successful knowledge sharing depends on individual behaviour, which varies from person to person and across cultures. To enhance the sharing in HEIs, knowledge sharing behaviour should be explored from the perspective of academics, as well as the factors influencing knowledge sharing as they contribute to facilitating and successful the knowledge-sharing process. One objective of this thesis (RO2) is to explore the factors influencing the WSK among CS academics at two Saudi universities: ATKS, ERA and IT. In this way, the current study fills the gap related to knowledge-sharing behaviour in CS academics in the context of Saudi HEIs, which is addressed in Sections 4.3 and 4.4.

When reviewing the existing KMS in HEIs, it was found that most of the systems have been developed for a generic knowledge context. In addition, these systems are concerned with explicit knowledge or know-what instead of tacit knowledge, which is important in HEIs. Teaching practices and experience are considered tacit knowledge that comes from the accumulation of academics' experience and will be lost if HEIs do not record and share it by using KMS. The review shows that existing KMS lack a social aspect to encourage sustained user engagement over time. Hence, an effective KMS methodology is needed to fulfil user requirements. This study applied SSM and JAD in the design of the TEP to overcome this lack, which is addressed in Chapter 5.

On reviewing the literature, it was noted that the evaluation of the current KMS used survey approaches, but different evaluation methods might be better able to assess the system's concept and usefulness. The fourth objective of this thesis is to evaluate the TEP system by conducting a seven-week experiment with CS academics and then evaluating the results. This evaluation used workshops to evaluate user experience (UX) and a questionnaire to measure the PU for each system function of the TEP, which is addressed in Chapter 7. A summary comparison of the current KMS in HEIs with the features of the TEP system is provided in Table 3.2.

Table 3.2 Summary Comparison of Existing KMS Functions

KMS	Knowledge Creation and Capture Using a specific Template	Document Management (Storage)	Knowledge Search and Retrieval	Discussion Forums	Gamification mechanism
Analysis of Tacit Knowledge Sharing and Codification in Higher Education [208]		✓	✓		
Computer Support for Knowledge	✓	✓	✓	✓	

Management within R&D and the Teaching of Bachelor Students [209]					
Web Portal: An E-Content Knowledge Management Tool [210]		✓	✓		
Hybrid Soft System Methodology (SSM) and Becerra Approach for Modeling Knowledge Management System [211]		✓	✓	✓	
Web-Based Knowledge Management System for Camarines Norte State College [213]		✓	✓	✓	
Knowledge Management System Design Method with Joint Application Design (JAD) adoption [214]		✓	✓	✓	
Is Higher Education Ready for Knowledge Management? [98]		✓	✓		
University customized knowledge management system (KMS) [216]		✓	✓		
The Knowledge Management System Development for Smart Education [217]		✓	✓		
A Framework for Constructing and Assessing Knowledge Management Systems for Engineering Institutes [157]		✓	✓		
Developing A Knowledge Management Support System for Teaching		✓	✓		

Database Normalization[218]					
A higher education social network to share and promote teaching innovation experiences [219]		✓	✓		
TEP	✓	✓	✓	✓	✓

3.7 Theoretical Justification:

The mixed-methods approach was selected over alternative methodologies due to its integration of qualitative and quantitative data, which provides a comprehensive understanding of the research problem. The investigation phase comprises the use of questionnaires, which provide quantitative data, alongside interviews that yield qualitative insights, all aimed at addressing the specified research questions (RO1, RO2). This facilitates the identification of statistical trends and enables a thorough exploration of insights derived from participants. In a similar vein, the design, implementation, and validation of the teaching experience platform (RO3), along with the evaluation of the system's impact (RO4), necessitate a mixed-methods approach that facilitates the triangulation of data to comprehensively address these varied objectives. The process of knowledge sharing within Saudi higher education institutions encompasses a range of cultural, technological, and academic factors, which necessitates a multifaceted approach for comprehensive understanding. Quantitative surveys assist in recognizing overarching trends, whereas qualitative interviews and workshops offer insights that are specific to the context.

The rationale for against alternative methodologies, such as “Action Research,” is grounded in the observation that, despite its iterative and collaborative nature, action research predominantly emphasizes the resolution of practical issues within a cyclical framework. This may not correspond with the necessity for a strong theoretical framework and thorough evaluation, as stipulated in RO3 and RO4. In a similar vein, “Design-Based Research (DBR)” places significant emphasis on iterative design processes in educational settings. Although relevant, it may not sufficiently highlight the importance of extensive quantitative validation via questionnaires, as demonstrated in RO1 and RO2. Moreover, approaches such as case studies and phenomenology are effective for in-depth exploration; however, they do not provide the capacity to generalize findings quantitatively, which is crucial for assessing the wider applicability of the Teaching Experience Platform. Although a “qualitative study” provides significant insights into broad patterns and hypothesis testing, relying solely on a quantitative approach would inadequately address the complex understanding of participant experiences necessary for RO2 and RO4.

Another rationale for adopting a mixed method approach is grounded in the necessity for "Flexibility for System Development and Evaluation," which demands both subjective and objective assessments. The use of mixed methods offers a flexible approach for the design and validation of the system through participatory techniques, such as SSM and JAD. The evaluation of outcomes involved a systematic approach utilizing both experimental designs (quantitative) and user feedback (qualitative). The research phases utilize mixed methods effectively, integrating surveys and interviews to provide a comprehensive perspective on existing practices.

The design and implementation of the mixed-methods approach was selected due to its compatibility with the complex nature of the research. This choice facilitates a thorough exploration, design, and evaluation of the Teaching Experience Platform, while effectively addressing the limitations inherent in other methodologies.

The Teaching Experience Platform (TEP) must be assessed to determine its efficacy and alignment with research goals. RO4, which emphasizes Perceived Usefulness, can be supported by exploring other methods like the Technology Acceptance Model (TAM). TEP is evaluated for its efficacy, usefulness, and impact on computer science academic knowledge-sharing. Surveys, system usage data, focus groups, and semi-structured interviews are used to evaluate measures.

Other evaluation frameworks can shed light on the "TEP" platform's success. Technology Acceptance Model (TAM) and System Usability Scale are relevant methodologies. User acceptance of technology is measured using the Technology Acceptance Model (TAM). The study focuses on two concepts. RO4, which assesses TEP user perceptions, matches TAM's focus on perceived usefulness (PU). You can measure PU with surveys. TAM shows how PEOU indirectly affects PU and user happiness. Using TAM as an evaluation framework contextualizes PU research within a broad, proven technology adoption model.

For digital platform usability assessment, the System Usability Scale (SUS) is extensively used and reliable. The 10-item questionnaire measures user perceptions of the system's usability on a 1–5 scale. The SUS makes TEP usability assessment simple and efficient, improving qualitative user input insights. High SUS scores indicate a user-friendly platform, which is crucial for adoption and engagement. TAM and SUS are robust evaluation frameworks, but adding methodologies could improve evaluation comprehensiveness. In RO4, PU is important for analyzing whether TEP meets its main purpose of promoting knowledge sharing. Users' intents to embrace and use a platform depend on perceived usefulness, according to the Technology Acceptance Model. PU evaluation guarantees that the platform fits user demands and expectations, boosting its practicality. This project aims to provide a realistic, user-centered solution for information exchange in higher

education institutions. PU supports this goal. Usability and technical performance are vital, but PU determines the platform's relevance and influence.

This study's RO4 specifically evaluates the TEP in relation to Perceived Usefulness (PU). The consideration of additional factors, including Perceived Ease of Use (PEU) and Behavioral Intention (BI), is valid; however, the decision to prioritize Perceived Usefulness (PU) is justified by its status as a critical determinant of technology adoption and sustained usage. The exclusion of alternative factors is based on this rationale. The Technology Acceptance Model (TAM) defines Perceived Usefulness (PU) as the extent to which users perceive that a system improves their job performance [238]. This research demonstrates that PU is directly aligned with the platform's primary objective of improving knowledge sharing and teaching practices among computer science academics. The likelihood of adoption and success increases if users perceive the platform as beneficial for achieving their objectives. Concentrating on PU offers advantages related to direct alignment with research objectives, as evaluating PU enables the study to quantitatively assess the effectiveness of TEP in fulfilling its primary aim of enhancing knowledge sharing. Research has consistently demonstrated that perceived usefulness (PU) is a significant predictor of user adoption and satisfaction, frequently surpassing other factors such as perceived ease of use (PEU) [239, 240].

As briefly described, ignoring "Perceived Ease of Use (PEU)" is a secondary determinant of user acceptance within the TAM framework; it indirectly influences user adoption through its effect on Perceived Usefulness (PU). Users are more inclined to invest effort in learning to use the platform if they find it beneficial, despite any initial perceptions of complexity.

Similarly, disregarding “Behavioral Intention (BI)” is warranted, as it serves as a significant indicator of long-term adoption but lacks actionable relevance within the scope of this research. The absence of immediate feedback hinders its ability to predict future behavior and fails to offer direct insights into the platform's current effectiveness. In a similar manner, the current outcomes indicate that RO4 seeks to assess the platform's effectiveness in achieving its objectives in its present condition, thereby rendering PU a more pertinent factor. This research's inability to combine PU and PEU stems from the fact that their integration offers a more comprehensive evaluation of user acceptance. This research specifically emphasizes PU due to its alignment with the platform's strategic objectives, highlighting the importance of prioritizing impact. The primary objective is to ensure that the platform is recognized as valuable for enhancing teaching and knowledge-sharing practices, although ease of use remains significant.

The first research objective (RO1) aims to identify and improve the tools and practices that promote knowledge sharing among computer science academics. Social media applications were selected instead of Learning Management Systems (LMS) like Blackboard, Moodle, Google Workspace, or Microsoft Teams for this purpose. The decision was informed by a comparative analysis of features, functionality, and alignment with the objectives of RO1.Table 1 present the comparative analysis that shows the reason for selecting social media applications over others LMS. Social media applications were selected for RO1 due to their superior alignment with the objective of improving knowledge sharing among academics. Their global reach, real-time interaction, versatility, and trends in user adoption render them a more effective tool for this purpose than LMS platforms. LMS platforms provide effective structured educational delivery within institutions; however, their limitations in accessibility, interactivity, and networking capabilities render them less appropriate for the broader objectives of RO1.

Table 3.3 Comparative Analysis for Selecting Social Media Applications over LMS

Criteria	**Social Media Applications**	**LMS**
Global Reach	Open and accessible to all users	Restricted to institutional users
Interactivity	Real-time, informal interaction	Asynchronous, formal communication
Content Flexibility	Supports diverse content (text, video)	Focused on structured educational content
Networking Opportunities	Enables interdisciplinary connections	Limited to institutional boundaries
Ease of Use	Intuitive and user-friendly	Steeper learning curve
Adoption Trends	Widely adopted by academics globally	Primarily used for teaching purposes

Social media applications such as Twitter, LinkedIn, and Facebook are widely accessible and not restricted by institutional limitations. Academics can exchange knowledge, ideas, and experiences with colleagues from various institutions and disciplines on these platforms, enhancing interdisciplinary collaboration. LMS platforms, such as Blackboard and Moodle, are generally confined to particular educational institutions or environments. Knowledge-sharing is restricted to enrolled students and faculty, thereby constraining its accessibility. LMS platforms excel in structured course delivery; however, they do not provide the global networking capabilities found in social media.

Social media applications facilitate the rapid dissemination of updates, resources, and insights among academics through various platforms. LMS, such as Blackboard and Moodle, are

intended for structured, course-oriented interactions. While they provide discussion boards and announcements, these platforms do not possess the immediacy characteristic of social media.
Social networking platforms facilitate diverse content types, including text, images, videos, and live streaming. Twitter facilitates succinct discussions and the exchange of resources. LMS systems, such as Blackboard and Moodle, serve as platforms for the delivery of educational content Gamification focuses on the use of game design elements in non-game contexts, which has gained recognition as an effective tool in education. The capacity to improve engagement, motivation, and learning outcomes has been corroborated by numerous studies. Balbaa et al. [241] discovered that the integration of badges in online education enhanced student engagement and intrinsic motivation. Nevertheless, Feng et al. [242] pointed out that the outcomes were varied, indicating that while certain students found motivation, others faced demotivation as a result of competition. Challenges and quests have proven to be effective tools for engaging students while aligning gamification with educational goals. The study conducted by "Teacher Academy 2020" highlighted the significance of tailoring these components to meet the needs of the intended audience [243].

3.8 Summary

This chapter provides a thorough literature review that begins with a definition of knowledge and KM processes. Subsequently, attention is directed to the environment of HEIs, where the significance and implementation of KM and knowledge sharing are examined. In addition, the significance of academics with a focus on CS academics and categories of knowledge in HEI are discussed. Moreover, comparison of the academic journey in Saudi Arabia and the UK is provided. In addition, the technologies used in KM are discussed. The review examines the current KMS in higher education, discussing KMS methodologies. Finally, a summary comparison of the current KMS in HEI with the TEP system.

Based on the insights gained from this review of the literature, the following chapter seeks to thoroughly investigate the knowledge sharing in HEI issue from the viewpoints of CS academics employed in universities in Saudi Arabia through the findings of the investigation studies.

Chapter 4 Investigation of Knowledge Sharing Related to Teaching and Learning in HEIs

4.1 Introduction

This chapter describes the investigation studies related to knowledge sharing for learning and teaching purposes in HEIs. This provides valuable insights into CS academics' perceptions and answers RQ1 and RQ2. Three studies, using qualitative and quantitative methods, capture academics' perceptions and gather preliminary information to identify issues and challenges in knowledge sharing in order to provide suitable solutions. The outcomes of the studies are used to design a prototype of the proposed TEP system, as discussed in Chapter 5.

In this chapter, two research objectives are investigated. The first study, discussed in Section 4.2, addresses the first research objective (RO1), which is related to the feasibility of using social media applications to share knowledge effectively from CS pre-service teachers' perspectives. This study also addresses the first research question (RQ1): How can existing social media applications be used to share knowledge for teaching and learning purposes in HEIs?

The second and third studies, discussed in Sections 4.3 and 4.4, respectively, address the second research objective (RO2), to investigate CS academics' perspectives on teaching-related knowledge sharing, the factors influencing knowledge sharing behaviour, and the challenges in HEIs. An e-survey and online interviews were conducted with CS academics who work in the CS faculty of two Saudi Arabian HEIs in order to answer the second research question (RQ2): To what extent are CS academics in HEIs aware of the importance of knowledge sharing?

The methods, pilot study, population and sample, data collection, data analysis, results, and discussion for each study are discussed in their respective sections. The conclusion to this chapter is provided in Section 4.5. The outcomes of investigation studies are used for the system design phase.

4.2 The First Study: Questionnaire on use of Social Media

The first study investigates using social media platforms to share knowledge related to teaching and learning purposes in HEIs. The study tested the following three main hypotheses:

H1: A social media application is a good learning environment that influences sharing learning content with colleagues.

H2: A social media application is a good learning environment that influences pre-service teachers' learning.

H3: Sharing learning content with colleagues on a social media application influences pre-service teachers' learning.

Figure 4.1 below displays the conceptual framework for these studies. The hypotheses were developed based on the literature review results reported in Chapter 3, especially the work of Ali et al. [198] and Carpenter et al. [244], as they emphasised the role social media plays in sharing knowledge for learning purposes. The framework develops correlations between three pivotal factors. The factors are social media applications, pre-service teacher training, and sharing educational content. These factors are conceptualised to establish the following relationships:

1. The relationship between the perception of social media applications as effective learning environments and the act of sharing content with colleagues via these platforms.
2. The relationship between social media applications as an effective learning environment and the enhancement of learning among pre-service teachers.
3. The relationship between the utilisation of social media applications for sharing educational content among pre-service teachers and the enhancement of their learning.

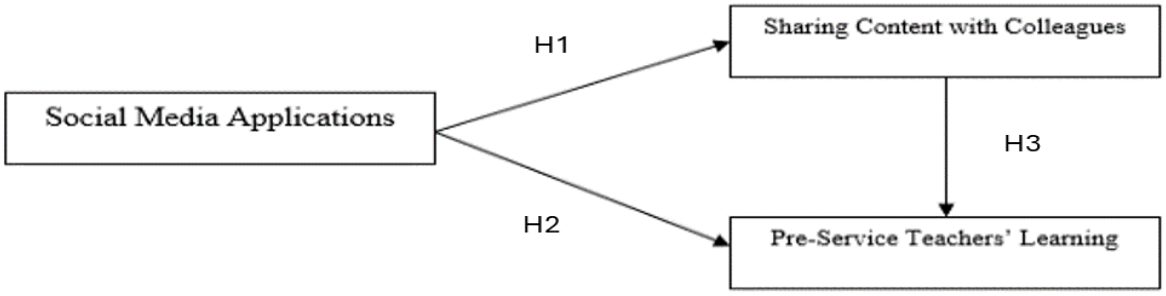


Figure 4.1 The Proposed Conceptual Framework of the First Study

The next section discusses the methodology of the first study.

4.2.1 Method

This study uses questionnaires to investigate the use of social media platforms to share knowledge related to teaching and learning purposes from pre-service teachers' perspectives. The questions were derived from the research conducted by Alshehri et al. [183] and Sobaih et al.[186] and modified to suit the specific research environment of the study.

The initial two questions were demographic in nature, inquiring about the participants' gender and the university they attend. The second section of the questionnaire comprised six structured inquiries regarding the participants' preferred and frequently utilised social media

platforms for educational purposes, their perception of the effectiveness of social media platforms as learning environments, and their utilisation patterns of social media platforms. Subsequently, a question was posed about the interface and functionalities of social networking applications for interacting with peers and instructors. These questions were all multiple choice. The next questions asked participants about their perspectives on utilising social media applications to enhance their learning experience and their opinions on the effectiveness of various existing social media platforms for communication with peers and professionals. These two questions used a Likert scale (ranging from 1 = strongly disagree to 5 = strongly agree and 1 = very unhelpful to 5 = very helpful, respectively) (see Appendix B.1 for all questions). The thesis supervisors examined the readability, consistency, suitability, and face validity of all items on the survey.

Because of the distribution of this study in Saudi universities, questions were translated into Arabic. Using the appropriate native language in questionnaires is typically preferable, as it ensures that participants comprehend the questions and can respond appropriately without loss of meaning [245]. To this end, the researcher used a back-translation technique, which is 'a process whereby the translated text is re-translated back into the source language by a translator who does not see the original text. If any discrepancies are found between the back-translation and the original, this is taken as an indication of translation errors in the target language version' [246]. This step helps to add an additional layer of quality. The questions were translated from English to Arabic by the researcher. The questions were then translated back into English by a native Arabic speaker, a doctoral researcher in applied linguistics at Leicester University. A few minor words were modified, and the quality of the translation was verified. A pilot study was conducted to enhance the survey's readability before it was disseminated among a wider group, as discussed in the next section.

4.2.2 Pilot Study

The pilot study aimed to assess the formulation and order of the questions and the appropriate time to allow for answers [247, 248], as well as to identify any limitations or flaws in the research instruments prior to carrying out the complete investigation [54-57]. Conducting a pilot study is beneficial, because if the questions are not suitable, the instruments will not yield the expected information [58]. For the pilot study, the survey was sent to two postdoctoral researchers, one from Newcastle University and another from Umm Al-Qura University in Saudi Arabia, and four PhD students in Computing at Newcastle University. These are all CS specialists with teaching expertise in HEIs. Participants were invited via email. This email contained details regarding the research

objective, problem statement, and goals. Survey Monkey [30] was used to conduct the pilot survey, and all participants were provided with a link to complete the questionnaire and provide comments on all items by email. The majority of respondents accepted the request to evaluate the survey and offer feedback. After receiving their comments, the researcher made revisions to the questions to enhance their clarity and precision. A few minor modifications to the language and wording were suggested and incorporated into the questionnaire based on the results of the pilot study. When the pilot phase was concluded, the main phase of the research began, as discussed in the next section.

4.2.3 Population and Sample

The population of this study is pre-service teachers in CS departments at two universities in Saudi Arabia (Jeddah University and Umm Al-Qura University). These respondents had participated in professional training facilitated by social media. They were pre-service teachers undergoing training to become academics in HEIs or teachers. In the present study, the term 'professional training programmes' pertains to a range of educational offerings, such as brief courses, workshops or summer training, which are tailored to meet the specific requirements of the university.

Newcastle University's Research Ethics Committee granted ethics approval for this study, reference number 20-ALH-045 (see Appendix A). All participation in the study was voluntary, and it was explained that participants could withdraw from the study without giving a reason. A total sample of 67 completed questionnaires was collected.

4.2.4 Data Collection

The schools' deans sent an email invitation to all pre-service teachers in the Faculty of Computer Science at Jeddah and Umm Al-Qura Universities. The invitation included a cover letter elaborating on the research aim, the researcher's contact details, an electronic data collection and storage consent form, and a link to the survey. Survey Monkey [30], a commercial online survey service, was used to create the questionnaire. The survey design was structured so that each participant was required to respond to all five closed-ended questions. The questionnaire could not be completed if a required question was not answered. This ensured that no data was missed during the survey collection. The open-ended question was optional. The data was collected during training in summer 2021(June/August 2021). Once all survey data had been collected, it was exported from Survey Monkey into an Excel file to start the data analysis. The data analysis section outlines this in more detail.

4.2.5 Data analysis

The data analysis methodology encompasses descriptive and inferential statistics. Quantitative data was processed for analysis by coding and cleaning the data and eliminating incomplete entries. Subsequently, the quantitative data was transferred from Excel to SPSS's statistical software for the purpose of conducting inferential statistical analysis [249]. A chi-square test of independence was employed to assess the correlation between variables and ascertain whether the study dimensions displayed a normal relationship. A *p* value below 0.05 was considered to be statistically significant. The qualitative data was copied and inserted into an MS Word document for analysis. Response rates varied for open-ended question. The responses to open-ended question was utilised to bolster the quantitative data, as demonstrated in the findings.

4.2.6 Results

A. Demographic data

Table 4.1 displays the demographic information of the participants. The overall number of participants was 67. 37% of the individuals involved in the study were male, while 63% were female. 84% of the participants were pre-service teachers studying at the Faculty of Computing at Jeddah University. 16% of the participants were registered at the Faculty of Computing at Umm Al-Qura University. Given that the majority of the replies were obtained from Jeddah University, the findings of the study may hold particular significance for Jeddah University.

Table 4.1 Demographic Analysis of Pre-Service Teachers

Demographic data		**N**	**%**
Gender	Female	42	63
	Male	25	37
University	Jeddah University	56	84
	Umm Al-Qura	11	16

B. Descriptive data

This section presents the descriptive data for each question in the questionnaire.

- **Social media applications used for learning and teaching**

In the first question, participants were asked which social media applications are their favourite to use daily for learning. As shown in Table 4.2, Twitter is the most often utilised social media

platform for daily education and learning purposes among the sample of 67 individuals, with a usage rate of 65.7%.[1] Instagram follows closely behind with a usage rate of 38.8%. Telegram is utilised by 28.4% of the sample, YouTube by 26.9%, and WhatsApp by 16.4%.

Table 4.2 Social Media Applications Used Daily for Education

Social media application	N	%	Rank
Twitter	44	65.7	1
Instagram	26	38.8	2
Telegram	19	28.4	3
YouTube	18	26.9	4
WhatsApp	11	16.4	5

- **Social media applications are good learning environments**

In the second question, participants were asked whether they think social media applications are a good learning environment. Figure 4.2 shows the percentage of respondents (N = 67) who believe that social media platforms provide a good learning environment. 51% of the sample answered neutrally, 42% answered 'yes', and 7% answered 'no'.

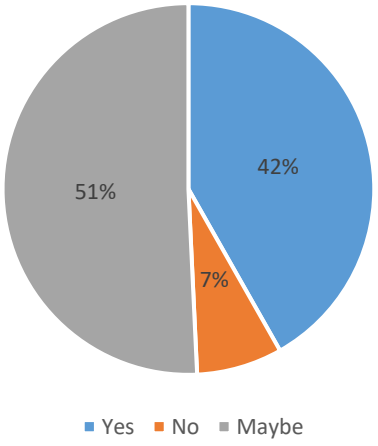


Figure 4.2 Social Media Applications Provide a Good Learning Environment

[1] Since July 2023, Twitter is known as X, however, when the research took place, it was still known as Twitter and is therefore referred to as such in this thesis.

- **Using social media applications to improve learning experiences**

The third question asked participants to what extent they agree using social media applications improves the learning experiences of students. Figure 4.3 shows the pre-service teachers' opinions on using social media platforms to improve their learning experiences. They answered this question using a 5-point Likert scale ranging from 1 = strongly disagree to 5 = strongly agree. The mean score was 4.13 out of 5.00, with a standard deviation of 0.796. When interpreting this data, it should be borne in mind that the mean values lie between 3.400-4.800, and thus, any mean value larger than 3 indicates a positive evaluation [250]. Of the sample, 48% agreed that the use of social media applications improves their learning experiences, and 34% strongly agreed. 16% of responses were neutral, and one participant (2%) strongly disagreed. The 'disagree' option was not chosen at all.

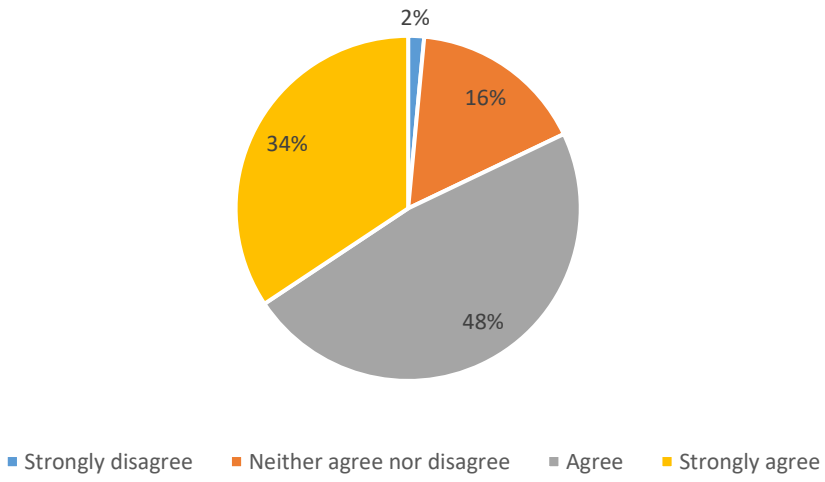


Figure 4.3 Social Media Applications Improve the Learning Experience

- **Purposes of social media applications for learning and education**

The fourth question asked participants what they used social media platforms for in the context of learning and education. The highest percentage of the sample (76%) specified searching for information, followed by browsing to gain knowledge (73%). Sharing content with colleagues was noted by 63% of the total sample, followed by adding comments and clicking 'like' or 'dislike' (48% and 45%, respectively). Writing content on social media platforms and finding social support were listed by 36% and 15% of the sample, respectively. The results are displayed in Table 4.3.

Table 4.3 Purpose of Use of Social Media Platforms for Learning and Education

Use of social media	N	%	Rank
Searching	51	76	1
Browsing	49	73	2
Sharing	42	63	3
Adding a comment	32	48	4
'Liking' or 'disliking'	30	45	5
Writing content	24	36	6
Finding social support	10	15	7

- **The usefulness of existing social media applications**

Figure 4.4 presents the participants' responses to the fifth questionnaire question (Q5: How would you describe your experiences with some existing social media platforms that you use to communicate with your peers and teachers?) (which involved the use of a 5-point Likert scale ranging from 1 = very unhelpful to 5 = very helpful). The mean score was 4.15 out of 5.00, with a standard deviation of 0.723. Most responses, 46% of the total sample, indicated social media applications to be helpful, while 34% chose the 'very helpful' option. Neutral responses were offered by 20% of participants, and no participants chose the options 'unhelpful' or 'very unhelpful'.

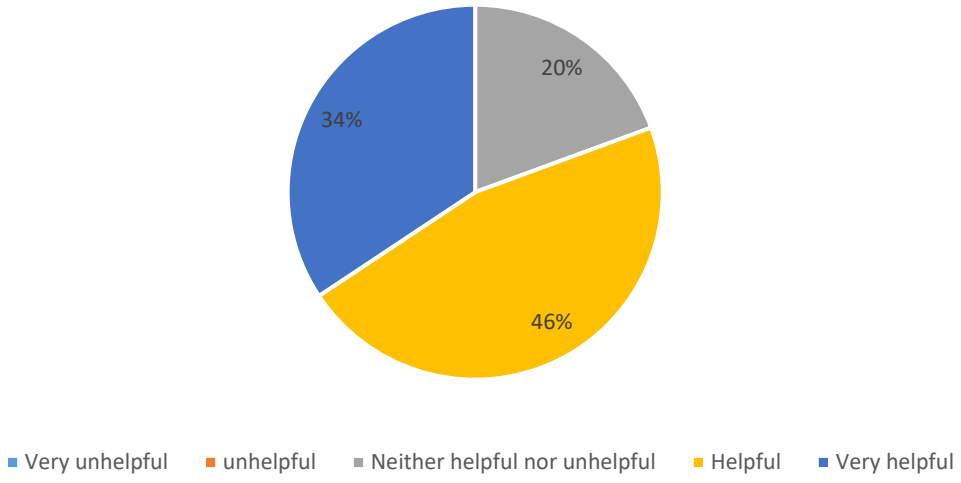


Figure 4.4 Usefulness of Existing Social Media Platforms for Communicating with Peers and Professionals

Summary of descriptive data

From the descriptive results above, it can be concluded that the participants mostly use Twitter for learning and education, which might be due to its accessibility and ease of use. In addition, its interactive nature contributes to encouraging active involvement among users. Pre-service teachers agreed that using social media improves their learning experiences, which might encourage peer learning and enhance overall learning outcomes. However, most participants were neutral about the idea that social media applications provide a good learning environment that can be used for educational purposes. This might be due to their perception of the negative aspects of social media, such as privacy and copyright issues, which can lead to communities being unsafe for sharing learning content. Furthermore, searching for information by browsing social media applications was one of the most important reasons for using social media in the participants' opinions, since social media offers access to content easily and quickly. Most participants perceived existing social media applications as useful for communicating with peers, which might help overcome time and location limitations in play when meeting in person. Therefore, it can be noted that using social media applications in an interactive environment might encourage sharing and enhance the pre-service teacher experience.

C. Hypothesis testing

The study's findings offer a crucial viewpoint on the utilisation of social media in the field of education as a whole, and more specifically in relation to professional training. The results of the data for the hypotheses listed above is discussed below.

H1: A social media application is a good learning environment that influences sharing learning content with colleagues.

The first hypothesis posits that social media provides a good learning environment that influences sharing content. A chi-square test reveals a statistically significant link between perceiving social media applications as good learning environments and sharing content with peers using these applications. The chi-square test resulted in a *p* value of 0.006, which is significantly below the predetermined threshold for statistical significance of 0.05. Therefore, Hypothesis 1 is supported.

A majority of participants, 51.2%, agreed that social media platforms are appropriate for learning when it comes to sharing content with co-workers. Conversely, 48.8% of participants who share materials with colleagues on social media sites had a neutral perspective on whether these

platforms foster a productive learning environment. These findings indicate that individuals who engage in more extensive content sharing on social media platforms are more inclined to view social media as a favourable setting for educational purposes, as demonstrated in Figure 4.5.

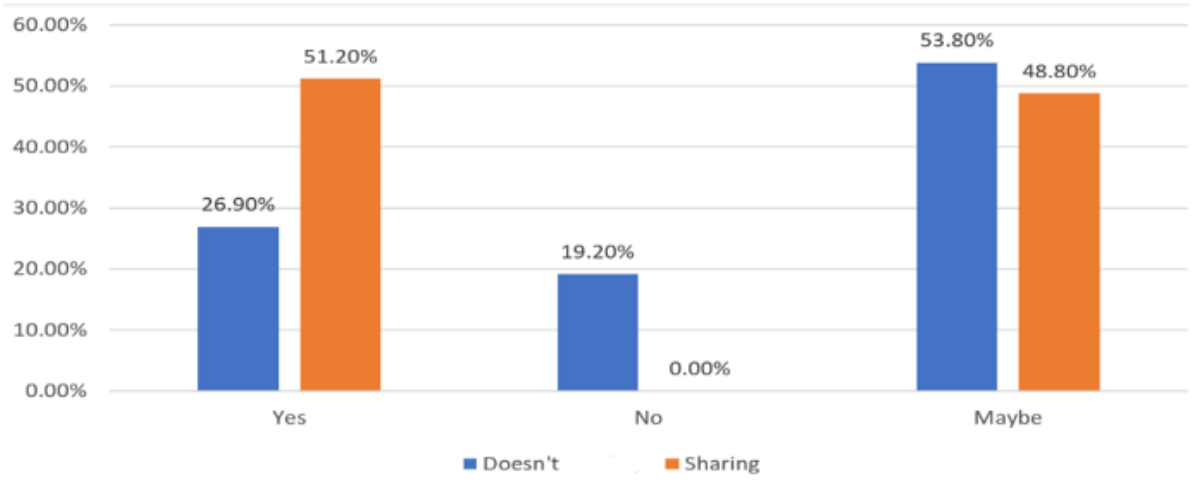


Figure 4.5 The Frequency of Content Sharing with Colleagues through Social Media Applications

H2: A social media application is a good learning environment that influences pre-service teachers' learning

The second hypothesis explores the potential advantages that pre-service teachers can gain by utilising social media tools to enhance their personal learning. A chi-square test demonstrates a statistically significant association between the perception of social media applications as an appropriate learning environment and the belief in their ability to enhance the learning of pre-service teachers. The chi-square test yielded a *p* value of 0.004, which is significantly below the threshold of 0.05. Therefore, Hypothesis 2 is supported.

Based on the results, a significant majority (69.9%) of participants who strongly agreed with the notion that social media applications might improve their learning also believed that these applications could generate a favourable learning environment. Around 62.5% of the participants who agreed with the notion that social networking applications could enhance their learning experience were neutral as to whether they can create a conducive learning environment. These findings indicate that pre-service teachers who hold a positive view of social media as a platform for education were more inclined to believe that it may enhance their own learning experiences. This is due to the fact that pre-service teachers generally hold positive evaluations of educational platforms (refer to Figure 4.6).

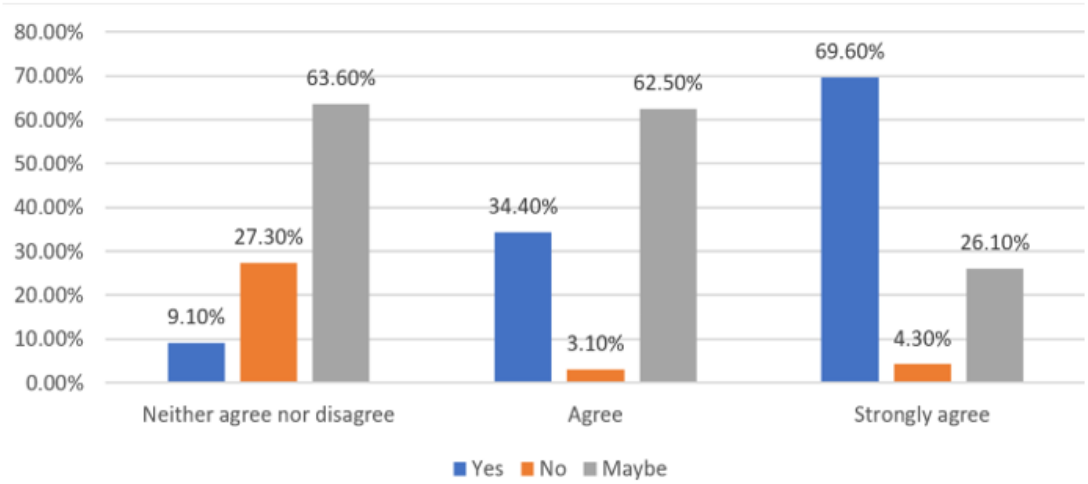


Figure 4.6 Social Media Applications as a Good Learning Environment and the Improvement of Pre-Service Teachers' Learning

H3: Sharing learning content with colleagues on a social media application influences pre-service teachers' learning

Hypothesis 3 examines the influence of sharing content with colleagues on social media on the enhancement of learning for pre-service teachers. The findings demonstrate a statistically significant correlation, as established by the chi-square test, between the use of social media applications by pre-service teachers to exchange content with peers and the improvement of their learning experience. The chi-square test yielded a p value of 0.039, which falls below the significance level of 0.05. Therefore, Hypothesis 3 is confirmed.

53.7% of participants who shared content with their colleagues agreed that social media applications have a beneficial influence on their learning. This is illustrated in Figure 4.7. 39% of the respondents expressed strong agreement. The results suggest that there is a direct relationship between the level of participation of pre-service teachers in posting educational content on social media platforms and their evaluation of the educational advantages gained from using these platforms.

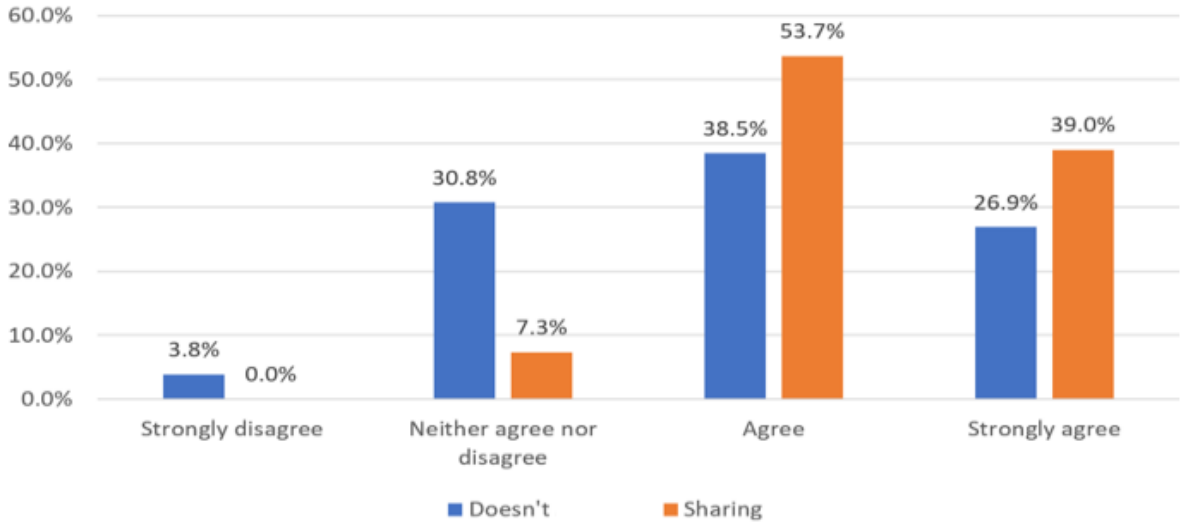


Figure 4.7 The Frequency of Content Sharing with Colleagues through Social Media Applications and Improving Pre-Service Teachers' Learning

D. The open-ended question

The open-ended question inquired about the interface and functionality of the social media platforms that the user currently employs to engage with their classmates and lecturers. Out of the 67 participants, 59 answered this question. According to 18 responses, the ability to share content with others is one of the most important features of social media platforms. This feature can enhance communication between peers and teachers, as exemplified by the following response: 'I utilise WhatsApp and Twitter to share content and information, which allows me to easily connect with people at any time'. An additional attribute that could enhance communication is a user-friendly interface (usability). A total of 20 answers acknowledged this particular characteristic. Furthermore, six respondents specifically mentioned the platform's capability to upload files or videos of substantial size as a notable feature. Nine respondents emphasised the importance of a discussion board feature that enables communication and information exchange between students and teachers. There were six replies about the group creation feature, which facilitates task organisation and the sharing of information pertaining to certain activities. Participants expressed approval of the characteristics seen on existing social media sites, as these aspects effectively aided in communication. There were 16 responses about WhatsApp, six about Telegram, five about MS Teams, and four about Twitter.

4.2.7 Discussion

This study aimed to explore the feasibility of using social media applications to share knowledge from CS pre-service teachers' perspectives in two Saudi universities (Jeddah and Umm Al-Qura) to answer RQ2 ('To what extent are CS academics in HEIs aware of the importance of knowledge sharing?'). It shows that social media platforms have the potential to serve as excellent learning tools within HEIs, with a special emphasis on professional development [186]. Based on the results of this survey, Twitter is the most popular social media network utilised by pre-service teachers for instructional purposes. The educational and instructional benefits of Twitter as a great learning tool have been highlighted by prior research [186, 251, 252], and it arises as a result of its capacity to encourage active involvement within a digital community of people who share a professional interest. As a result, it provides individuals with opportunities to exchange knowledge and useful insights, which in turn helps them enhance their abilities [253]. It is a community that encourages the sharing of information within an educational environment and is characterised by its interactive nature.

The findings that emerge from this study show that pre-service teachers agree on the effectiveness of social media platforms as environments that are favourable to both learning and teaching. There is a correlation between this conclusion and the research carried out by Alshehri and lally [183]. This is in contrast to the widespread perception that social networking has very little benefits to bring to society [254]. Furthermore, the findings of this study indicate that pre-service teachers hold positive views towards the use of social media platforms as a means of strengthening teacher training and facilitating an enhanced learning experience. This is a significant conclusion that suggests that leveraging these platforms could lead to more effective teacher education, improved engagement, and potentially better learning outcomes, which can have a positive impact on their future teaching practices. It has been proven in previous research that the use of social media platforms for educational purposes can help improve teaching practices among educators working in higher education and enhance learning outcomes for pre-service teachers [186, 188, 255, 256]. Furthermore, the results of the survey suggest that the social media platforms that are being utilised for the purpose of professional and peer communication within the training programme are effective. Consequently, it is of the utmost importance for individuals to make use of social media platforms as a means of disseminating information and engaging in conversation with both peers and experts. This will allow them to overcome the limitations of time and space that they will encounter during their training. The findings of this study are consistent with those

of previous research that has indicated the widespread adoption of social media as a communication medium for the purpose of socialising [257-260].

The results indicate that pre-service teachers utilise social media platforms for various educational purposes, including information retrieval, knowledge acquisition, and knowledge sharing. This facilitates their ability to collaborate and actively participate with their peers, resulting in a beneficial influence on their academic accomplishments [183, 187, 189]. Furthermore, the present study reveals a statistically significant correlation between the act of sharing educational content with colleagues via social media applications and the enhancement of learning outcomes among pre-service teachers. The findings indicate that a significant proportion of respondents uses social media platforms for the purpose of disseminating content or knowledge and concurred that it has the educational encounters of pre-service teachers. A comparison of the findings with those of other studies confirms that using social media for learning purposes and interaction with peers and teachers positively affects their academic performance [261]. This implies that the act of exchanging ideas and information has the potential to facilitate rapid and effortless acquisition of knowledge, thereby enhancing the process of learning. Furthermore, integration of these technologies could lead to transformative and significant modifications in the realm of collaborative learning within higher education, specifically in the context of professional training. The study revealed a statistically significant correlation between the perception of social media applications as effective learning environments and their actual impact on learning outcomes.

To enhance the educational experiences of pre-service teachers, it is imperative for pre-service teacher training programmes to incorporate these technologies within their curriculum in order to enhance instructional practices. Collaborative learning is a recognised educational approach that encompasses the acquisition of knowledge through active participation in diverse activities within our everyday lives [261]. According to Castro-Romero [185], the utilisation of social media platforms has the potential to augment students' educational experiences and foster their engagement with both peers and instructors. This is achieved through the facilitation of shared content, discussions, and communication within virtual learning communities.

The findings of the study indicate a significant correlation between the utilisation of social media platforms for the purpose of sharing content among colleagues and the belief that this constitutes a conducive learning environment. Nevertheless, it is imperative to acknowledge certain factors that may exert an influence on the efficacy of these technologies. These factors, including

ease of utilisation, utility, and motivation, warrant careful consideration [189]. This study examines the perspectives of pre-service teachers regarding the utilisation of social media applications during summer training at Saudi universities, specifically within the faculties of CS, with the aim of enhancing teaching and learning practices. There is a growing incentive to promote the incorporation of these technologies into professional development programmes, with the aim of enhancing the competencies of both pre-service and in-service teachers. The research findings present a persuasive case for the incorporation of social media within the educational setting to enhance teaching and learning. The application of social media and its diverse elements offers new prospects for promoting sustainable professional development and lifelong learning.

Using social media, individuals have the ability to access assistance and guidance by participating in online communities that are expressly centred on educational efforts. In general, the results of this survey indicate that pre-service educators are in agreement that making use of social media platforms to share knowledge with their colleagues would be beneficial to their educational journey. This conclusion is backed by the statistical correlation. Applications for social media can thus function as a powerful educational platform that can enhance the learning experiences of pre-service teachers. Facilitating the resolution of challenges that are related to temporal and spatial limits can be accomplished through the integration of these technologies with the enhancement of professional abilities. Social media platforms can be accessed at any time and from any location. As Qian et al. [262] points out, the formation of professional development programmes for pre-service teachers in the School of Computing is an endeavour that is of the utmost importance. As pointed out by Almuqrin et al. [10] and Amasha and Alkhalaf [263], this requirement is especially apparent in the context of Saudi Arabia. In order to improve the reliability and relevance of the findings, it is recommended that additional studies be carried out to collect data from a larger sample of students attending a variety of educational institutions. Applying these findings to dissimilar situations requires some caution.

4.3 The Second Study: Questionnaire on the factors influencing knowledge sharing behaviour

This study aims to investigate CS academics' perspectives regarding the factors that affect their WSK. These factors include ATKS, ERA, EC, and the IT platform that is used for knowledge sharing in a school of computing. This study provides a partial answer to **RQ2**. This study used a questionnaire. The conceptual framework for this study is depicted in Figure 4.8. It establishes

linkages between four independent variables, ATKS, ERA, EC, and IT platform, and one dependent variable, WSK. The main hypothesis in this study is:

H4: ATKS, ERA, EC, and IT platform influence WSK.

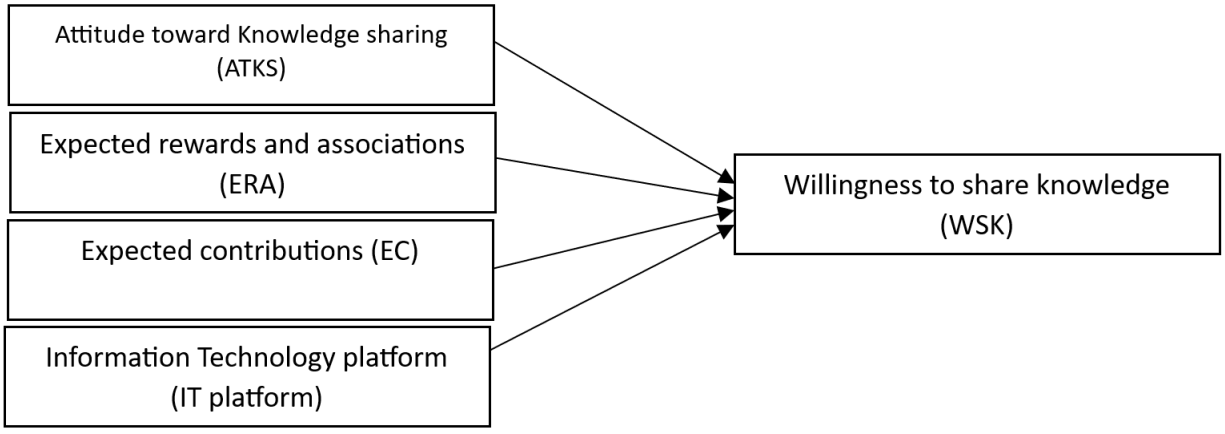


Figure 4.8 Conceptual Framework of the Quantitative Inferential Study

4.3.1 Method

This study uses a questionnaire to investigate the factors that affect CS academics' WSK among peers. These factors include ATKS, ERA, EC, and the IT platform. The questionnaire was constructed with a blend of closed and open-ended questions. Items of the questionnaire were adapted from prior validated knowledge-sharing studies by Fullwood et al. [2], Bock et al. [139] and Shannak et al. [264] to ensure the reliability and validity of the measures (see Appendix B.2). It was then adjusted to the study's goal of sharing knowledge related to teaching. Survey research offers the advantage of enabling generalisation and making inferences for a wider group [265].

The study employed quantitative questions to ascertain the factors influencing knowledge sharing and qualitative questions to obtain a more profound comprehension of participants' responses. The questionnaire comprised of three sections. The initial section addressed demographic variables, such as the name of the university, gender, age, academic position, and years of experience. The second section inquired about five dimensions: 1) WSK (consisting of eight items), 2) ATKS (consisting of four items), 3) ERA (consisting of three items), 4) EC (consisting of three items), and 5) the IT platform (consisting of four items). All the aspects were assessed using a 5-point Likert scale, with responses ranging from 1 = strongly disagree to 5 = strongly agree. The third section of the survey consisted of one multiple-choice question and three

open-ended questions. The multiple-choice question addressed the existing techniques employed for knowledge sharing, whereas the open-ended questions focused on respondents' opinions regarding the most effective methods for sharing information, their emotions when sharing knowledge with colleagues, and their recommendations for technologies that could enhance their sharing capabilities (see Appendix B.2) [266]. A total of 119 replies were received, with all closed-ended survey items being answered.

To validate the questionnaire, the researcher and supervisors discussed, reviewed and assessed the consistency, appropriateness, and face validity of all items on the instrument with the study's objectives, specifically RO2. The questionnaire was translated into Arabic for distribution in Saudi universities. Using the appropriate native language in questionnaires is typically preferable, as it ensures that participants comprehend the questions and can respond appropriately without loss of meaning [245]. To this end, the researcher used a back-translation technique, which is 'a process whereby the translated text is re-translated back into the source language by a translator who does not see the original text. If any discrepancies are found between the back-translation and the original, this is taken as an indication of translation errors in the target language version' [246]. This step helps to add an additional layer of quality. The questions were first translated into Arabic by the researcher and then translated back into English by two native Arabic speakers. One of them is a doctoral researcher in applied linguistics at Leicester University, and the other person is a doctoral researcher in applied linguistics at Newcastle University. A few minor words were modified, and the quality of the translation was verified.

A pilot study was carried out to assess the content validity and improve the clarity and conciseness of certain questions before distributing the questionnaire to the intended participants.

4.3.2 Pilot Study

A pilot study helps determine any weaknesses and deficiencies in the research instruments before implementing the full study [15-18]. Carrying out a pilot study is useful, since if the questions are not appropriate, the tools will not obtain the intended information [19].

The pilot study was carried out among a group of 12 CS PhD students at Newcastle University. The main comments on the pilot study were related to word choice, and minor changes in vocabulary were made to avoid misunderstanding by participants. Prior to the main study, modifications and improvements were implemented to the instruments based on the findings of the pilot study. After the completion of the pilot phase, the research entered its major phase, as described in the following section.

4.3.3 Population and Sample

Prior to conducting the research, ethical clearance was obtained from Newcastle University (21-033-ALH) (See Appendix A.2). The sample of this study includes all CS academics currently employed full time in the faculty of CS at Jeddah and Umm Al-Qura Universities, including professors, associate professors, assistant professors, lecturers and teaching assistants. Their level of experience ranges from novice to experienced academics teaching in HEIs. As previously said, this survey obtained 119 replies.

4.3.4 Data Collection

An email invitation was sent to all teaching faculty members in the Faculty of Computer Science at Jeddah and Umm Al-Qura Universities. The invitation included a link to an online questionnaire along with a cover letter elaborating on the overall research aim, the researcher's contact details, and an electronic data collection and storage consent form. The researcher utilised Survey Monkey [30] for the questionnaire. The survey was structured such that each participant was required to respond to all of the closed-ended questions. If a mandatory question was left unanswered, the survey could not be submitted. This approach ensured that no data was overlooked or omitted during the survey collection procedure. Upon finishing the survey, participants were given the choice to respond to the open-ended questions. The data was collected from April 2022 to June 2022. After gathering the data, it was transferred from Survey Monkey to Excel for analysis, as discussed in the next section.

4.3.5 Data analysis

This study processed the quantitative data for analysis by coding and cleaning the data, as well as eliminating incomplete entries. Frequency and descriptive statistics were used for data analysis, and no missing data was present. Subsequently, the numerical data was transferred from Excel to SPSS's statistical software for further examination.

4.3.5.1 Reliability test

To evaluate the general dependability of the variables in the survey, a reliability test was conducted, employing Cronbach's Alpha. The test results are presented in Table 4.4. All the variables in this study exhibited high reliability, as evidenced by Cronbach's Alpha values over 0.7. Based on the fact that most of the projected values were higher than 0.778, it may be inferred that there was a

strong link between all variables. Therefore, the current investigation demonstrates remarkable reliability.

Table 4.4 Reliability Test for All Variables in the Study (N = 119)

Cronbach's Alpha	**N**
0.778	36

4.3.5.2 Normality test

The Kolmogorov-Smirnov and Shapiro-Wilk normality tests were carried out in order to ascertain whether or not the data occurred in accordance with the normal distribution. The variables that are being examined in this study do not follow a normal distribution, as demonstrated by the Shapiro-Wilk test (knowledge sharing, $p < 0.001$), as presented in Table 4.5. If the sample size is greater than 30 or 40, the assumption of the data's normalcy distribution should not result in a substantial problem [267], and the distribution of the data can be disregarded [268]. Parametric techniques can thus be used despite the fact that the data did not follow a normal distribution [269].

Table 4.5 Normality Test

Variable	**Kolmogorov-Smirnov**			**Shapiro-Wilk**		
	W	**DF**	***P* value**	**W**	**DF**	***P* value**
WSK	0.170	119	< 0.001**	0.882	119	< 0.001**
ATKS	0.181	119	< 0.001**	0.891	119	< 0.001**
ERA	0.147	119	< 0.001**	0.966	119	0.005**
EC	0.216	119	< 0.001**	0.914	119	< 0.001**
IT Platform	0.117	119	< 0.001**	0.974	119	0.19

** significant result at $p < 0.01$

4.3.5.3 Qualitative data

Qualitative data were obtained from three open-ended questions to better understand factors contributing to a CS academic's WSK within Saudi Arabian HEIs. The response rates for the open-ended questions varied dramatically from one type of inquiry to another and individual answers also showed significant variation. There were a few occasions where participants' remarks were left incomplete, but the majority did answer all questions. Table 4.6 provides a summary of the response rates for the open-ended questions in the survey.

The qualitative data were analysed and coded using the methods suggested by Miles et al. [270] and Creswell [34]. This method assisted in identifying key themes for each open-ended question. Initially, all answers were copied and pasted into a Word document. Answers were read line by line for the first time familiarisation with the contents. These data were then coded manually in Microsoft Word. Finally, similar codes were sorted by emerging themes. To present the results, the themes and codes were organised into tables to identify relationships and patterns more clearly.

To validate the findings from the qualitative data, the researcher employed three approaches. First, the 'back-translation technique' [271] was used, translating themes, codes and quotations from Arabic (in which they were originally written) into English by the researcher and then back to Arabic by the translator, a native Arabic-speaking PhD student from the applied linguistics department at Newcastle University. Second, the findings were peer reviewed [26]. This process was performed by a peer reviewer with experience in qualitative research. The peer reviewer analysed the responses to open-ended questions and created their own codes. These codes were then compared with the researcher's codes. Finally, the researcher used direct quotations from the participants' responses in the thesis to enhance qualitative validity [272].

Table 4.6 Summary Results of the Open-Ended Questions (N = 119)

Questions	N	Valid	Missing	% valid
OQ1: In your opinion, what is the best way to share knowledge with your colleagues?	119	116	3	97.48
OQ2: How do you feel about sharing knowledge with other members in your college?	119	113	6	94.95
OQ3: What types of technologies need to be implemented to encourage academics to share their knowledge in your college?	119	113	10	91.59

4.3.6 Results

A. Demographic data

The majority of the participants who took part in the survey (64.7%) were affiliated with Jeddah University, while 35.3% of those who participated were linked with Umm Al-Qura University. There were 72.3% female participants and 27.7% male participants. 62.2% of the participants were between the ages of 31 and 40, whereas younger academics (those under 30 years old) and older academics (those between 41 and 50 years old) were both underrepresented (16.8%). In terms of the academic status or rank, 41.2% of the participants held the position of lecturer, 26.1% held the

post of assistant professor, and 19.3% held the position of teaching assistant. 32.7% of participants had between two and five years of experience in the field of education, while approximately 30.3% of them had more experience, with six to 10 years. Those with less than two years of experience and those with more than 16 years of experience were less represented (11.8% and 8.4%, respectively). Table 4.7 displays all the demographic information.

Table 4.7 Demographic Information N = 119

Variable	Frequency	Percentage
University		
Jeddah University	77	64.7
Umm Al-Qura University	42	35.3
Gender		
Male	33	27.7
Female	86	72.3
Age		
< 30	20	16.8
31-40	74	62.2
41-50	20	16.8
51-60	4	3.4
> 60	1	0.8
Academic position		
Assistant lecturer	23	19.3
Lecturer	49	41.2
Assistant professor	31	26.1
Associate professor	14	11.8
Professor	2	1.7
Experience (in years)		
< 2	14	11.8
2-5	39	32.8
6-10	36	30.3
11-15	20	16.8
> 16	10	8.4

B. Quantitative data

Descriptive data analysis was carried out to investigate the primary pattern that emerged from the information that was gathered through the survey. Using the data, the maximum and minimum possible values were determined, as well as the mean, the standard error of the mean, and the standard deviation. As a result of this screening of the data, the significance of all factors that were examined for academics in Saudi HEIs was investigated. There was no missing data in the 119

responses. When it comes to sharing their knowledge with other staff members, academics have a positive attitude, as indicated by the average response on the Likert scale on attitude, which is 4.36 with a standard deviation of 0.05. Respondents were positive about their EC, with an average score of 4.03±0.06. On the other hand, they did not have any strong opinions regarding the ERA (2.80±0.06), nor did they have any strong opinions regarding the IT platform to share their expertise (3.39±0.04), as demonstrated in Table 4.8. It can be inferred that CS academics tend to share their knowledge due to belief about their EC.

Table 4.8 Descriptive Statistics per Variable (N = 119)

Variable	N		Mean	S.E.M.	Median	Mode	S.D.	Min.	Max.	Level
	Valid	Miss.								
ATKS	119	0	4.36	0.05	4.25	4.00[a]	0.51	3.25	5.00	Very high
ERA	119	0	2.80	0.06	2.67	2.67	0.68	1.00	5.00	Medium
EC	119	0	4.03	0.06	4.00	4.00	0.69	2.00	5.00	High
IT Platform	119	0	3.39	0.04	3.50	3.50	0.47	2.00	4.75	Medium
WSK	119	0	4.50	0.04	4.50	5.00	0.46	3.50	5.00	Very high

a. Multiple modes exist. The smallest value is shown.

Willingness to share knowledge (WSK)

The results in Table 4.9 below demonstrate that the majority of CS faculty members are inclined to share their knowledge. The standard deviation ranged from 0.512 to 0.769. A significant number of participants indicated their agreement that sharing their teaching experiences within their field with their peers is crucial for enhancing their teaching methodologies, and that it has a positive impact on students' achievements. Nearly 97% of individuals hold the belief that sharing their teaching experiences with colleagues is an effective means of enhancing academic performance and facilitating mutual learning and growth. In addition, a significant majority (96%) of CS academics concurred with two statements suggesting that sharing their teaching experiences with inexperienced academics in their field could potentially address the difficulties they encounter while teaching unfamiliar topics and enhance their teaching methodologies. The mean score for willingness to share knowledge was 4.50±0.459, indicating a significantly high level of agreement. All items exhibited mean scores exceeding 4.20, indicating a robust level of agreement. Therefore, the descriptive data shows that CS academics are willing to share their knowledge with peers because they believe in the importance of this process. This might lead to enhanced and innovation in teaching methods within departments.

Table 4.9 Item Analysis of CS Academics' willingness to share knowledge (N = 119)

Willingness to share knowledge (WSK)	SA	A	N	D	SD	Mean	Std.	Level
1: Sharing teaching experiences with your colleagues improves learning and helps your colleagues to learn.	73 (61.3%)	43 (36.1%)	2 (1.7%)	0	1 (0.8%)	4.57	.619	Very high
2: Sharing teaching experiences with your colleagues improves academic performance.	74 (62.2%)	42 (35.3%)	3 (2.5%)	0	0	4.60	.542	Very high
3: Sharing teaching experiences in your discipline with your colleagues is important to improve your teaching practices and that will reflect on student outcomes.	70 58.8%	48 40.3%	1 0.8%	0	0	4.58	.512	Very high
4: Sharing teaching experiences with your peers helps you get your teaching done faster.	57 47.9%	46 38.7%	13 10.9%	3 2.5%	0	4.32	.769	Very high
5: Sharing teaching experiences with your peers helps to improve their teaching competence.	53 44.5%	49 41.2%	17 14.3%	0	0	4.30	.708	Very high
6: Sharing teaching experiences in your discipline with novice academics might solve challenges they face when teaching new subjects.	74 62.2%	40 33.6%	5 4.2%	0	0	4.58	.575	Very high
7: Sharing teaching experiences in your discipline with novice academics might improve their teaching practices.	71 59.7%	43 36.1%	4 3.4%	1 0.8%	0	4.55	.607	Very high
8: Sharing teaching experiences will help other academics (coordinators), who are involved in designing course syllabi to avoid errors that might affect the quality of teaching outcomes.	68 57.1%	44 37%	7 5.9%	0	0	4.51	.609	Very high
WSK						**4.50**	**0.459**	**Very high**

Note: SA = 'strongly agree', A = 'agree', N = neutral, D = 'disagree', and SD = 'strongly disagree'.

Attitude toward knowledge sharing (ATKS)

Table 4.10 shows that there is a positive attitude towards teaching experience sharing among peers. The standard deviation values are between 0.552-0.798 and the overall mean score is 4.36±0.513,

which is very high. CS faculty members agreed with the statement, 'I enjoy sharing my teaching experiences with my colleagues' (97%) and 'I feel sharing my teaching experience with other college members is a valuable experience' (96%). In addition, 94% of CS academics agreed that they welcome the opportunity to spend significant time with other academics at their university to learn from their work, and 83% agreed with the statement 'I share my teaching experiences in an appropriate and effective way with other academics to accomplish the goal of our department and college'. Most participants thus have a positive attitude toward sharing teaching experiences with peers. It can be concluded that most of the participants have a positive attitude toward sharing teaching experiences with peers, which might enhance teaching experiences and best practices.

Table 4.10 Item Analysis of CS Academics' Attitude toward Knowledge Sharing (N = 119)

Attitude toward knowledge sharing (ATKS)	**SA**	**A**	**N**	**D**	**SD**	**Mean**	**Std.**	**Level**
1: I enjoy sharing my teaching experience with my colleagues.	49 41.2%	66 55.5%	4 3.4%	0	0	4.38	.552	Very high
2: I feel sharing my teaching experience with other college members is a valuable experience.	57 47.9%	57 47.9%	5 4.2%	0	0	4.44	.577	Very high
3: I share my teaching experience in an appropriate and effective way with other academics to accomplish the goal of our department and college.	48 40.3%	51 42.9%	16 13.4%	4 3.4%	0	4.20	.798	Very high
4: I would welcome the opportunity to spend significant time with other academics at my university to learn from their work.	61 51.3%	51 42.9%	5 4.2%	2 1.7%	0	4.44	.659	Very high
ATKS						**4.36**	**0.513**	**Very high**

Expected rewards and associations (ERA)

The participants generally expressed a neutral attitude towards the ERA resulting from knowledge sharing. Table 4.11 shows that the standard deviation values in this case ranged from 0.870 to 0.980, while the mean values ranged from 2.18 to 3.77. The average score is 2.79±0.682, indicating a neutral attitude towards the statement. A majority of the participants (52.9%, mean value = 2.44)

expressed disagreement with the statement that sharing their teaching experiences will lead to promotion. Furthermore, a significant majority of participants (69%) expressed their disagreement (mean = 2.18) with the statement 'I will earn financial incentives for sharing my teaching experience'. Nevertheless, a significant majority of 66% of participants concurred that by sharing their expertise, they experienced an enhancement in their self-esteem, as indicated by a mean score of 3.77. It can be concluded that participants do not perceive their departments to formally reward them for knowledge sharing. However, they believe sharing their knowledge will enhance their self-perception and confidence. Therefore, a reward system within departments might encourage academics to share knowledge.

Table 4.11 Item Analysis of CS Academics' Expected Rewards and Associations for Sharing Knowledge (N = 119)

Expected rewards and Associations (ERA)	**SA**	**A**	**N**	**D**	**SD**	**Mean**	**Std.**	**Level**
1: If I share my teaching experiences, I will get promoted.	2 1.7%	8 6.7%	46 38.7%	47 39.5%	16 13.4%	2.44	.870	Low
2: Sharing my teaching experiences would improve my sense of self-worth.	26 21.8%	53 44.5%	28 23.5%	11 9.2%	1 0.8%	3.77	.925	High
3: I will receive monetary rewards for sharing my teaching experience.	2 1.7%	11 9.2%	24 20.2%	51 42.9%	31 26.1%	2.18	.980	Low
ERA						**2.79**	**0.682**	**Medium**

Expected contribution (EC)

Table 4.12 shows that a majority of the participants (over 80%) expressed agreement regarding the positive impact of sharing their teaching experiences with colleagues. They believed that this practice could effectively address teaching challenges, enhance work procedures, and boost productivity in their educational institutions. The mean values for these aspects were 4.03, 3.98, and 4.06, respectively. The average score is 4.02±0.686, indicating a high level of agreement. This shows that participants are of the opinion that disseminating their expertise will have a beneficial impact. Academics recognise the benefits of contributing their expertise, such as enhancing learning environments and improving their teaching practices. This might encourage them to share their knowledge.

Table 4.12 Item Analysis of CS Academics' Belief about the Contribution of Sharing Knowledge (N = 119)

Expected contribution (EC)	SA	A	N	D	SD	Mean	Std.	Level
1: Sharing my teaching experiences would help others in the faculty to solve teaching problems.	30 25.2%	69 58%	15 12.6%	4 3.4%	1 0.8%	4.03	.769	High
2: Sharing my teaching experiences would improve work processes in the department in particular and in the university in general.	28 23.5%	67 56.3%	19 16%	4 3.4%	1 0.8%	3.98	.781	High
3: Sharing my teaching experiences would increase the productivity of the university in order to achieve its objectives.	35 29.4%	62 52.1%	17 14.3%	4 3.4%	1 0.8%	4.06	.806	High
EC						**4.02**	**0.686**	**High**

Information technology platform (IT Platform)

In general, the academics were neither positive nor negative about IT platforms, as indicated by the average score of 3.40±0.474, which is relatively neutral. However, a majority of participants (almost 86%) felt that an online platform for sharing teaching experiences across different departments would enhance collaboration. 25% of respondents agreed and 46.2% disagreed that their university has created an online platform to enhance the exchange of teaching experiences across different departments. This corroborates the necessity for technology platforms to disseminate academics' expertise (educational experiences) across different departments, as illustrated in Table 4.13.

Table 4.13 Item Analysis of CS Academics' Opinion on an Information Technology Platform for Sharing Knowledge (N = 119)

Information technology platform (IT Platform)	SA	A	N	D	SD	Mean	Std.	Level
1: My university does not encourage online teaching experiences sharing.	11 9.2%	28 23.5%	50 42%	21 17.6%	9 7.6%	3.09	1.041	Medium
2: If there was an online platform to share teaching experiences across departmental boundaries, this would make sharing easier.	43 36.1%	60 50.4%	10 8.4%	4 3.4%	2 1.7%	4.16	.844	High
3: My university designs an online platform to facilitate teaching experiences exchange across departmental boundaries.	9 7.6%	21 17.6%	34 28.6%	39 32.8%	16 13.4%	2.73	1.133	Medium
4: The online platform at my university is designed to be user friendly.	21 17.6%	51 42.9%	29 24.4%	14 11.8%	4 3.4%	3.60	1.019	High
IT Platform						**3.40**	**0.474**	**Medium**

Although the participants were neutral about the IT platform for sharing knowledge, they were in agreement that creating an online platform within the department might facilitate sharing knowledge, which enhances collaboration in the workplace. Therefore, it can be claimed that university leaders should encourage their academics to share teaching experiences and best practice with peers, which influences academic performance. That could be achieved by changing the university's policy regarding facilitating knowledge sharing related to teaching, such as applying a rewards system and creating formal virtual communities within departments.

C. Correlation between factors influencing knowledge sharing

In order to examine the extent and nature of the relationship between various factors that influence knowledge sharing among academics in Saudi HEIs, the researcher conducted a Pearson's correlation analysis [273]. The results revealed a highly significant positive correlation between ATKS and WSK (0.59), ERA and knowledge sharing (0.24), EC and knowledge sharing (0.46), attitude and EC (0.27), and ERA and EC (0.40). Furthermore, there was a significant correlation observed between the IT platform and the anticipated benefits and associations, with a coefficient of 0.23. However, as Table 4.14 shows, there is no correlation between the platform used and the act of sharing knowledge.

Table 4.14 Correlation between Variables Affecting Knowledge Sharing

	WSK	ATKS	ERA	EC	IT Platform
WSK	1	0.585**	0.244**	0.461**	0.110
ATKS	0.585**	1	0.166	0.274**	0.088
ERA	0.244**	0.166	1	0.401**	0.232*
EC	0.461**	0.274**	0.401**	1	0.056
IT Platform	0.110	0.088	0.232*	0.056	1

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

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

D. Linearity test

A linearity test was carried out to investigate whether or not there was a connection between the independent variables of attitude, ERA, EC, and platform and the dependent variable of information sharing. The results of this test are depicted in Figure 4.9. There is a linear link between

the sharing of knowledge and attitude and EC; however, there is no correlation between the sharing of knowledge and platform, nor between the sharing of knowledge and ERA.

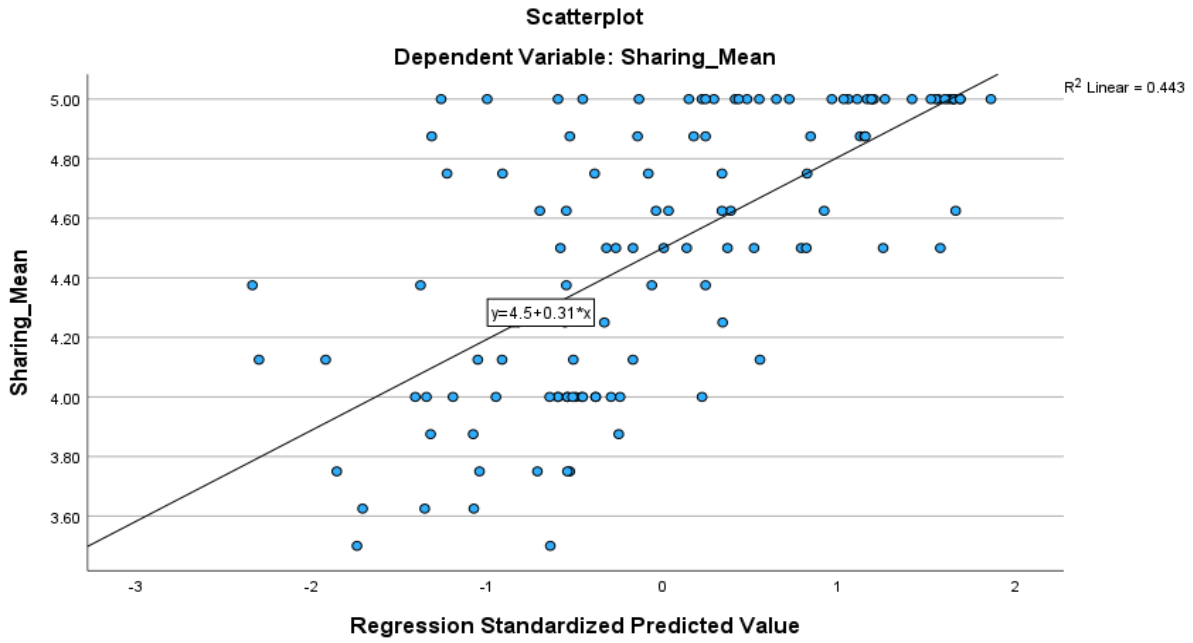


Figure 4.9 Linearity Plot for All Independent Variables on the X-Axis vs the Dependent Variable Knowledge Sharing on the Y-Axis

E. Factors influencing knowledge sharing

The data collected from this study indicates that ATKS, ERA, EC, and IT platform play a crucial role in the WSK among the surveyed academics. Table 4.15, Table 4.16, and Table 4.17 present the results of the regression analysis. Table 4.15 presents the summary results of the multiple linear regression analysis for each of the four variables (ATKS, ERA, EC and IT Platform) to the dependent variable (WSK). The statistical findings in Table 4.15 show that two of the four variables were statistically significant in predicting the WSK, namely ATKS and EC. Results also show that ERA and IT Platform do not have statistically significant impact on WSK. ATKS had a beta of 0.50 with a *p* value of < 0.001. The significant result implies that ATKS contributes to a person's WSK. EC had a beta value of 0.31 with a *p* value of < 0.001. The significant result implies that EC contributes to a person's WSK. However, ERA and IT Platform were out of the regression equation.

Table 4.15 Multiple Linear Regression Model for the Impact of ATKS, ERA, and IT Platform on WSK

Model	Unstandardised coefficients		Standardised coefficients	*t*	*P* value	Collinearity statistics	
	β	S.E.M	β			Tolerance	VIF
(Constant)	1.55	0.361	-	4.28	< 0.001**		
ATKS	0.44	0.065	0.50	6.73	< 0.001**	.917	1.090
ERA	0.02	0.053	0.03	0.35	0.730	.793	1.261
EC	0.21	0.053	0.31	3.99	< 0.001**	.792	1.262
IT Platform	0.41	0.070	0.04	0.59	0.556	.941	1.063

**** Statistically significant results at 0.01 level.**

Table 4.16 presents the output of the model summary of the multiple linear regression analysis; the two predictors (ATKS, EC) significantly predict the WSK, [$R^2 = 0.443$, $R^2_{adj} = 0.424$].

Table 4.16 Model Fit Summary

R	R Square	Adjusted R Square	S.E.
0.666	0.443	0.424	0.349

Table 4.17 presents the ANOVA analysis for the generated model. The MLR, ANOVA result of $F(4, 118) = 22.694$, with a significance level of $p < 0.001$ has been generated. This model indicates that these predictors explain 44% of the variation in the WSK ($R^2 = 0.44$).

Table 4.17 ANOVA for the Model

Model	SS	*df*	MS	F	*P*
Regression	11.048	4	2.762	22.694	< 0.001**
Residual	13.874	114	0.122		
Total	24.92	118			

** Significant results at $p < 0.01$

There is a clear linear connection between the independent factors and the dependent variable, which is knowledge sharing, as shown in Figure 4.9, an illustration of this connection. Tests for multi-collinearity were carried out, and the results showed that the variance inflation factor for each of the models was lower than 3, indicating that there was no multi-collinearity present. According

to the illustration in Figure 4.10, the residuals of each and every model follow a normal distribution. Because of this, the prerequisites for conducting a regression analysis were attained.

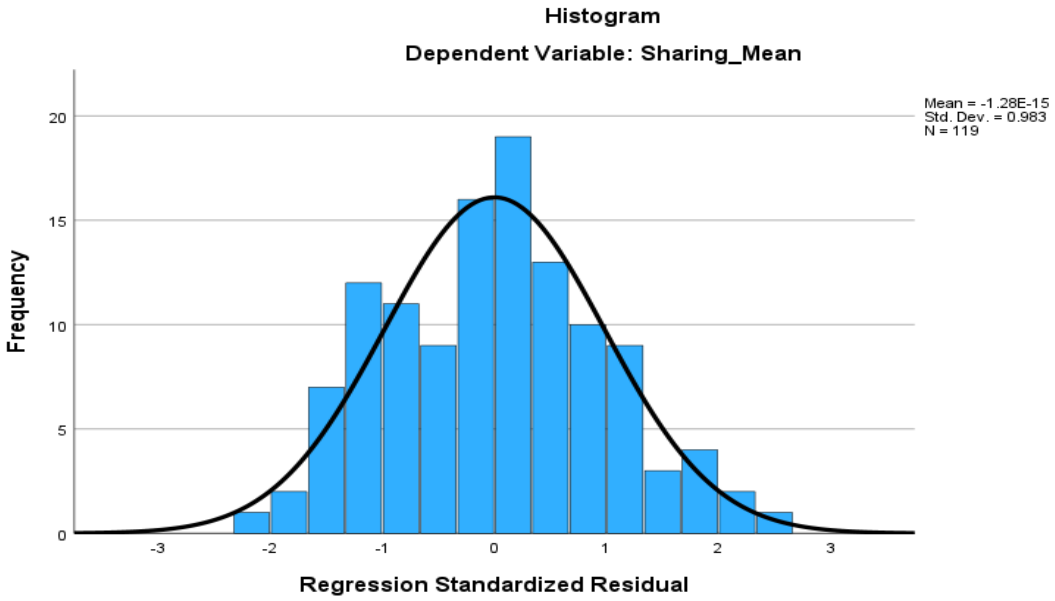


Figure 4.10 Normality for Regression Residual

F. Current methods for sharing knowledge among academics

The data indicates that a substantial majority of participants (95%) exchange knowledge through direct personal interaction. As Table 4.18 shows, email was the second most commonly used method of exchanging knowledge, with 52.9% of participants using it. A smaller proportion of individuals choose to disseminate their expertise by phone (46.2%) or on social media (42.9%).

Table 4.18 Methods of Knowledge Sharing that Participants Currently Use

Method	Frequency	Percentage (%)
Face to face	113	95
Email	63	52.9
Phone	55	46.2
Social media	51	42.9
Conference	20	16.8
Publication	13	10.9
Cloud space	4	3.4
Meeting	2	1.7

G. Answers to open ended questions

The survey's open-ended questions examined the preferred technology for facilitating the exchange of knowledge among CS academics. These findings are presented in Table 4.19. The participants' responses to open-ended question 1, which asked for their view on the best method to share knowledge with colleagues, indicate that a considerable number of academics prefer sharing knowledge through either in-person or virtual meetings and discussions. One participant highlighted that meetings are the most efficient and expedient method for transmitting information and ensuring understanding and clarity. Another participant stated that meetings and discussions about effective teaching experiences contribute to the attainment of the college's goals. Workshops, which aim to convey teaching-related expertise from experienced academics to less-experienced colleagues, emerged as the second-most preferred approach for sharing knowledge. One participant noted that it is crucial to have regular workshops held by faculty members who have teaching expertise in order to effectively transmit knowledge to new members. This method facilitates the improvement of their abilities and can even be carried out remotely through platforms like Zoom. In addition, email and social media emerged as popular channels for academics to share and exchange knowledge.

Table 4.19 Summary of Themes for OQ 1 (N = 116)

Open-ended question 1	Theme	Codes
OQ1: From your point of view, what is the best way to share teaching experiences among faculty members in the college?	Meeting and discussion	Face to face Online
	Workshops	Online Face to face
	Communication	Email Social media

The responses to OQ2, which asked about individuals' attitudes about sharing knowledge with other members in their college, were coded into two main categories: favourable sentiments and the advantages of knowledge sharing. These findings are presented in Table 4.20. The majority of the replies indicated favourable attitudes towards the exchange of information among colleagues. The respondents expressed experiencing emotions such as happiness, achievement, satisfaction and self-assurance. One respondent pointed out that the ease of sharing knowledge with someone

depends on the individual who is imparting the knowledge, since there can be difficulties arising from their commitment to honesty and moral principles. When it comes to the advantages of knowledge sharing, the majority of participants expressed the belief that sharing knowledge has a beneficial impact on their institution. This is because it contributes to the improvement of the learning process, the quality of teaching, and the outcomes of students. Additionally, sharing knowledge helps to strengthen relationships between academics in the workplace. The majority of the replies stated that the act of sharing knowledge assists academics in conserving both effort and time, particularly for those who are new to the field. It was also mentioned that sharing knowledge can effectively address issues pertaining to teaching. Lastly, it has the potential to enhance teachers' pedagogical abilities

Table 4.20 Summary of Themes for OQ 2 (N = 113)

Open-ended question 2	Theme	Codes
OQ2: How do you feel about sharing knowledge with other members in your college?	Positive vibes (perceptions)	Happiness Achievement Satisfaction Self-assurance
	Knowledge sharing benefit	Outcome for the institution Save effort and time Help others improve their skills

Data collected from responses to OQ3 (what kinds of technologies need to be implemented to encourage academics to share their knowledge in your college?) was combined and categorised into several themes in order to investigate whether or not there are methods that could effectively facilitate knowledge sharing among academics who specialise in CS. Table 4.21 contains a variety of codes that are associated with each of the themes found in the study. The aforementioned topics include both verbal communication and approaches that are based on technology.

A significant number of respondents (N = 110) stated that technical solutions are the most effective approach for the dissemination of information. Particularly noteworthy is the fact that the development of an interactive online platform was mentioned most frequently for efficient knowledge sharing. For example, a suggestion made by one participant was: 'Developing a comprehensive interactive platform for faculty members to exchange experiences, including teaching methods and innovative teaching ideas'. In addition, the participants were in agreement that the establishment of a platform that would allow for the documentation of teaching experiences

in accordance with particular modules. This would be accessible whenever it was required and thus has the potential to enhance the learning outcomes within their respective educational institutions. There were a number of responses that pushed for the suggested platform's incorporation into university websites, which would provide a universal platform for faculty members to contribute their knowledge. There were a few responses who suggested using learning management systems (LMS) like Blackboard or other similar platforms.

In addition, a number of participants brought up the usefulness of social media apps like WhatsApp, Telegram, and Twitter for the purpose of information exchange. In addition, a few individuals brought attention to the usefulness of cloud services applications like OneDrive, Dropbox, and Google Drive for the purpose of sharing relevant documents as well as resources and presentations linked to the individual modules. Email, video conferencing, and the Zoom app for online conversations were some of the alternative proposals that were included in the responses. As a result, the incorporation of a platform that utilises information technology emerges as a crucial component in the process of promoting the sharing of knowledge in HEIs.

Table 4.21 Summary of Themes for OQ 3 (N = 113)

Open-ended question 3	Theme	Subthemes	Codes
OQ3: What types of technologies need to be implemented to encourage academics to share their knowledge in your college?	Technologies	Online platform	Special online platform LMS Blackboard
		Cloud services	Dropbox One Drive Google Drive
		Social media	General WhatsApp Twitter Telegram Facebook
		Online discussion	Zoom Video conference
		Other technologies for communication	Email Microsoft Office365

4.3.7 Discussion

This quantitative study aimed to investigate CS academics' perspectives regarding the factors that affect their WSK. These factors include ATKS, ERA, EC, and the IT platform that is used for knowledge sharing in a school of computing. This study partly answers RQ2. A total of 119 CS academics took part in the survey. The survey results show that ATKS, ERA, EC, and IT platforms

play a crucial role in the WSK among the surveyed academics. The study reveals that CS faculty members in Saudi universities have a favourable disposition towards the exchange of knowledge for the purpose of teaching. The findings align with remarks [139, 274] indicating that a positive attitude has a direct impact on academics' desire to share knowledge. In addition, the qualitative findings reveal that CS academics experience good emotions, such as contentment, fulfilment, achievement, self-esteem, and self-confidence, when they engage in the sharing of teaching experiences with their colleagues. This will result in a rise in the individual's intrinsic incentive to disseminate knowledge and acquire new knowledge from others in order to enhance their abilities.

This study also shows that CS academics largely concur on the expectations that arise from the exchange of teaching experiences. Academics claim that the act of exchanging teaching experiences can have a beneficial impact, as it helps address instructional challenges, enhance operational procedures, and support the university in attaining its performance goals. Furthermore, CS academics acknowledged the advantages of exchanging teaching experiences with colleagues as a means of saving time and energy. They stated that sharing teaching experiences has a good impact on their institution by improving the learning process, teaching quality, and student outcomes. It also fosters stronger ties among academics in the workplace. These findings align with Bock et al. [139]. Respondents were neutral about the rewards or associations of teaching experience sharing among staff. This is because they know their department does not give them rewards for knowledge sharing. However, numerous studies have demonstrated that monetary and other incentives play a crucial role in motivating academics to share their knowledge with their colleagues [2, 153, 154]. The results of this study do not align with the results of Alsuraihi et al. [144], who showed that remuneration influences knowledge sharing in Saudi Arabian organisations.

Technology is essential in enabling the exchange of knowledge inside HEIs. The present study found that the majority of participants (87%) believes that online platforms would have a beneficial impact on facilitating the exchange of teaching experiences. The results of the qualitative analysis (the open-ended questions) suggest that there is a requirement for technical solutions to streamline the exchange of knowledge among peers. The commonly referenced methods for effective knowledge dissemination include face-to-face interactions, email communication, mobile phone usage, social media platforms, conferences, publications, cloud storage, and meetings. This aligns with researchers who have suggested the establishment of new virtual communities for scholars to exchange knowledge in HEIs in Saudi Arabia [10, 275]. These findings were highly

promising and encouraged the establishing of a novel virtual community for exchanging teaching experiences among CS academics and their peers, which is objective RO3 of this thesis. This research is limited in scope, as it only recruited CS researchers from two universities in Saudi Arabia. Nevertheless, the sample is a reliable and comprehensive representation, as it encompasses both male and female academics with a wide range of experience, from beginners to experts. Additional research is required to adequately address the requirements of all CS academics across all Saudi universities.

4.4 The Third Study: Interviews on the factors influencing knowledge sharing

The third study used interviews to discover the perspectives of CS academics about sharing teaching-related knowledge among colleagues, as well as the factors that influence knowledge sharing, such as motivation, barriers, and the technology utilised for knowledge sharing within the CS faculties in Saudi Arabian universities. This study partly answers RQ2.

4.4.1 Method

Interviews were used to gain an understanding of academics' perceptions of teaching-related knowledge sharing among colleagues and knowledge sharing factors, including motivation, barriers and current technology used for knowledge sharing in a school of computing. Qualitative data provides a more in-depth understanding of participants' perceptions, makes it possible to understand the topic at hand better [266]. Qualitative methods, particularly reflexive thematic analysis, require researchers to critically engage with their own biases and acknowledge their influence on the interpretation of results. Qualitative methods offer an effective understanding of a problem in natural language from an individual or a community's perspective [35]. Interview questions were formulated based on Alsaadi [15], Alotabi et al. [4] and Alammari et al. [145].

In this study, the interview started by asking the participant's perspective about knowledge sharing among their peers in a HEI context. Questions included:

1. 'What is the importance of sharing tacit knowledge (teaching experience) among your colleagues?'
2. 'How do you feel about sharing knowledge with other members of your university?'
3. 'What factors can motivate CS academics to share their teaching practices?'
4. 'What are factors that can prevent knowledge sharing with your colleagues?'
5. 'What do you expect to gain from sharing your knowledge?'
6. 'What do you think are the benefits of sharing teaching experiences with others?'

7. ‘What technologies must be implemented to encourage academics to share their knowledge in your college?’
8. ‘What technologies are currently used to share knowledge in your college?’
9. ‘What is an important feature that will encourage CS academics to share teaching experiences through an online platform?’

A pilot study was conducted with three members of the target population to ensure that the participants understood the questions and that the questions provided relevant information. More detail is provided in the next section.

4.4.2 Pilot Study

A pilot study was carried out with three participants who were CS academics at Jeddah University, the selected sample. Two participants were lecturers with teaching experience; one of them has six to 10 years of experience, and the other has less than two years. the final participant was an Associate Professor with 1 to 15 years of teaching experience. The objective was to ensure the clarity of the questions and that they provided significant information relevant to the research. The pilot study also yielded valuable data regarding the time needed to respond to the inquiries. The insights obtained from these interviews were examined together with data from additional interviews. Hence, the pilot study allowed for the refinement of data collection by focusing on specific analytical themes [276]. Based on the pilot study, minor modifications were made to the questions prior to subsequent interviews to elucidate some aspects to the participants. After the completion of the pilot phase, the main part of the research commenced, as elaborated below.

4.4.3 Population and Sample

Qualitative research typically involves a small number of participants [277, 278], with the sample size based on ‘saturation’, meaning that data collection continues until no new information is obtained [279]. Based on this recommendation, interviews were conducted until no additional new or unique information was gathered from subsequent participants in this study, thus determining the number of participants required [279]. A total of 17 CS academic staff members at Jeddah University in Saudi Arabia were interviewed through online, semi-structured interviews. This university was chosen based on its convenient accessibility and the fact that it had garnered the majority of replies to the survey.

4.4.4 Data Collection

During data collection for the survey in Section 4.3.4, participants were asked to participate in the interviews related to this study. If participants chose to take part in the interview, they completed the electronic consent form and provided their email address and phone number to facilitate communication with the researcher and scheduling the interview.

Subsequently, an email was sent to the participants, providing them with a Zoom meeting link (Zoom access provided by Newcastle University). Academics were informed that the duration of the online interview would be 30 to at most 45 minutes. In addition, they were informed that they had the option to stop and withdraw from the interview at any time and for any reason. The interviews were conducted from May 2022 to September 2022. All interviews were recorded by Zoom with the participants' consent and saved on the researcher's university account. This facilitated the secure storage of interviews, serving as a preliminary step before analysis. The data analysis procedure is discussed below.

4.4.5 Data Analysis

Inductive thematic analysis coding was employed to develop an understanding of CS academics' perceptions of teaching-related knowledge sharing among colleagues [280]. Thematic analysis can be defined as a 'method that depends on constant comparative analysis processes to develop ways of understanding human phenomena within the context in which they are experienced' [281]. This approach facilitated the natural extraction of key themes from the data, after which anticipated or predetermined themes were identified [282]. Braun and Clarke [283] identified the stages of thematic analysis as follows:

Step 1) Familiarising with the data enables the researcher to read the data and write notes related to initial ideas.
Step 2) The generation of the initial codes enables the identification of segments with meaning in the text by using code highlights in MaxQDA.
Step 3) Theme generation sorts the different codes into relevant themes with the potential to create new themes. In this step, pre-determined themes that have been found to be irrelevant can be deleted.
Step 4) Reviewing and checking themes generated in the previous step.
Step 5) Reporting the analysis by writing down each theme with direct quotes from the data.

Bryman [284] suggests one crucial step is to transcribe the participants' responses early in the process. He argues that this helps to clarify certain points, take notes, and make any necessary adjustments for subsequent interviews. Thus, the data analysis process started with the transcription of interview recordings. Immediately following each interview, the researcher started with listening to the recording to familiarise themselves with the vocabulary utilised and to obtain an understanding of the context. This presented an initial opportunity to acquaint themselves with the data and begin to critically examine it. At first, the researcher tried automated transcribing systems, but the outcomes were imprecise, because the interviews were conducted in Arabic. Therefore, all interviews were transcribed manually using MS Word and made anonymous using code numbers instead of the participants' real names, i.e. P1 to P17, to maintain confidentiality and anonymity. Forty-five minutes of interview generally took around one and a half hour to type up.

Upon completing all interviews, the researcher reviewed all transcripts by listening to the recorded interviews again to avoid errors. Then, all transcripts were uploaded to the MaxQDA software application, which is primarily developed for qualitative data analysis and coded electronically. MaxQDA was chosen over Nvivo, because it supports Arabic.

A meticulous examination of each line was conducted and the responses were categorised by assigning codes to determine their primary topic. This facilitated the extraction of the primary themes that were mentioned by the interviewees. All codes and themes were in Arabic and were translated into English and back translated into Arabic with the aid of bilingual professionals in order to guarantee the precise transmission of their intended significance. This action was taken to maintain the original content's authenticity and completeness. Upon analysing the qualitative data, a comprehensive depiction of the process and requirements for knowledge sharing among Saudi academics was derived. To validate the findings from the qualitative data, the researcher employed three approaches. First, the 'back-translation technique' [271] was used, translating themes, codes and quotations from Arabic (in which they were originally written) into English by the researcher and then back to Arabic by the translator, a native Arabic-speaking PhD student from the applied linguistics department at Newcastle University. Second, the findings were peer reviewed [26]. This process was performed by a peer reviewer with experience in qualitative research. The peer reviewer analysed two transcripts separately and then compared the resulting codes with the researcher's codes to ensure that the coding process was valid. Approximately 90% of codes were similar. Finally, the researcher used direct quotations from the participants' responses in the thesis to enhance qualitative validity [272].

4.4.6 Results

A. The results of the interviews identified five overarching themes: the importance of knowledge sharing, the factors that motivate people to share their expertise, the obstacles that stand in the way of information sharing, the Attitude toward knowledge sharing, and the requirements of CS academics. Below, demographic data is provided first, after which each theme is discussed.**Demographic data**

Both male and female academics, ranging from beginners to seasoned professionals in the CS faculty, participated in the research study to ensure the acquisition of precise and thorough findings. The demographic data of the interviewed participants is provided in Table 4.22.

Table 4.22 Demographics of the Participants in the Semi-Structured Interviews

Participant	Position	Gender	Years of experience
P1	Assistant Professor	Female	6-10
P2	Associate Professor	Female	6-10
P3	Assistant Professor	Female	6-10
P4	Lecturer	Female	2-5
P5	Associate Professor	Male	6-10
P6	Associate Professor	Male	6-10
P7	Assistant Professor	Male	2-5
P8	Associate Professor	Male	11-15
P9	Lecturer	Female	6-10
P10	Lecturer	Female	> 16
P11	Lecturer	Female	11-15
P12	Lecturer	Male	2-5
P13	Lecturer	Female	<2
P14	Associate Professor	Male	2-5
P15	Associate Professor	Female	11-15
P16	Assistant Professor	Female	11-15
P17	Assistant teacher	Female	11-15

4.4.6.1 First theme: The importance of sharing teaching experiences

All interviewees (N = 17) strongly agree with the importance of sharing teaching experiences as a way of learning and helping their colleagues to learn from each other. For example, Participant P1 indicated that ‘we will learn from each other’ and Participant P2 stated that ‘sharing teaching experiences helps me to recognise my mistakes and weak points to improve my understanding’. Seven participants believed that sharing teaching experiences might help academics, whether novices or more experienced, to gain teaching skills through peer learning instead of starting from scratch. Participant P3 stated that ‘instead of everyone starting from scratch, it is better for us to

participate... I give you my experience, and you give me your experience... For example, he/she might not have teaching experience, but he/she has the knowledge of developments and modern tools'. Thus, sharing knowledge will help to spread knowledge, enhance educational progress and provide continuous improvement in teaching and learning in the workplace. 'The greater the exchange of experiences among the members, the higher the quality, and the educational outcomes will be enhanced' (Participant P4). 'It ensures continuous improvement among all academics' (Participant P5).

In addition, the majority of respondents (N = 15) said that sharing teaching experiences might help them to improve teaching and classroom practices and academics' performance. They agreed that sharing teaching experiences would raise the teaching competency of academics, which would be reflected in students' outcomes. Participants also see sharing teaching experiences as a way to facilitate teaching tasks. Five participants reported that sharing helped them to improve their teaching skills and gain new skills. For example, Participant P8 said: 'To gain the necessary skills for teaching in record time... sharing teaching experiences makes us advanced in teaching'. Sharing teaching experiences was seen as a way to help other academics who are involved in designing course syllabi to avoid errors that might affect the quality of teaching outcomes: 'The faculty member had experience teaching the curriculum, and every time he taught this curriculum, he discovered gaps and begins to avoid them in the coming years, so when this expert shares this experience with colleagues, it helps others to avoid issues' (Participant P9).

Most responses (N = 14) discussed the benefits of sharing knowledge for new academics, who have no experience teaching or are teaching a new curriculum. Sharing knowledge helps them to prepare their curriculum. Participant P2 said: 'This information [that came from knowledge sharing] helps me prepare for the new material... Thus, it is really important for the new faculty member and me as an expert faculty member'. In other words, sharing knowledge helps new academics to save time and effort. Participant P5 said: 'It will help novice academics to save time and effort to build their teaching experience instead of starting from scratch'. Moreover, most of the responses (N = 12) indicated that knowledge sharing would help them to save time when they prepare lectures. Also, some (N = 9) agreed that it saves effort when they need to teach new curricula. Moreover, it saves effort for academics in general: 'It will save effort. In particular, we suffer when we teach a new subject that we have no experience with, or the curriculum has been updated... The sharing of experiences gives me ideas and resources that help me to prepare lectures... Therefore, this will help reduce the educational effort that I need to make' (Participant

P11). The majority of respondents (N = 14) emphasised the importance of sharing teaching methods among academics. This is because curricula vary, and therefore, the same method cannot be used for all curricula in CS. Participant P14 stated: 'We cannot use one teaching method for all college subjects... the curricula have different requirements'. Participant P13 also noted that 'the curricula differ from each other'. CS academics are thus aware of the importance of sharing teaching-related knowledge among peers and of its benefits in improving their teaching skills.

4.4.6.2 Second theme: The factors that motivate knowledge sharing among CS academics

Responses about motivating factors for sharing teaching experience imply there are two kinds of motivation: intrinsic, which depends on the person, and extrinsic, which comes from another person or the organisation. Some academics in these interviews exhibited internal motivation e.g. '...I desire to improve my teaching experience to be better regardless of motivation from leadership...' (Participant P9). Other responses illustrated the desire to develop new teaching methods to deliver information to students. Participant P12 said: '...the desire to innovate a new way of teaching to deliver information, so this is an incentive to share teaching-related knowledge'. Responses also indicated that gaining a good reputation among colleagues is a motivating factor for sharing teaching experience. Participant P14 said: 'In my view, motivation for sharing knowledge depends on individual factors like academics gaining a reputation in the faculty'. Most of the participants in the study expressed that their faculty's leadership could motivate academics to share their experiences by introducing a reward system. They believed that this could be one of the most significant motivating factors for academics, which could also impact their teaching performance evaluation. One of the participants, P7, stated that 'a reward for anyone who provided a service, whether material or moral, by saying "thank you"' would be a motivating factor. Additionally, they suggested that the faculty leadership should recognise and appreciate academics who share their experiences by giving them certificates of appreciation or material incentives. Another participant, P8, emphasised the need for a clear evaluation system for sharing knowledge, which could be in the form of rewards or certificates of thanks and appreciation. Participant P12 also highlighted the importance of certificates of appreciation or material incentives. Participant P15 suggested that the faculty's leadership could give certificates of thanks for sharing knowledge with colleagues and count them as volunteer points. One of the respondents pointed out that feedback from colleagues on their teaching encouraged them to engage with their colleagues to share teaching experiences. Participant P2 said: 'The feedback I received from many colleagues. For example [when someone

says]: “I heard you say .... and applied it, and this information made a difference in my teaching...”. When I see this, I am motivated to share my experience more and more’.

4.4.6.3 Third theme: Barriers to knowledge sharing

According to most participants (N = 15), personal factors were a crucial factor in influencing knowledge sharing. However, some participants stated that their colleagues were unwilling to share their ideas and efforts with them, which they viewed as a barrier to knowledge sharing. Participant P8 believed that extreme reservation and privacy prevented sharing knowledge, while Participant P12 stated that some people preferred not to share information or their way of teaching because they considered it their own. Many respondents (N = 14) cited selfishness and monopoly as reasons for the prevention of sharing knowledge. Fear of making a mistake and being held accountable by higher leadership was also mentioned as a factor. Participant P11 said: ‘A person’s fear that he made a mistake in a specific area and that he might be punished for it’. Finally, some respondents want to be the best and gain a reputation. Participant P9 noted that some people do not want to share knowledge because they want to be seen as the best. Moreover, some participants said that some academics do not take the initiative to share their knowledge. One participant mentioned that some behaviours of academics prevent communication, because they do not accept information or may offend others during discussions.

External factors that might inhibit knowledge sharing were highlighted by some participants. They mentioned that face-to-face meetings are one of the best ways to share knowledge with their colleagues, but there may be no time for this, for example because of teaching load, which 11 participants mentioned prevents them from sharing their knowledge. Participant P1 said: ‘...and I want to add another point, which is teaching load, as academics are busy with teaching, so there is no time to meet with colleagues or ask them questions, and then when they end their lectures, they leave the college. This is a barrier to sharing their knowledge’. Other responses about external factors or barriers to knowledge sharing included the fact that many academics have administrative and development tasks in their faculty, which take up their time. Participant P6 said: ‘It is their responsibility to participate in administrative and development activities’. Other participants indicated that institutional policy might not encourage the sharing of knowledge among academics. For instance, Participant P6 said that ‘leadership does not count knowledge sharing as volunteer hours’. However, all of the participants (N = 17) agreed that one of biggest barriers that academics face is that there is no effective way to communicate with colleagues to share teaching experiences aside from face to face. Participant P3 mentioned a

‘difficulty in face-to-face communication due to lack of time and teaching loads, and I do not have an alternative way to communicate with others, such as online communication, that could be easier’. It can seem that CS academics face challenges that prevent them from sharing their teaching related knowledge due to time constraints primarily imposed by teaching loads and administrative and development tasks. Such constraints prevent them from communicating face to face. CS academics indicated that University policy does not prioritise encouraging academics to share knowledge and has no specific communication tools specifically to facilitate sharing their teaching experiences. Therefore, an interactive online platform can be developed to facilitate the sharing of teaching experiences among academics in order to address barriers. This platform could include various features, such as creating posts and a discussion board, providing a more accessible and collaborative environment for sharing teaching-related knowledge.

4.4.6.4 Fourth theme: Attitude toward knowledge sharing

All participants (N = 17) agreed that the act of sharing knowledge with others elicits a profound sense of awe and admiration. Some individuals expressed that sharing is pleasurable and brings them happiness, but others mentioned that it is gratifying and provides a sense of comfort, ultimately boosting their confidence. Participant P16 expressed that sharing their experience brings them a sense of comfort, confidence, and enjoyment, which they believe benefits everyone. Several participants highlighted that engaging in information-sharing activities enhances their sense of self-worth. Multiple participants expressed their willingness to share their teaching experiences, as they considered it was their duty to disseminate their knowledge. Participant P2 expressed a desire to disseminate information and observe its impact on the work environment. Others argued that information sharing included the acquisition of knowledge for both themselves and others, thereby enhancing their expertise.

Most participants emphasised that sharing might enhance networking among academics, thus fostering a better and more interactive work environment. Furthermore, they asserted that it has the potential to enhance the motivation of educators to engage in innovative teaching methods. All participants expressed the belief that sharing would enhance the outputs and overall productivity of their institution, as well as that of their own department. Therefore, these findings confirm those of the second study, which showed the tendency and willingness of CS academics to share their knowledge with peers.

4.4.6.5 Fifth theme: CS academics' needs

- **Types of knowledge**

Most CS academics mentioned a need for sharing explicit knowledge relating to new materials and resources. This would help them to prepare their modules. One of the participants stated: 'We need to share the resources for a specific module, such as slides, exams and exercises, especially for new modules or when they are updated' (Participant P4). Most of the responses also mentioned the need to share tacit knowledge about the best teaching methods, effective communication with students, tools used for teaching, and assessments. This knowledge usually comes from participants' teaching experiences. For example: 'We can share best teaching methods that attract the students... and the more distinguished a teaching method is, the more this is reflected in students' outcome' (Participant P14). In addition, they indicated that they faced a struggle to deliver knowledge to students. For example: 'I struggle to deliver information to my students effectively as a novice academic' (Participant P12). Therefore, the most effective teaching methods often stem from practical teaching experiences and collaboration with experts. It is important to note that academics frequently need to exchange teaching-related knowledge in order to enhance their curricula, regardless of their level of expertise. This type of knowledge can enhance their teaching abilities.

- **Technologies**

Most respondents (N = 14) mentioned a need to create a special technological platform for sharing knowledge among CS academics within their faculty to facilitate sharing knowledge in an asynchronous manner. Participant P16 said: 'The best way is to have an electronic platform where experiences are exchanged, because it facilitates a meeting between members, and logging in at any time and place becomes possible. ... And it is better than meeting face to face'. They pointed out that this platform needs many features to work effectively, such as a discussion forum to ask questions and share media and files among peers. It also needs to be easy to access and use. All responses indicated the need for an integrated electronic platform (all features on one platform) that is accessible anytime and everywhere. For instance, one participant mentioned: 'Unfortunately, there is no online platform with all the features we need, so if they were all combined in one interactive platform using the modern technologies that are now available, I very much expect this to work great' (Participant P3). Others indicated the importance of e-documentation of teaching experiences to save and use when they need it. 'If there is an electronic platform that allows for

documentation, and members can enter at any time, this is better...' (Participant P17). This is because some academics could leave their job, which leads to a loss of their experience if it has not been documented. Participant P4 noted: '...there are academics who travel to complete postgraduate studies outside the country or others whose contract is terminated at the end of the year and the job is left without documentation of teaching experience for the subjects they studied... or some retire from the job'. In addition, one of the interviewees stated that 'during the semester, there were some mistakes in the coding, but I documented this mistake, and how to solve it then I saved on my own laptop, so we need to document that and update the material' (Participant P3). The findings of the interviews suggest that a function that classifies knowledge based on modules (courses) would be useful to facilitate the search process. Therefore, the features mentioned in these interviews were added to the initial requirements for the prototype design phase of the research.

4.4.7 Discussion

The interviews aimed to comprehend the perspectives of CS academics about sharing teaching-related knowledge among colleagues, as well as the factors that influence knowledge sharing, such as motivation, barriers, and the technology utilised for knowledge sharing within the CS faculties in Saudi Arabian universities. This study partly answers RQ2. The participants were male and female academics who hold various academic positions and have diverse levels of teaching experience in higher education, ranging from novices to seasoned professionals. The interviews enhanced comprehension and ensured the study's precision and comprehensiveness. The interviews revealed five overarching themes: the significance of information exchange, motivating factors, obstacles, ATKS, and the demands of CS academics.

The interviews indicate that academics' inclination to exchange teaching experiences with colleagues stems from the advantages they gain both personally and for the educational institution. According to their assessment, it can be seen as a method of acquiring knowledge and assisting fellow colleagues in learning from one another, especially for inexperienced academics who have not taught before. Furthermore, it can serve as a means to assist other scholars engaged in the creation of course syllabi in avoiding mistakes that could impact the effectiveness of teaching results. Disseminating pedagogical information among CS academics could potentially streamline the process of curriculum preparation, resulting in time and effort savings. Hence, it can be asserted that academics in the field of CS recognise the significance of disseminating teaching-related information, with the potential to improve the quality of teaching and manifest in students' achievements [285].

The qualitative results clearly show that participants prefer to share knowledge regarding courses, as well as implicit knowledge concerning optimal teaching methods, effective student communication, and teaching tools. They mentioned that they struggle to deliver knowledge to their students, especially novice academics. The results support previous studies showing that CS academics are typically trained as researchers and may not be well versed in effective teaching methods [16]. Therefore, academics in HEIs can enhance their teaching skills by engaging in discussions with colleagues about effective teaching practices. This can be particularly beneficial for newer faculty members [20]. As a result, it can be concluded that sharing this knowledge type would benefit them in preparing their modules, potentially leading to improvements in curricular resources and classroom practices they need to support their students.

Interestingly, all CS academics involved in the interviews emphasised the importance of recording teaching experiences for future reference and utilisation. They reported that some academics leave their jobs due to retirement or termination of the employment contract in the department, leading to a loss of their experience if it has not been documented. These findings align with previous research that emphasises the need for HEIs to preserve knowledge, particularly when experienced or knowledgeable academics leave and novices come in [165-167]. Preserving knowledge allows the HEI to remain innovative, enhance academic performance, and stay ahead of the competition [106, 168].

The results identified several obstacles that could hinder the exchange of teaching-related knowledge among CS academics. The main barrier is the lack of efficient communication methods, aside from face-to-face interaction, which is challenging due to academics' heavy teaching load. This is compounded by their administrative duties, limiting their available time. These findings are supported by similar results from previous studies. For example, Skaik and Othman [77] found that the primary reasons why staff could not exchange work-related information face to face were time constraints, which led to limited opportunities. The findings are also consistent with Alotaibi et al. [4], who found that academics in Saudi universities teach more than 16 hours a week on average. A lack of efficient communication among peers and a lack of motivation are significant barriers to knowledge-sharing activities.

The qualitative data indicates that most CS academics are open to the idea of instituting a reward system to motivate knowledge sharing, such as certificates of appreciation or material incentives. A reward system has been found to be a strong motivator for knowledge sharing among academics and could substantially impact their teaching performance. These results are in line with

the results from Gururajan and Fink [286], who found that a reward system helps motivate sharing among academics. Additionally, gaining a positive reputation among peers and improving teaching skills are important motivators for sharing knowledge. Academics also value receiving feedback from colleagues, which leads to increased interaction and knowledge sharing. Therefore, rewards and gaining a positive reputation are likely to motivate academics to share their knowledge with their colleagues.

Furthermore, participants highlighted the demand of developing a unified technological platform to share teaching-related knowledge among CS academics in their faculty. They emphasised that utilising such an integrated online platform would enable asynchronous sharing of knowledge that is accessible anytime, from anywhere, and that it would facilitate easier contact with expert academics instead of face to face, as mentioned. Participants highlighted that for this platform to function effectively, it would require several specific features, such as a discussion forum to ask questions and share media and files among peers. In addition, they need a function that classifies knowledge based on modules (courses) to facilitate the search process.

Based on the findings detailed above, the current state of affairs for CS academics in HEIs shows a pressing need for a novel knowledge sharing platform that caters to their unique teaching requirements, particularly teaching-related knowledge. This could be a solution for overcoming the current challenges associated with sharing teaching experiences among peers. Moreover, this system should come equipped with functional tools that enable academics to capture, store and share knowledge effectively while ensuring seamless coordination. In addition, effective motivation factors should be applied on the platform to encourage the sharing of knowledge among CS academics.

4.5 Summary

This chapter discussed three investigation studies on knowledge sharing in HEIs for learning and teaching purposes. The first study employed an online questionnaire to explore sharing knowledge through social media. The second study utilised an online questionnaire to explore CS academics' perspectives on teaching-related knowledge-sharing behaviour. The third study conducted online interviews to gain an understanding of academics' perceptions of teaching-related knowledge sharing among colleagues and knowledge sharing factors and current technology used for knowledge sharing in the school of computing.

The first study's findings in Section 4.2 answer the first question (RQ1: How do pre-service educators utilise existing social media platforms to engage with peers and professionals for teaching and learning purposes?). The study showed that pre-service teachers utilise social media platforms for various educational purposes, including information retrieval, knowledge acquisition, and knowledge sharing. This implies that the act of exchanging ideas and information has the potential to facilitate rapid and effortless acquisition of knowledge, thereby enhancing the process of learning. In addition, the study's findings indicate a significant correlation between the utilisation of social media platforms for sharing content among colleagues and the establishment of a conducive learning environment. Moreover, the study revealed a statistically significant correlation between the perception of social media applications as effective learning environments and their actual impact on learning outcomes.

In general, the first study indicates that pre-service educators are in agreement that making use of social media platforms to share knowledge with their colleagues is beneficial to their educational journey. This conclusion is backed by the statistical correlation. Based on the statistical correlation, I propose that applications for social media can function as a powerful educational platform that can enhance the learning experiences of pre-service teachers.

In summary, there is a growing impetus to promote incorporating these technologies into professional development programmes in HEIs, aiming to enhance the competencies of both pre-service and in-service teachers. Integrating these technologies can resolve challenges related to time and resource constraints and enhance professional abilities. Nevertheless, it is imperative to acknowledge certain factors that may exert an influence on the efficacy of these technologies. These factors, including ease of utilisation, utility, and motivation, warrant careful consideration [189]. The findings present a persuasive case for the incorporation of social media within the educational setting to enhance teaching and learning. The application of social media and its diverse elements offers new prospects for promoting sustainable professional development and lifelong learning.

The findings of the second study in Section 4.3 and the third study in Section 4.4 answer the second research question (RQ2: To what extent are CS academics in HEIs aware of the importance of knowledge sharing?). Most academics are aware of the importance of exchanging teaching experiences and its potential benefits for their teaching practice. The findings of the second study in Section 4.3 reveal that CS faculty members in Saudi universities have a favourable disposition towards the exchange of knowledge for the purpose of teaching. The factors influencing

the sharing of teaching experiences, such as ATKS and EC, significantly impact the WSK, which in turn influences the sharing behaviour. This is supported by the results of the third study discussed in Section 4.4.

The results of the third study show that there are many challenges that prevent knowledge sharing, such as a lack of effective communication tools that facilitate sharing and motivation factors that encourage academics to share. This highlights the main problem encountered in exchanging teaching experiences. It is interesting to note that all participants agreed on the importance of developing technological solutions to enhance the exchange of knowledge among peers.

This work aims to provide a foundation for future research to address the problem of inadequate communication and promote the documenting of teaching-related knowledge in HEIs. The overall goal is to create a system that allows interested peers to access and utilise this knowledge readily. The findings of these studies offer preliminary insights into the need for a KSM system. In the next chapter, a conceptual model for such a KSM system is presented. This model incorporates many functions and features derived from the findings discussed in the current chapter.

Chapter 5 Design of the Teaching Experience Platform (TEP)

5.1 Introduction

The findings from Chapter 4 revealed the challenges faced by CS academics when exchanging teaching-related knowledge with peers. Furthermore, it highlighted CS academics' need for a new communication tool to facilitate the exchange of knowledge, overcome the problem of ineffective communication, and promote the documentation of teaching-related knowledge in HEIs. Based on these findings, this chapter develops a KSM system that simplifies the exchange of teaching experiences among CS academics. A KSM system is an internet-based platform or framework specifically developed to streamline the process of creating, storing, retrieving, and exchanging knowledge within an organisation. The functionality of a KSM system might vary based on its specific purpose and to align with the distinct demands and objectives of the organisation. This feature renders it a highly efficient instrument for capturing, arranging, and disseminating knowledge. This chapter represents the design phase in this research methodology, as discussed in Section 2.2.2.

This chapter addresses the third objective (RO3) of the thesis, which is the development of the KSM system to be deployed in the faculty of CS. This is the TEP. It also addresses the third research question (RQ3), on the features and functions CS academics require in the proposed platform in order to encourage the sharing of knowledge. The design phase of the proposed TEP employed SSM to examine and analyse the requirements and the JAD technique to authenticate the prototype.

The key contribution of this chapter is the design of the TEP system, as well as the validation of the TEP system prototype through the utilisation of a mix of JAD and SSM. The chapter begins by discussing the proposed TEP in Section 5.2. The system architecture is discussed in Section 5.3, the use case diagram is provided in Section 5.4, and the prototype is showcased in Section 5.6. The conclusion can be found in Section 5.7.

5.2 Proposed System

SSM is employed to identify the problem situation and analyse system requirements from human activities aligned with CS academic perspectives extracted from the investigation studies' findings [36], as mentioned in the Section 3.5.1. The investigation studies' findings in Chapter 4 reveal a notable challenge: the absence of efficient communication channels beyond traditional face-to-face interactions, combined with a lack of motivation. This issue is compounded by academics' heavy teaching commitments, leaving them with minimal time for knowledge exchange. The findings

underscore the critical necessity for CS academics to share insights on course content and tacit knowledge concerning optimal teaching methodologies, student engagement techniques, and the utilisation of teaching tools. Participants overwhelmingly advocate for developing an integrated technological platform tailored to the specific needs of CS academics, fostering asynchronous knowledge sharing accessible across various locations and time zones.

The problems in this situation are primarily related to KM mechanisms, sharing knowledge related to teaching, and how this is facilitated. SSM proposes a root definition of a solution to the problem of teaching-related knowledge-sharing barriers by developing a comprehensive information system to support knowledge-sharing activities. This situation presents a number of challenges, most of them are associated with the methods for managing knowledge, the exchange of knowledge connected to teaching, and the manner in which this is supported.

Effective system design requires a thorough analysis and understanding of the requirements at the outset to fulfil the need of a teaching related KSM system as requested by CS academics. As part of designing this system, a set of actual users' requirements and needs were extracted and then mapped to the KM functions. The proposed TEP will create, collect, store, and share knowledge of CS academics. It will facilitate knowledge sharing related to teaching among academics to enhance the quality of teaching in CS. Table 5.1 presents a compilation of requirements and needs derived from interviews alongside their corresponding features and functionalities in the KMS.

Table 5.1 Requirements and Needs and their Corresponding Features and Functionalities in the KMS

Barriers to share knowledge	**Issues**	**which study**	**Solution**	**TEP functionalities**
Lack of Structured Platforms	-There was no dedicated system or formal mechanism for sharing teaching-related knowledge. -Academics need able to document their knowledge.	interviews	The TEP serves as a dedicated, centralised system for knowledge sharing	Structured templates for knowledge creation and sharing
Time, geographical and social Constraints	-Academics often cited lack of time as a major obstacle, teaching responsibilities. - Participants need a means of asynchronous communication to discuss issues with colleagues who teach the same courses. For example, sharing a	Interviews and questionnaires with CS academics	Asynchronous platform where academics can share and access knowledge at their convenience.	Discussion forums and Document management

	file as a video or image. - Resources or documents for all courses need to be in one place. -Participants need to be able to search and retrieve the knowledge they documented when they need it.			
Motivation factor	- a lack of rewards. -Participants need motivation factors to encourage them to share their knowledge. - Participants want an interactive platform to share and interact with their colleagues.	All studies	The TEP incorporates gamification and social features to motivate participation and engagement.	points and leaderboards and Social feature (Like and favourite)

The recommended system requirements are based on the findings of the investigation studies. The conceptual model of the TEP system is presented in Figure 5.1.

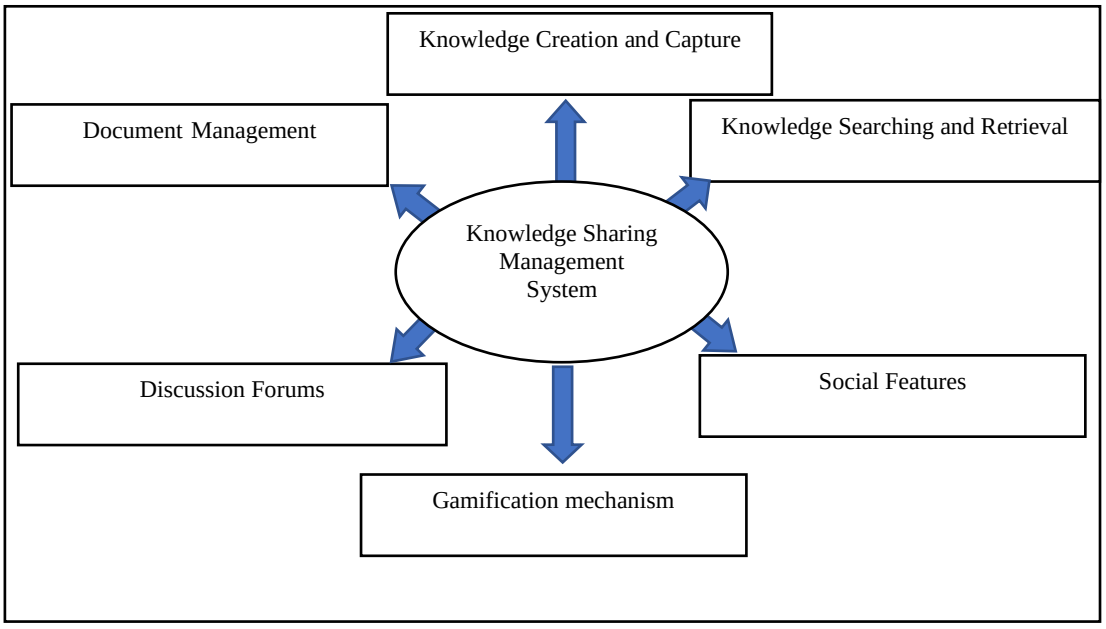


Figure 5.1 The Conceptual Model of the TEP

Based on these requirements, the solution is a comprehensive web-based KSM system with six functionalities, as follows:

5.2.1 Knowledge Creation and Capture

This functionality will allow the documentation of teaching experiences, allowing users to share suggestions for specific modules, experience with modules, how to make module assessments, teaching methods, issues in the lab, any errors in the code, and corrections for specific modules and learning tools. It will provide a tool to create content and contribute tacit knowledge. This personalisation strategy will help to capture tacit knowledge and can be shared [60], as mentioned in Section 3.2.1. This function required designing a document template for CS academics to capture the teaching-related knowledge (tacit knowledge) and represent the explicit knowledge in a clear form. This template design should be aligned with CS academics' demands for their work practices, because it positively affects their knowledge sharing behavioural intention, according to Alotabi [4]. Thus, the template consists of knowledge attributes that could help academics describe their knowledge easily based on their requirements. The template will provide a clear structure with a set of coherent and related attributes to organise the knowledge content, thus saving time and effort for the CS academics when they document their knowledge [287]. Table 5.2 presents a description of the knowledge attributes in the template. All these attributes are related to teaching experiences in a specific course context.

Table 5.2 Description of the Knowledge Attributes in the Template

Knowledge attribute	**Description**
Title	A suitable title to document your teaching experience.
Description	Add a written description of the teaching experience content, outlining the expected outcomes resulting from its application.
Upload file	Attach a file if necessary.
Teaching experience type	Classification of the teaching experience by application (e.g., teaching practical, lessons learned, teaching material, teaching method, assessments, mistakes).
Applies to	Where was the teaching experience applied? (e.g., in the lab, in a lecture, in a seminar, in a workshop, in distance learning).
Select department	Department of the course to which the experience applies.
Select course	Course to which the experience applies.

5.2.2 Document Management

This functionality will allow users to save the documents or resources related to the modules, such as slides, syllabi, labs, exam forms and QA forms, in one place, thereby enabling users to download and view them whenever they need. This includes the document storage process, indexing and

future retrieval to reuse it. Thus, this will enable academics to manage content more effectively. It will also enable users to search and retrieve documents and contents quickly. This codification strategy allows the reuse of existing knowledge [60]. This function can provide substantial benefits for the organisation, which can protect the organisation from losing employees' knowledge due to for example academic retirement [70].

5.2.3 Knowledge Searching and Retrieval

This functionality will be used to search and retrieve the documents in the proposed system. CS academics will be able to specify what content they would like to search for by suggesting relevant content or they can choose keywords. The system will provide robust search and retrieval capabilities that will enable CS academics to locate specific knowledge quickly and easily in order to develop an effective system, thereby saving a significant amount of time and effort. This function is crucial for a successful proposed system and for improving work procedures and practices[288, 289].

5.2.4 Discussion Forums

This feature will facilitate collaboration and communication among academics anywhere, anytime, thereby encouraging them to share teaching-related knowledge, ask questions, and engage in discussions. The participants in the interviews and questionnaires indicated that they need a means to communicate at different times to ask questions about issues with colleagues who teach the same courses.

5.2.5 Social Features

This feature will integrate social media into the platform to promote user collaboration and knowledge sharing. Users will have the ability to rate the knowledge provided, highlighting valuable content. For instance, users can leave comments and replies on posts, photos, or other shared content. Additionally, they can express appreciation for content by clicking a 'like' or 'favourite' button. These functions will meet participants' requirements, as expressed in the interviews, where they indicated their need for an interactive platform to share and interact with their colleagues.

5.2.6 Gamification Mechanism

This feature will be offered with the intention of encouraging academics to share their knowledge with their colleagues. As a method of counting points won depending on the quantity of their knowledge contributions to the system, it is possible that this may be taken into consideration. On

the other hand, it might be regarded as a prize. Academics stated it would be good to get rewards and recognition, so the system will include a feature that will award points to users depending on the quantity of their knowledge contributions to the system.

The structure identified above was used to create the system's architecture, use case, initial scenario, and prototype mechanism. The system architecture is discussed in the next section.

5.3 System Architecture

The system architecture is a crucial part of the system's design, which focuses on the main components of a system's design and their interaction way [290]. For this reason, the architecture was designed using the system structure discussed above. Moreover, the use case diagram (see below, Section 5.4) was used to determine the components of the system. System architecture involves designing principal components and their interactions to facilitate capturing, organising, retrieving, and sharing knowledge within the system. The architecture of this system consists of three layers in addition to relationships between its components, as illustrated in Figure 5.2.

Presentation layer:

The first layer of system architecture is the Graphical User Interface (GUI), the system's primary gateway that enables users to interact with system resources. This layer is responsible for authentication, including user registration and verification, and requires users to provide a username and password to access the system. Users must enter their unique username and password to access resources or services on the system. By requiring authentication, the system can prevent unauthorised access. Two user categories interact with the system: those who teach the CS curriculum at the faculty and coordinators, who are CS academics with additional responsibility for coordinating a specific curriculum. Both use all system functions. Administrators have the authorisation to validate the content and add resources. Users can access the system from various devices, such as PCs, laptops, tablets, and mobile phones.

Application layer:

The second layer supports the knowledge functions of the system discussed in Section 5.2. It includes knowledge capture and creation, document management, knowledge search and retrieval, discussion forums, social features, and gamification mechanisms. Knowledge creation and capture functions facilitate tacit knowledge acquisition and allow users to read information using a comprehensive template easily. It uses a personalisation strategy approach that documents tacit knowledge from experience, as discussed in Section 3.2.1. Document management involves organising and classifying all educational materials based on the relevant curriculum. This function

will allow academics to browse and download the resources that coordinators uploaded. It uses a codification strategy approach that involves existing knowledge to reuse it, as discussed in Section 3.2.1. Tags, labels, and keywords will be used in search and retrieval functions. This will enable users to find the required knowledge stored in the database. Discussion forums will connect members and allow them to interact by asking questions and answers as a collaboration tool. Additionally, social features will enable users to interact with posts or questions asked by using likes, favourites and writing comments. To motivate the users, gamification elements are used, such as points and leaderboards. This allows users to earn reputation points to encourage them to participate in sharing their knowledge by calculating points displayed on the leaderboard.

Database layer:

The third layer manages and stores content knowledge and users' information. The knowledge repository may encompass the content, e.g., documents, multimedia content, and tacit knowledge captured from users' experiences. The user's database will encompass the user's name, password and reputation points.

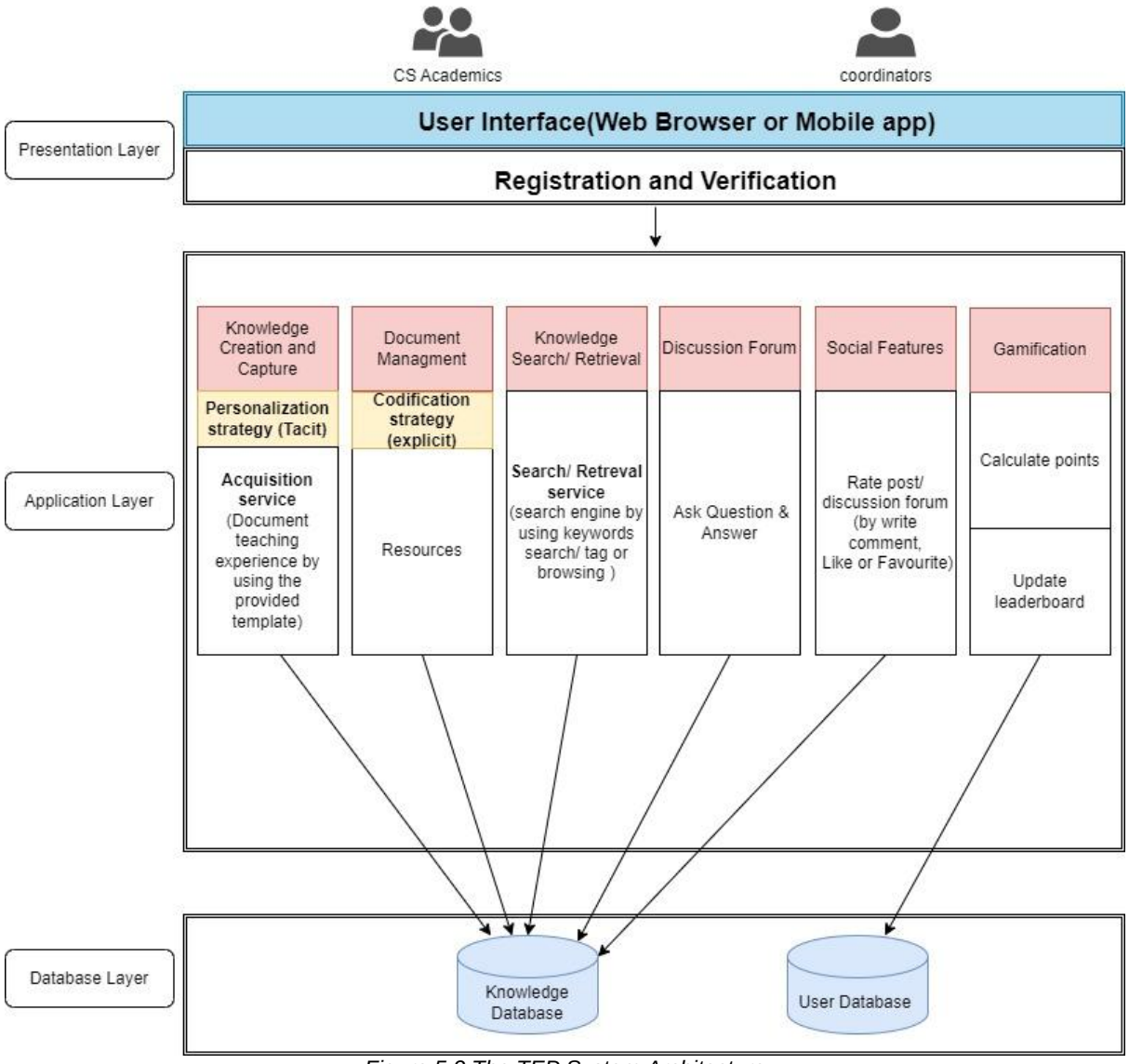


Figure 5.2 The TEP System Architecture

5.4 Use Case Diagram

The primary purpose of a use case diagram of the proposed system is to visually represent the interactions between users (actors) and the system's primary functional components (known as use cases) to accomplish specific tasks or goals [291]. The use case diagram of the proposed system includes the name of the use case and the actors involved, the association between actors and the use case, and the relationship among use cases, illustrated in Figure 5.3.

There are two actors in the use case diagram. The first actor is a CS academic who teaches the CS curriculum at the School of Computing. The second actor is a coordinator, a CS academic with additional responsibilities for coordinating a specific curriculum. All actors (CS academics and coordinators) log into the system. After that, each actor can add, update, or delete their own

post or write comments on others' posts. On the discussion forum, they can ask their own questions and answer others' questions. Moreover, they can search for knowledge (post or question) by typing keywords or viewing all posts and discussion forums. All actors can rate the knowledge that is presented in the form of posts, questions, answers and comments. Furthermore, they can view and download the resource lists. In contrast, a coordinator can upload the resources related to their curriculum and validate the knowledge on posts, questions, answers and comments. The description of use cases of the proposed system is presented in the next section.

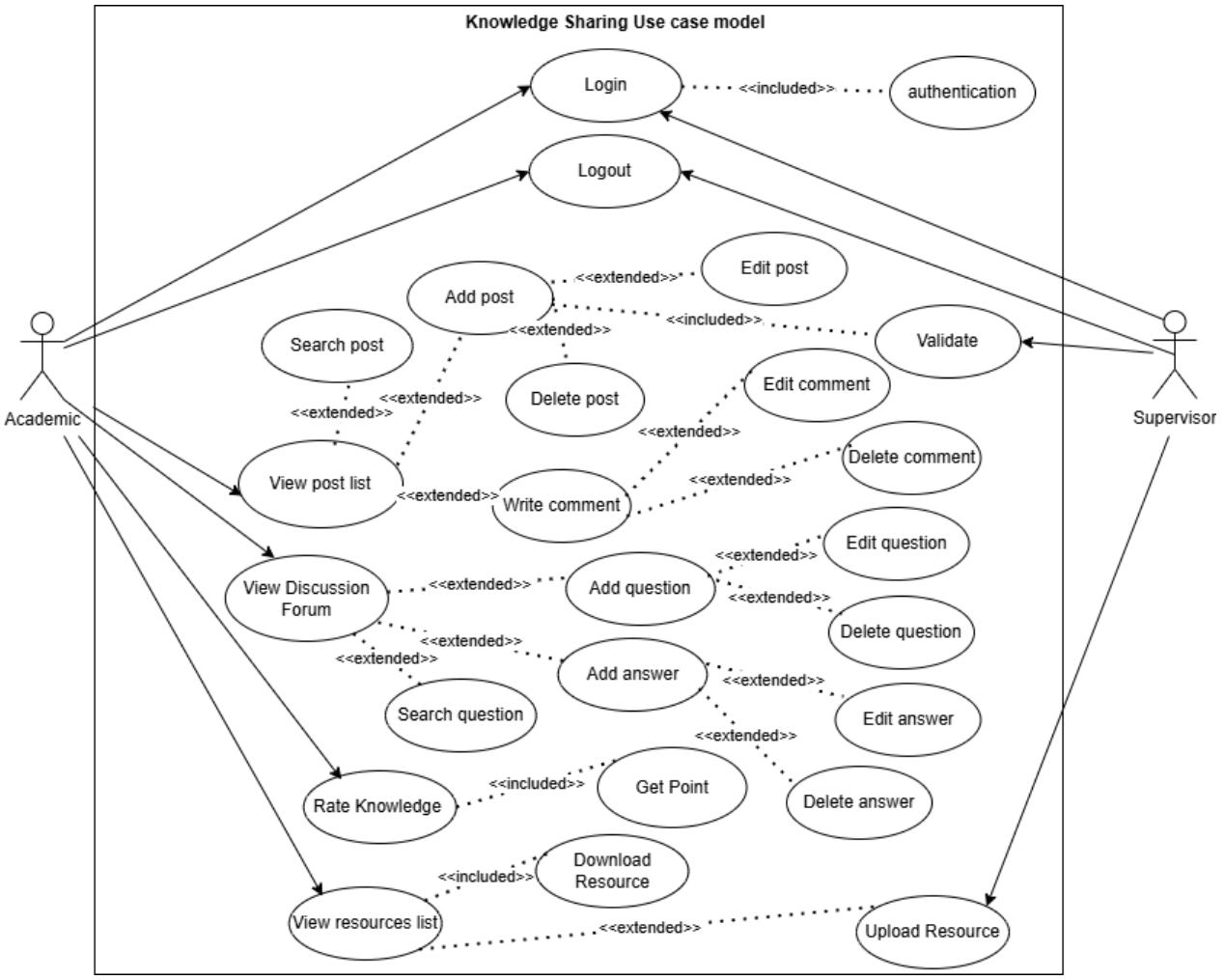


Figure 5.3 Use Case diagram of the TEP System

5.4.1 Specification of Use Case:

- **Use case 1: View Post List**

  Actor : Academic

  Objective: To allow the academic to browse and view the list of posts available in the TEP.

Preconditions:

- The Academic must be logged into the system.

- Posts must exist in the system database.

Postconditions:

- The TEP system displays the list of posts.

- Academics can access additional actions, such as searching, adding, editing, deleting, or commenting on posts.

The flow of events:

1. The Academic logs in and navigates to the "View Post List" page.
2. The system fetches and displays a list of posts.
3. The Academic selects a post to view its details.
4. The system displays the content of the selected post.
5. Posts should be organized by categories or tags for easier navigation.

- **Use case 2: Add Post**

Actor: Academic

Objective:

To allow the Academic to create and add a new post to the TEP system.

Preconditions:

- The Academic must be logged in and have access to the "View Post List" page.

Postconditions:

- If any required fields are empty or invalid, the system displays an error message and prompts the Academic to correct the inputs.

A new post is added to the system.

- The post may require validation by the Supervisor before publication.

The flow of events:

1. The Academic logs in and navigates to the "View Post List" page and then the Academic clicks on the "Add Post" button in the "View Post List" interface.
2. The system displays a form for creating a new post.
3. The Academic fills out the post details (e.g., title, description, tags).
4. The Academic submits the form.
5. The system stores the post in the database and confirms successful submission.

Related Use Cases 2:

- **Edit Post:** The Academic may edit the post after creation.
- **Delete Post:** The Academic can remove the post if needed.

- **Use case 3: Search Post**

Actor: Academic

Objective:

To allow the Academic to enter keywords or tags to filter the posts in the TEP system.

The system displays matching results.

Preconditions:

- The Academic must be logged in and have access to the "View Post List" page.
- Posts must exist in the system database.

Postconditions:

- The TEP system displays the list of posts that related to keywords or tage.

The flow of events:

1. The Academic logs in and navigates to the "View Post List" page.
2. the academics types the keyword in the search box or press tage to retrive the post related it.

- **Use case 4: Write Comment:**

Actor: Academic

Objective:

To allow the Academic to write comments related to the post in the TEP system.

Preconditions:

- The Academic must be logged in and have access to the "View Post List" page.
- Posts must exist in the system database.
- Academic selected the post to write comments.

Postconditions:

- The TEP system displays the list of posts that are related to keywords or tags.

The flow of events:

1. The Academic logs in and navigates to the "View Post List" page.
2. the academic chooses the post.
3. The Academic adds a comment on the post by pressing the comment button.

- **Use case 5: View Discussion Forum**

Actor: Academic

Objective:

To allow the Academic to view, ask, and answer questions in the discussion forum.

Preconditions:

- The Academic must be logged in to access the discussion forum.

Postconditions:

- The Academic can view questions and answers or contribute by asking or answering questions.

The flow of events:

1. The Academic navigates to the "View Discussion Forum" page.
2. The system fetches and displays a list of questions.
3. The Academic selects a question to view its details.
4. The system displays the question and its answers.

- **Use case 6: Add Question:**

Actor: Academic

Objective:

To allow the Academic to ask new question in the discussion forum.

Preconditions:

- The Academic must be logged in to access the discussion forum.

Postconditions:

- The Academic can view questions and answers or contribute by asking or answering questions.

The flow of events:

1. The Academic navigates to the "View Discussion Forum" page.
2. The system fetches and displays a list of questions.
3. The Academic adds a new question in the forum.
4. The system displays the question and its answers.

- **Use case 7: Answer question:**

Actor: Academic

Objective:

To allow the Academic to add respond to the existing questions in the discussion forum.

Preconditions:

- The Academic must be logged in to access the discussion forum.

Postconditions:

- The Academic can view questions and answers questions.

The flow of events:

1. The Academic navigates to the "View Discussion Forum" page.
2. The system fetches and displays a list of questions.
3. The Academic adds answer to the new question in the forum.
4. The system displays the question and its answers.

Related Use Cases 6 and 7 :

- **Edit question or answer:** The Academic may edit the question or answer after creation.
- **Delete question or answer** : The Academic can remove the question or answer if needed.

- **Use case 8: Search question**

Actor: Academic

Objective:

To allow the Academic to enter keywords or tags to filter the questions in the TEP system. The system displays matching results.

Preconditions:

- The Academic must be logged in and have access to the "View Discussion Forum" page.
- Questions must exist in the system database.

Postconditions:

- The TEP system displays the list of questions that related to keywords or tage.

The flow of events:

1. The Academic logs in and navigates to the "View Discussion Forum" page.
2. the academics types the keyword in the search box or press tage to retrive the question related it.

- **Use case 9: View Resources List**

Actor: Academic

Objective:

To allow the Academic to view list of resources available in the TEP system. (e.g., documents, research papers).

Preconditions:

- The Academic must be logged in and have access to the "View Resources List" page.

Postconditions:

- Academics must to see the list of resources available in the TEP system.

The flow of events:

1. The Academic navigates to the "View Resources List" page.
2. The system fetches and displays a list of resources.
3. The academic selects the module they want it.

Related Use Cases 9:

Download Resource: Users can download any listed resource.

- **Use Case 10: Upload Resource:**

Actor: Supervisor

Objective: To allow the supervisor to upload resources (e.g., documents, research papers, slides, labs..etc) for sharing with others on the platform.

Preconditions:

- The supervisor must be logged in and have access to the "View Resources List" page as a supervisor account.
- The supervisor can upload new resources for others to use.

Postconditions:

The supervisor must see the list of resources available in the TEP system.

- **Use Case 11: Rate Knowledge**

Actor: Academic

Objective:

To allow academic to rate the quality or usefulness of the knowledge shared in posts, questions, or answers.

Preconditions:

- The academic must be logged in and have access to the TEP system.
- Posts and questions must exist in the system database.

Postconditions:

The academic must be earn the point when they rate the posts or questions.

The flow of events:

1. The Academic logs in the TEP.
2. the academic chooses the posts or questions.

3. The Academic rate the post or question by writting comment, answer question, or pressing like or favorite button.

4- academic earn point for rating the contribution and auther will earn point to their post or question.

Related Use Cases 11: Get Point:

sers earn points for contributing or engaging in the platform through activities like posting, answering, or commenting.

- **Use Case 12: Validate Content**

Actor: Supervisor

Objective:

To allow the Supervisor to review and validate posts, comments, questions, answers, or resources for quality and appropriateness whcich is related to their module.

Preconditions:

- The Supervisor must be logged in as supervisor account.
- There must be pending content flagged for validation.

Postconditions:

- The content is approved and published or rejected and removed from the TEP system.

The flow of events:

1. The Supervisor logs in and accesses the validation queue.
2. The system displays a list of flagged content.
3. The Supervisor selects an item to review.
4. The Supervisor reviews the content and chooses to approve or reject it.
5. The system updates the content's status accordingly.

5.5 Entity Relationship Diagram (ERD)

An Entity Relationship Diagram (ERD) is a type of flowchart that illustrates how entities, such as academics, posts, questions, answers, and resources, relate to one another within a system, as shown in Figure 5.4. ER diagrams are most commonly used to design or debug relational databases in the field of software.

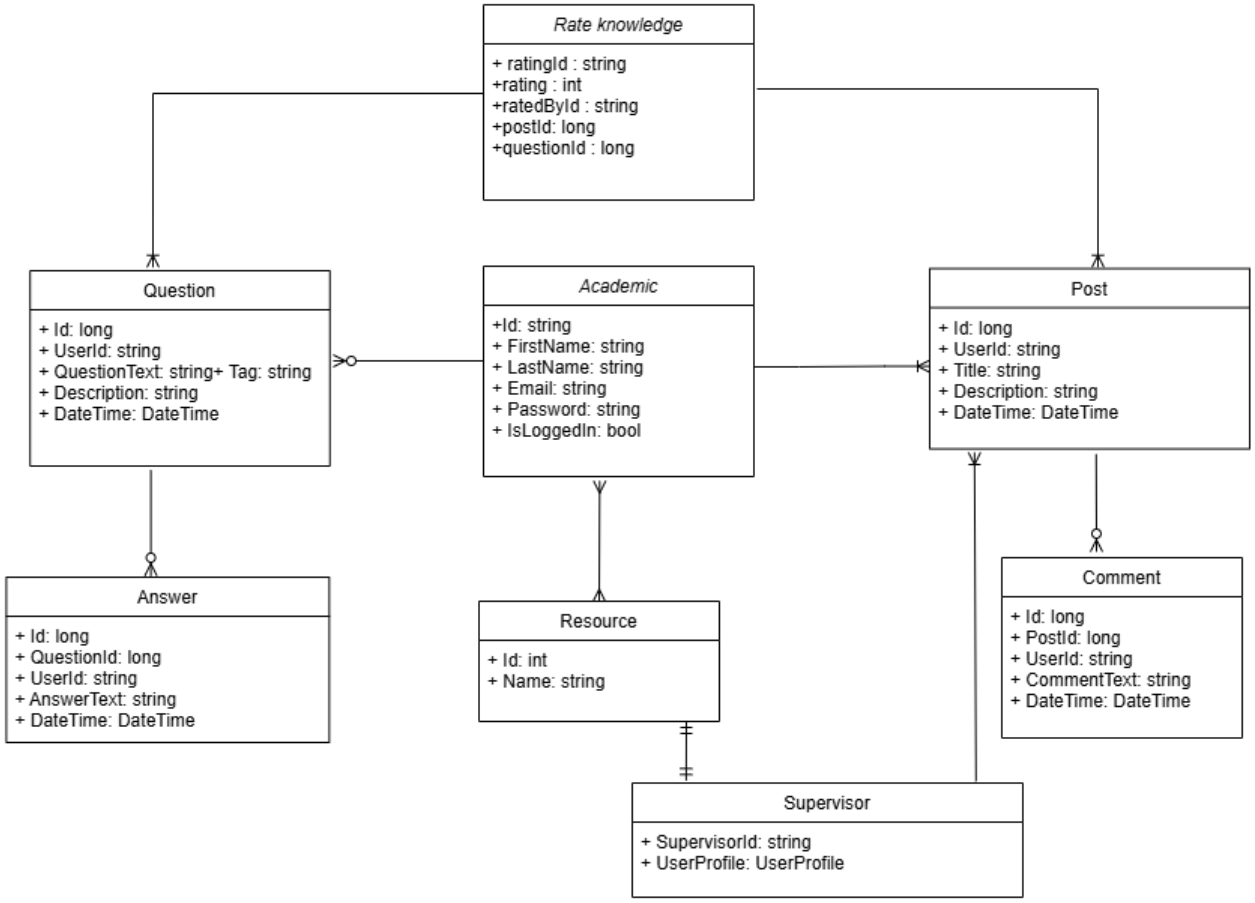


Figure 5.4 Entity Relationship Diagram (ERD)

In the next section, the prototype of the proposed system is discussed to validate the feasibility of the proposed functions and the usability of these functions in terms of clarity, ease of use, and time needed to achieve them.

5.6 Prototype

To validate the feasibility of the proposed solution, a medium-fidelity prototype of the proposed system using the Figma platform (a computer-based prototyping tool, [292]) was developed based on the proposed functions and features laid out above in Section 5.2. After that, an expert review session was conducted with two experts in prototype design to review the prototype before conducting the JAD sessions. The findings of expert reviews led to some modifications related to the colour of the interface and the initial scenario of each task.

The purpose of developing the prototype was to confirm the proposed system's functionality and evaluate its usability in terms of how clear and easy-to-use the features were and how long it took to perform tasks from the actual user's perspective. The JAD approach was used to validate the prototype of the proposed system, as mentioned in Section 3.5.2. In this stage, the JAD approach requires JAD sessions where actual users and developers collaborate to approve appropriate user requirements and user satisfaction. The JAD session has some advantages. First, it allows actual users to be involved in the system development to fit their requirements. Second, it captures the requirements and the designs of the system effectively, which will accelerate the implementation of the system. Third, it improves the quality of the system's design from the user's perspective. To facilitate sharing the idea with the participants, an initial scenario was created to identify the prototype mechanism (see Appendix C.2 and C.3).

5.6.1 JAD Session

The JAD session is designed to collect valuable data from developers and stakeholders. MoSCoW rules were used to determine priorities in user requirements. MoSCoW rules consist of four statuses: must have, should have, could have and won't have [293]. Must have requirements are functional requirements that must be considered in the system; without these functions, the system will be unsuccessful. Should have requirements are functional requirements that are necessary but not essential for success. Could have functions are less important than should have. Won't have are functions that are not required. The goal of these rules is to confirm the functional requirements the users need. These requirements must then be added to the proposed system.

In addition, the 'I like, I wish, what if' method was used to obtain honest feedback from users [294]. It is a simple method for encouraging constructive feedback. 'I like…' statements encouraged end users to give positive feedback on what they liked about the prototype. 'I wish...' statements are an opportunity for end users to share ideas about improving the prototype. 'What

if…' statements might lead to new ideas or suggestions. All of these contributed to meeting all functional requirements of the proposed system.

The JAD session to evaluate the prototype had eight participants. Participants had various positions (Lecturer and Assistant Professor) in the Faculty of CS at Jeddah University and different levels of teaching experiences, ranging from two to 15 years. Some were also IT developers, as shown in Table 5.3.

Table 5.3 Participants in the JAD Sessions

Participant	Position	Years experience
P1	Assistant Professor	6-10
P2	Lecturer	2-5
P3	Lecturer	6-10
P4	Assistant Professor	6-10
P5	Lecturer	11-15
P6	Lecturer	6-10
P7	Assistant Professor	2-5
P8	Assistant Professor	6-10

The JAD session took place online over Zoom. The JAD session took place online over Zoom in November 2022. Two approaches were employed to gain feedback from participants. The first approach involved them attending the online JAD session, during which the purpose of the system for sharing teaching experiences in higher education among CS academics was explained. Then, the scenario of each function to meet the user requirements was presented. After that, the participants were asked direct questions to clarify if there were weaknesses or disadvantages and engaged in discussion to get their feedback. The second approach involved an online questionnaire sent to the participants at the end of the JAD session. The survey covered seven functions (create post, add a comment for the post, view all posts and search, ask a new question for a specific module, add an answer to the question for a specific module, general discussion, and viewing the discussion board). For each function, there were four questions, three of them on a five-point Likert scale (strongly agree = 5 to strongly disagree = 1), and one open-ended question to invite end-users' suggestions. Finally, the end-users were asked open-ended questions using the 'I like, I wish and what if' format to gain more feedback. The survey results were analysed using basic descriptive statistics for quantitative data and an inductive approach for qualitative data [295]. In addition, the JAD session was documented and approved by the participants (see Appendix C.4 and C.5)

5.6.2 Results

The outcomes of the JAD sessions were merged with the survey results to obtain comprehensive information and feedback. The responses provided by the participants have been classified into two distinct categories, namely functional requirements, and non-functional requirements.

A. Functional requirements

Participants rated the degree to which they agreed with the statement 'I think this function is necessary' (see Figure 5.5). The results show that all participants strongly agreed with providing discussion forums for specific courses in which they could ask questions and provide answers. 87.5% strongly agreed with the need for a general discussion forum for communication, and 12.5% agreed. 87.5% strongly agreed with displaying a discussion forum. Overall, 87.5% of the participants liked the discussion forum function and related to it. In addition, 87.5% of the participants strongly agreed with creating a new post to document the teaching experience using a template and adding comments to the post, while 12.5% agreed. All participants strongly agreed with the display of the posts and searching for a specific post. Overall, 81% of the participants were pleased with the documenting teaching experience functions (POST) and related to them.

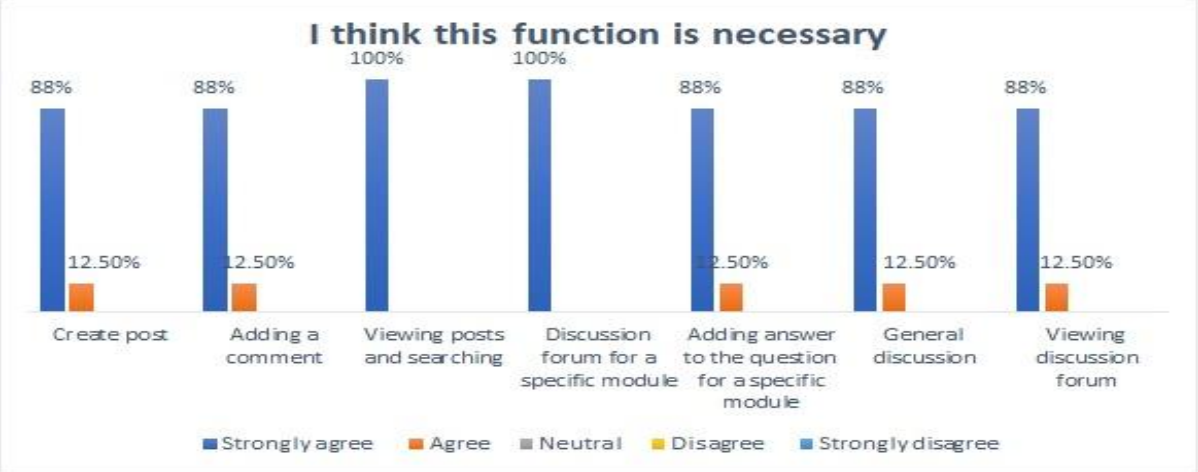


Figure 5.5 Participants' Agreement with Priority Function Requirements

During the JAD sessions, all the participants strongly agreed to provide resources related to their courses on the system. They suggested adding an option for uploading the syllabus and accreditation file for the course to the resources. Participant P1 said: 'Adding resources, e.g., syllabus... is important', and participant P2 said: 'As an academic, I need to see all the resources related to my module and share my teaching experience with colleagues on the system'. In addition, most participants agreed that the system has to filter teaching experience documents according to

users' teaching experience and allow users to see all teaching experience documents per module. Participant P3 said: 'We need a method to allow users to access the posts for the special courses'. Participants mentioned the importance of communicating with their colleagues on the system if the system provides each user's profile.

B. Non-functional requirements (operational requirements)

Participants mentioned two operational requirements. First, they said the system should allow access from multiple platforms, such as tablets and smartphones. Participant P3 said during the workshop: 'It should open and be used on mobile'. The second requirement mentioned was that it should be an open space platform allowing users who registered it to access all posts, discussion forums, and resources. All participants strongly agreed with this notion. For example, participant P2 said: 'When I need to open the platform, I need to access all posts, discussion board and resources related to my modules or any modules if I need it'.

C. Usability

In the survey, participants rated the degree to which they agreed with the statement 'I think this function is clear' for each function (see Figure 5.6). The results show that 87.5% of the participants strongly agreed that the general discussion forums and asking questions about a specific course were clear, while 12.5% agreed. They noted that the question template requires clarification messages for each attribute. All participants strongly agreed that adding answers and viewing the discussion forums were clear. About creating posts for teaching experience, 75% strongly agreed that the template was clear, while 25% of the participants agreed. They suggested adding information for each attribute on the template to clarify what information is required there. Participant P3 said: 'I think the template needs to add clarifying messages for each attribute'. All the participants strongly agreed that adding comments and viewing all posts were clear.

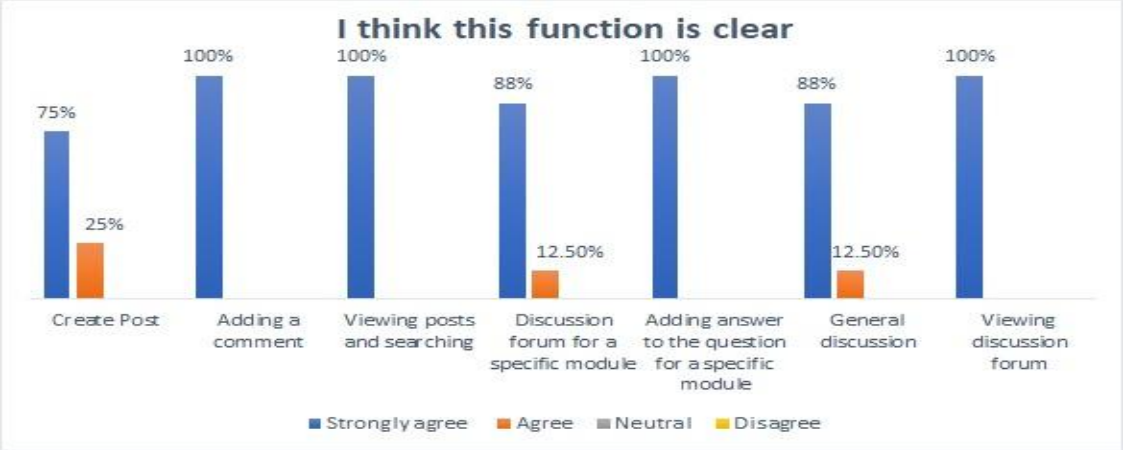


Figure 5.6 Participants' Agreement on the Clarity of the Functions

In response to the statement 'I think this function is easy', all participants strongly agreed that all functions were easy to use, except the general discussion forums, where 87.5% strongly agreed, while 12.5% of the participants agreed (see Figure 5.7).

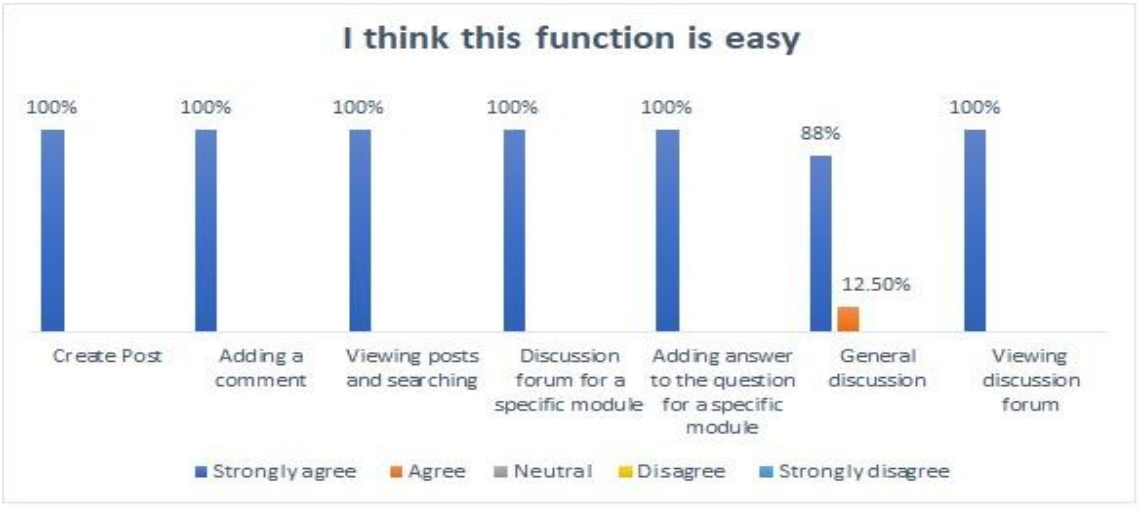


Figure 5.7 Participants' Agreement on the Ease of Use of the Functions

In response to the statement 'I think this task takes a short time to complete', 87.5% of the participants strongly agreed that creating new posts took a short time, while 12.5% were neutral. In their feedback, they mentioned it took some time to fill in all fields in the template, so they suggested marking each required field with a symbol, and proposed a suggestions menu should appear when they filled in the 'teaching experience type' and 'applied in' fields on the template. Moreover, 87.5% of the participants strongly agreed that viewing posts took a short time. All the participants strongly agreed that asking, answering, and viewing the discussion forums took a short

time (see Figure 5.8). They recommended implementing tags to filter posts and organise questions within the discussion forum for a particular course alongside its name, although they did note that viewing all course posts took a short time. For example, Participant P4 said: 'I think to be more effective and save time, we need to apply a method to categorise questions by course. Thus, I will be able to find questions related to my question to avoid duplication, and if there is no similar question, I can write my question'.

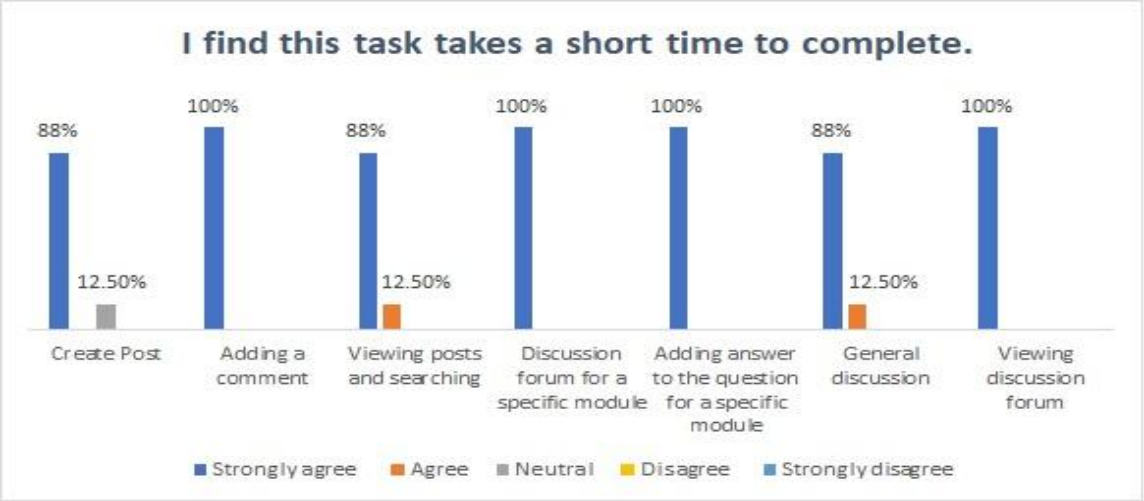


Figure 5.8 Participants' Agreement about Completing Tasks in a Short Time

5.6.3 Summary of the Findings

The aim of this study was to addresses the third objective (OB3) of the thesis, which is the development of an online TEP. The TEP should fulfil all the functional needs of real users. The study verified the suggested solution for implementing a KSM system for instructional purposes among CS academics in Saudi HEIs. This study combined SSM with JAD to create a system that prioritises the needs of the user [296]. Based on the findings, it can be inferred that the functions and characteristics of the proposed system are suitable for the case study of CS academics and are anticipated to enhance the effective utilisation of KSM in the teaching context by CS academics at Saudi HEIs. This addresses the third research question (RQ3), on the features and functions CS academics require in the proposed TEP in order to encourage the sharing of knowledge.

The primary purpose of the system is to record the educational experience by capturing the implicit knowledge of practitioners (knowledge production and capture). Therefore, the suggested system enables users to generate a post and append comments to it. The post adheres to a distinct template that was designed exclusively for this particular situation. This template facilitates users

in documenting their knowledge in a thorough format [297]. The second feature is the discussion forum, which allows users to pose questions and provide replies, either in a general context or dedicated to specific modules. Users will be able to enhance their communication and facilitate the exchange of knowledge [229]. Another feature is the resources section, specifically the document management function, which will allow module supervisors to upload all papers pertaining to their respective modules. This encompasses slides, exercises, and tests. The results of the survey and JAD session indicate that the search and retrieval features played a crucial role in saving time. However, participants recommended utilising tags for posts and questions in order to improve the quality of these services. The results indicate that the suggested system's functionalities and design were unambiguous and user-friendly. To enhance the design, they also suggested incorporating information on each attribute in the templates to guide users when they write a post and ask a question, as well as implementing a symbol to denote mandatory fields. The results indicate that users are satisfied with their ability to complete all tasks quickly. Users suggested that a suggestions menu be displayed in the fields on the template when they enter the teaching experience type. All appropriate recommendations were incorporated into the design. The system requirements were defined in the table. These requirements are categorized into Functional Requirements and Non-functional Requirements to outline the expected system behaviour and performance attributes clearly.

Functional Requirements:

Table 5.4 Functional Requirements

ID	Requirement	Description
FR-1	User Registration and Authentication	The system should allow users to register, log in, and manage their accounts securely.
FR-2	Profile Management	The system should enable users to create, update, and manage their personal profiles, including teaching expertise and interests.
FR-3	Teaching Experience Posting	The system should allow users to post and edit teaching experiences and classify them by categories (e.g., module, type of experience, apply in).
FR-4	Knowledge Categorisation	The system should allow users to tag posts with relevant categories, such as module or type of experience.

FR-5	Search Functionality	The system should provide a search feature to retrieve posts, discussions, and resources by keywords, tags, or categories.
FR-6	Discussion Forum	The system should enable users to participate in discussion forums for collaborative knowledge exchange.
FR-7	Social Interactions	The system should allow users to like, comment on, and favourite posts and discussions.
FR-8	Resource Repository	The system should enable users to download and share teaching resources for easy retrieval.
FR-9	Gamification Features	The system should incorporate gamification elements (e.g., points, leaderboard) to motivate user participation.
FR-10	Knowledge Evaluation	The system should allow users to evaluate and rate teaching experiences and shared resources.

Non-Functional Requirments:

Table 5.5 Non-Functional Requirements

ID	Requirement	Description
NFR-1	Usability	The system should have a user interface that enables users to complete core tasks within five steps.
NFR-2	Performance	The system should process user requests within 2 seconds under normal operating conditions.
NFR-3	Compatibility	The system should be compatible with the latest versions of Chrome, Firefox, Safari, and Edge browsers and allow access from multiple platforms, such as tablets and smartphones

5.7 Summary

This chapter has provided the essential facts required to authenticate the design of the proposed system. The summary of findings in Section 5.6.3 answers the third question (RQ3: What features and functions will CS academics require in the proposed platform in order to encourage the sharing of knowledge?). The key elements that have been examined and confirmed are functional requirements, non-functional needs, and usability in relation to clarity and user-friendliness, along with the users' perception of task completion time.

After analysing the outcomes, the design was enhanced. The next chapter discusses the implementation of the proposed system.

Chapter 6 Implementation of the Teaching Experience Platform (TEP)

6.1 Introduction

This chapter provides information about the implementation of the proposed system discussed in Chapter 4 and Chapter 5 presented earlier in Alharbi et al. [298, 299]. The system implementation is presented in Section 6.2 and users' interaction with system functions in Section 6.4. A summary is provided in Section 6.5.

6.2 System Implementation

The implementation phase started with choosing the required tools and technologies. The system has many functions, providing a comprehensive platform for all academics to share their knowledge online. All the functionalities identified by the prototype validation, using the JAD approach (as described in Chapter 5), were implemented.

6.2.1 Application Architecture

The application architecture is a diagram that outlines the interactions between the Web UI, API layer, authentication mechanisms, service repository, and database. Figure 6.1 (Application Architecture) illustrates the technical specifications regarding the implementation and support of these functionalities. Implementing the application architecture is the initial stage in constructing the application, and it helps in creating a well-organised and structured application. When designing software architecture, it is important to focus on two key services: the front-end and the back-end. The front-end of a system is dependent on the user experience and the user interface (UI). In contrast, the back-end service, hidden from the user, concentrates on the application services, as well as how to access the data and storage. These components interact in a typical process, as follows:

- The user interacts with the web UI, which sends a HTTP request to the server-side API.
- Authentication and authorisation mechanisms ensure that the user has the necessary permissions to perform the requested actions, and HTTP clients facilitate communication between the web UI and the server-side API.
- The API receives the request and forwards it to the appropriate service via API repository, which in turn fetches the appropriate service.
- The service interacts with the API repository to retrieve data in the database.
- The service processes the data as needed, applying business logic.
- Once the processing is complete, the service sends a response back to the API.

- The API formats the response and sends it back to the web UI via a HTTP response.
- The web UI receives the response and displays the relevant information to the user.

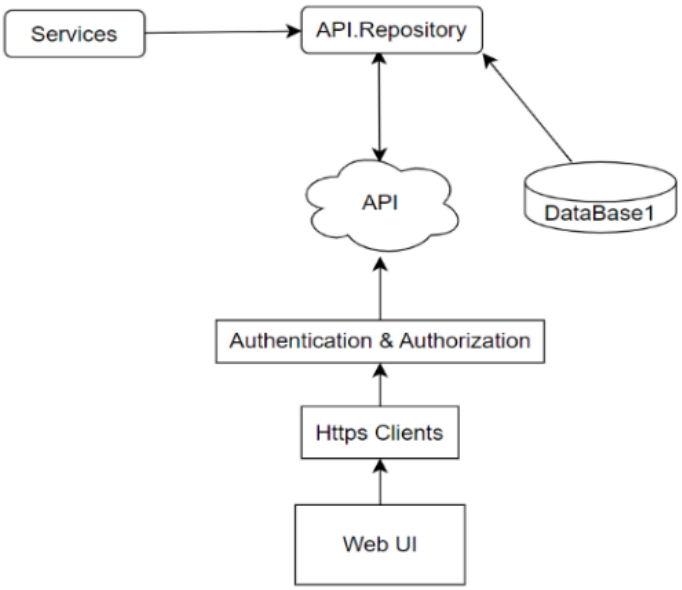


Figure 6.1 The Application Architecture

6.2.2 Technical Specifications

To implement the web application (proposed system), Visual Studio ASP.NET Core 6 [1], an open-source framework for building modern, cloud-enabled, internet-connected apps, was utilised. It contains the following features used in the system:

- **Blazor**, which is a web framework developed by Microsoft that enables developers to build interactive web UIs using C#.
- **ASP.NET Core Identity**, which is a framework for building secure, scalable, and extensible web applications. ASP.NET Core Identity adds UI login functionality to ASP.NET Core web apps. Duende IdentityServer, a tool that verifies the user's identity and stores all login information securely, was used to secure web APIs. To access the application, users can authenticate themselves through various methods, such as username and password or social media. Users can be authorised to access different parts of the application based on their role or group membership.
- **Entity Framework (EF) Core 6**, which is a powerful object-relational mapping (ORM) framework provided by Microsoft, was used to simplify the process of working with

databases in .NET applications. By leveraging EF Core 6, the database within the system was efficiently built and managed, streamlining the development process and improving maintainability.

- **API.Repository**, which is a RESTful API, which uses HTTP verbs to perform operations on resources. This makes it easy to integrate API.Repository with other services.
- **Azure** (for hosting the deployed services), which is a cloud hosting platform provided by Microsoft, was used to deploy the website and API. The database is also hosted on Azure. **Azure Cognitive Search**, a fully managed search-as-a-service offering provided by Microsoft Azure, is also used, because it offers powerful search capabilities enhanced with artificial intelligence (AI) capabilities beyond simple keyword matching. These features enable users to find relevant information quickly and efficiently. Azure Cognitive Search integrates seamlessly with other Azure services and tools, making incorporating search functionality into existing Azure applications easy. It provides SDKs and APIs for .NET and RESTful APIs for flexible integration with third-party applications and platforms.

6.3 Testing

After implementing the system, a series of tests was conducted to verify the functionality and accuracy of the system. The testing process included manual and automated testing methods to ensure the system was free of errors or bugs. The following tasks were tested: submitting POST, asking questions, searching for POSTs or questions, social features and gamification tools (see Table 6.1). Once all the tests were passed successfully, the system was deployed on the researcher's Azure account provided by Newcastle University to evaluate its performance and gather feedback from real users. The web application can be found at: https://tepweb.azurewebsites.net.

Table 6.1 Testing TEP functions

Test case action	Results	Status
Create POST	When all the details are entered, the system saves the information. However, if a required input is not entered, it shows an error indicating the required field.	Pass
Edit POST	While editing the post, if the details are entered in each text field, the system stores the modified details of the post	Pass

	fields. However, If a field is left empty, it shows the error.	
Delete POST	If pressed delete the post is deleted, and it will deleted from the database with all relations.	Pass
Discussion Board Ask question	When all the details are entered, the system saves the information. However, if a required input is not entered, it shows an error indicating the required field.	Pass
Discussion Board Answer to question	When the answer is entered, the system saves the answer under the question.	Pass
Search	When the write keywords or press stage, it will retrieve posts and questions related to the keywords or tags.	Pass
Social features	When press like or favourite button, it calculates points. And when press Unlike or unfavourite, it take off points	Pass
Gamification tools	The leaderboard is updated which associated with user points.	Pass

6.4 Users' Interaction with Functions of the System

The system has a graphical user interface (GUI) on the client side, enabling users to interact with its functions. The system is designed to be easy to use, allowing users to log in and access the platform. There are two types of users: academics and coordinators. Academics can add, edit, and delete their knowledge contribution to the system. Coordinators can use the platform like academics, but in addition, they can edit and delete posts and questions related to their modules and upload their resources. The web-based application developed for this study is a platform that offers various functions to make it easier for users to capture, acquire, store, and retrieve knowledge. The functions of the system are listed below.

6.4.1 User Registration and Login

Users must first sign up to the system using their email address and indicate their teaching experience in years to utilise it (as illustrated in Figure 6.2). Registered users can access the system by logging in using their email ID and password, as shown in Figure 6.3.

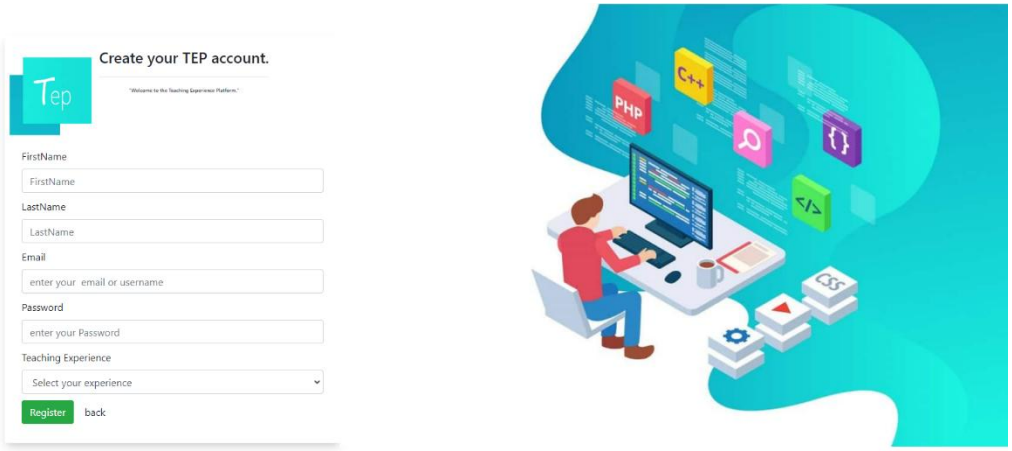


Figure 6.2 Registration Page

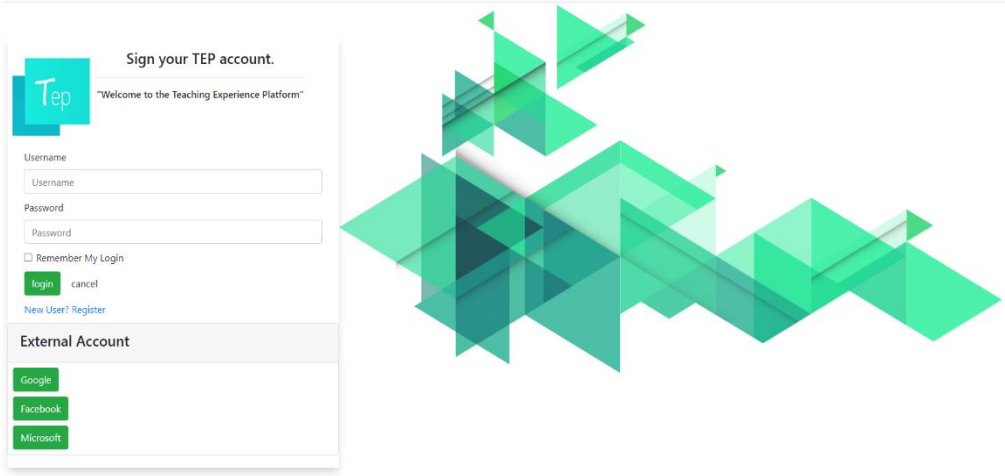


Figure 6.3 Login Page

6.4.2 User Profile

On this page, the user's information and all contact details are shown to facilitate connection with members. The user can edit their information and all contact details if needed. The user's profile page also displays their total reputation points, as well as tabs for activities, statistics, and

favourites, as shown in Figure 6.4. Each of these tabs are described in more detail below. All users are able to see the profiles of other users.

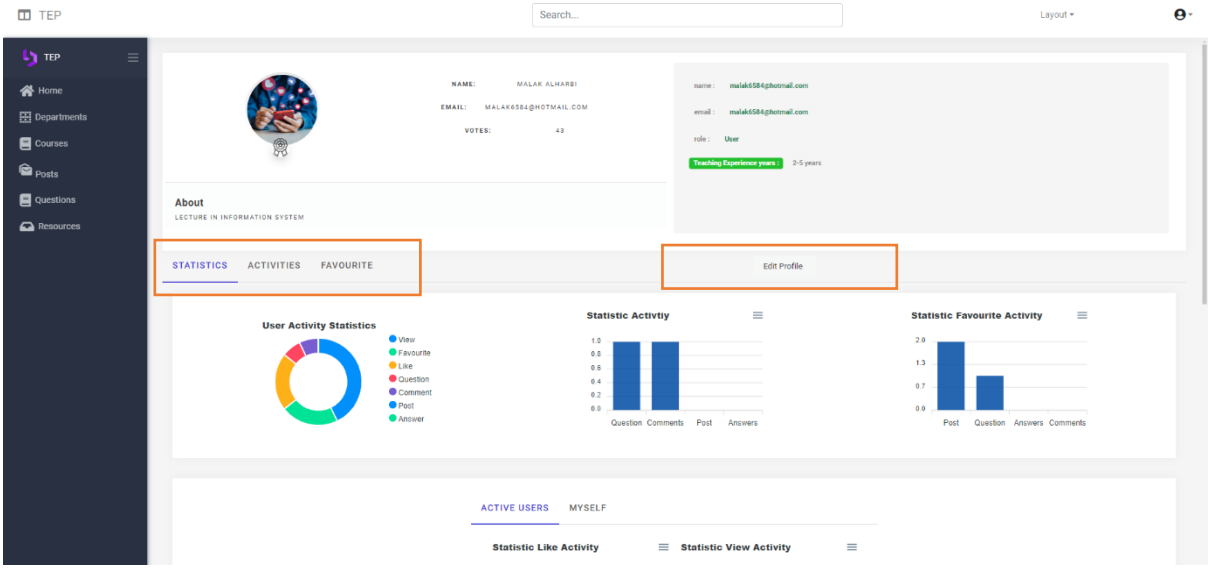


Figure 6.4 User Profile Page

6.4.2.1 STATISTICS tab

This tab allows all users to view a particular user's activity statistics, shown in views, likes, and favourites for posts; comments; questions; and answers, as illustrated in Figure 6.5. There are two tabs in the statistics: 'ACTIVE USERS' and 'MYSELF'. The 'ACTIVE USERS' view shows other users' interaction statistics with the user's contribution, while the 'MYSELF' view shows user interaction statistics with other users' contributions. Additionally, it shows daily activity if a specific time is selected. This indicates a user's reputation in terms of their contribution to the platform.

Figure 6.5 STATISTICS Tab on the User Profile Page

6.4.2.2 ACTIVITIES tab

This tab shows the department, course, and contributions (posts and questions) for all users. The profile owner can add the department and the courses they teach or have taught in the past. This is the default filter to view all contributions (posts and questions) related to their courses in the platform, as shown in Figure 6.6. This feature makes it simpler for users to locate course-related contributions quickly and efficiently.

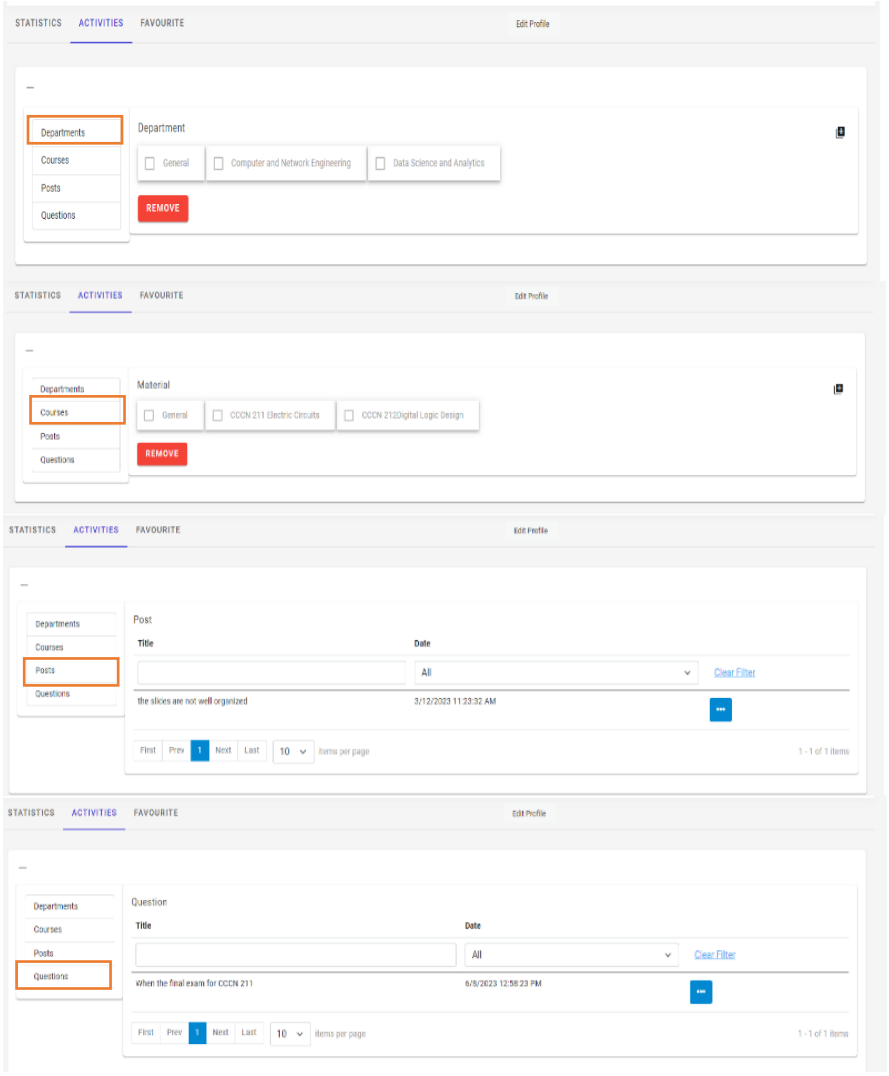


Figure 6.6 ACTIVITIES Tab on the User Profile Page

6.4.2.3 FAVOURITE tab

This tab shows all posts, comments, questions, and answers saved as favourites by the user, as shown in Figure 6.7.

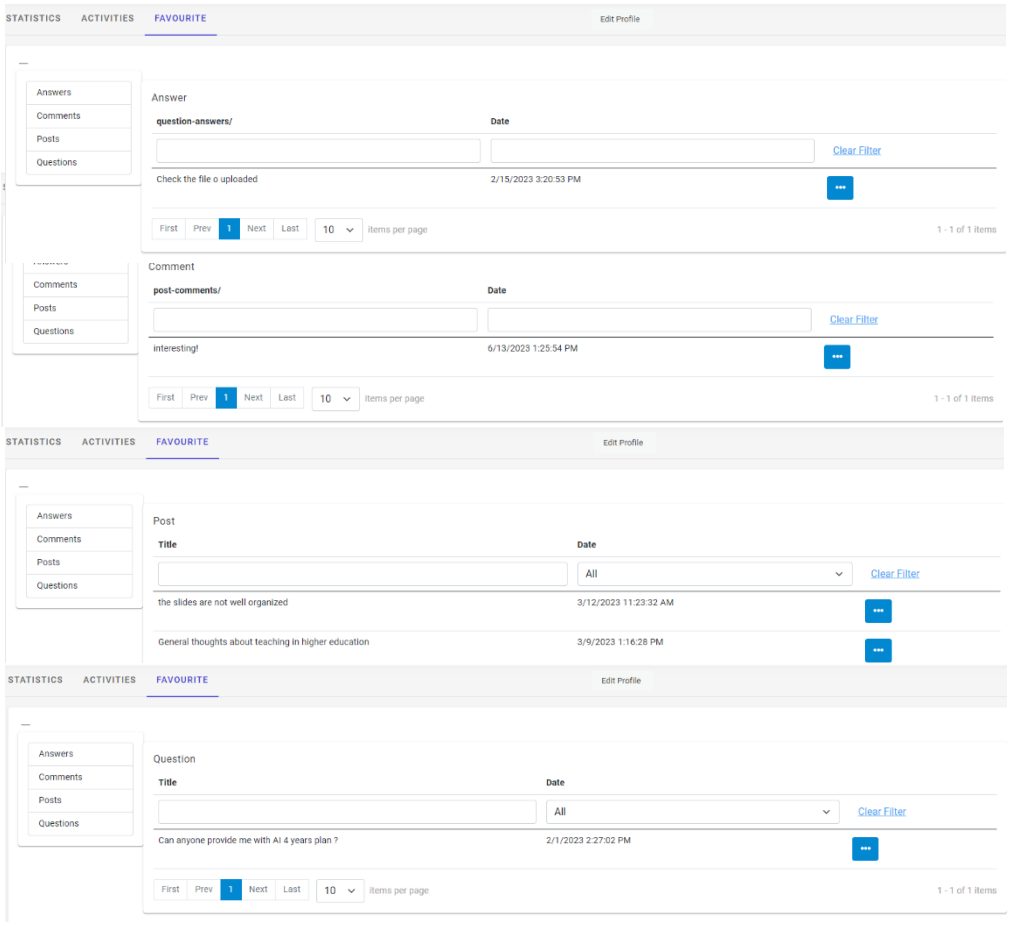


Figure 6.7 FAVOURITE Tab on the User Profile Page

After logging in, users can see their homepage, as shown in Figure 6.8. All the proposed functions of the system can be found on the homepage. By default, it presents general posts and discussion boards and those specific to the user's courses, which are set on their profile. On the left side of the page is a menu with functions that include departments, courses, posts, questions, and resources. Users are allowed to access all these functions, whether they are related to their courses or not. In addition, the search box at the top of the homepage allows users to retrieve posts and questions related to query keywords. Finally, the Top 10 Active Users leaderboard is at the bottom of the homepage.

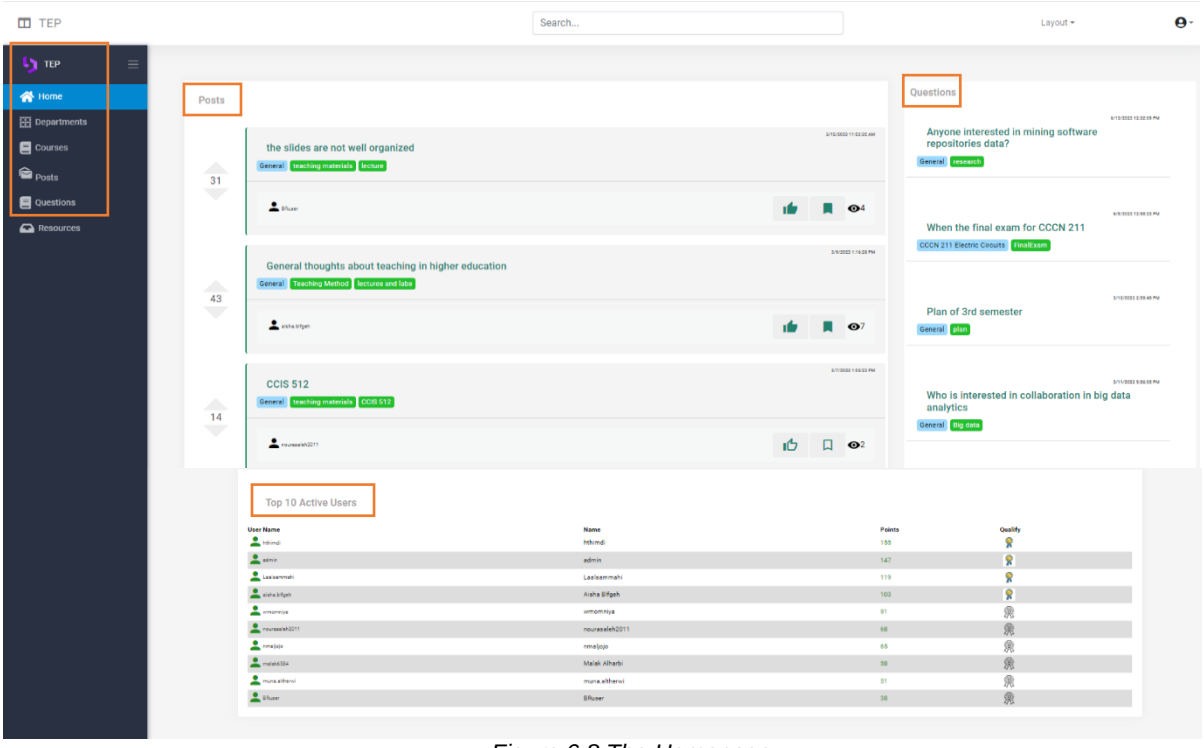


Figure 6.8 The Homepage

6.4.3 Create POST

The user can add a post on the POST page to capture their teaching experience. This is a knowledge creation and capture function. The template designed for this purpose is shown in Figure 6.9. There are explanatory messages for every attribute in the template that help users fill in suitable information. The template consists of several fields, as shown above in Table 5.2, Section 5.2.1. All these fields must be filled in unless specified otherwise.

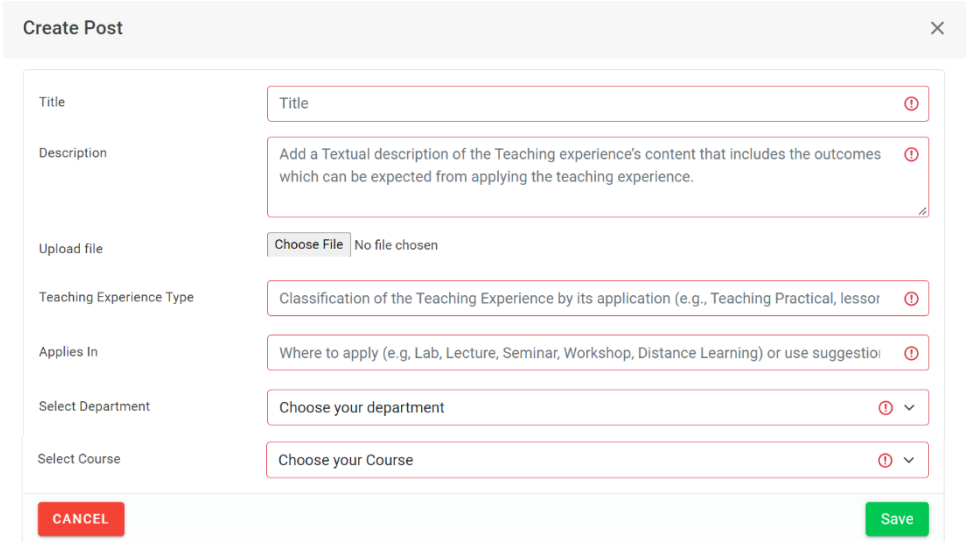


Figure 6.9 The POST Template

In the 'teaching experience type' and 'applies to' fields, suggestion menus appear when the user starts typing, or they can use their own keywords, as shown in Figure 6.10.

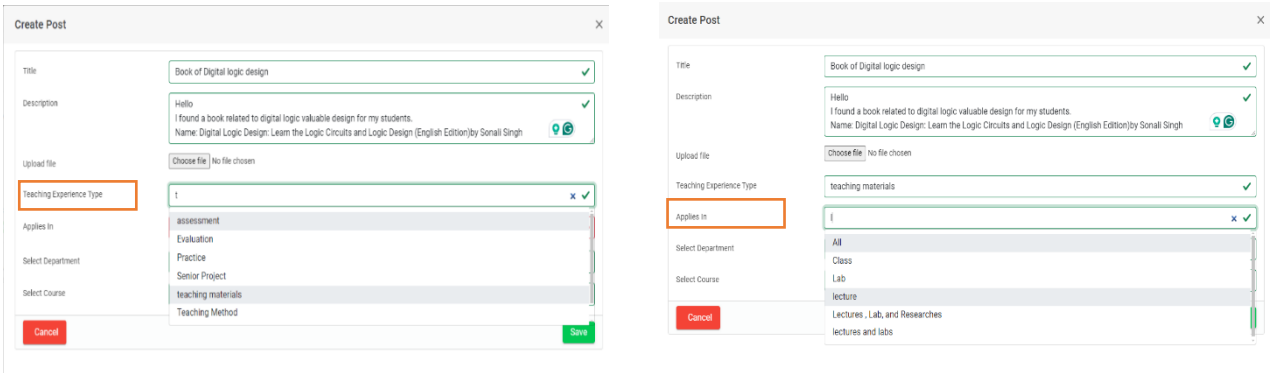


Figure 6.10 Suggestion Menus in 'Teaching Experience Type' and 'Applies to' Fields

6.4.4 Add Comment

This function allows users to add comments to a specific post, as shown in Figure 6.11. They can attach a file or multimedia if necessary.

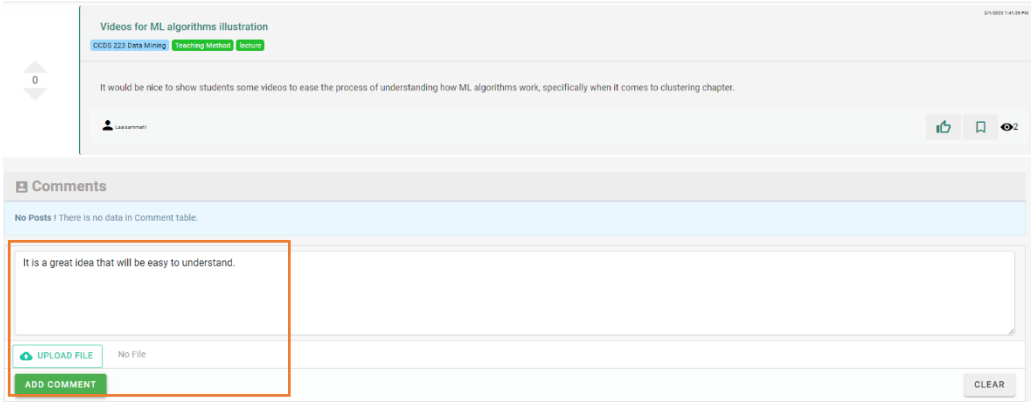


Figure 6.11 Add a Comment

6.4.5 Discussion Board

The discussion board provides collaboration and communication tools. Thus, users can ask and answer questions, both generally or related to their modules.

Add Question:

The user can ask questions by filling in the template, as shown in Figure 6.12. The template contains explanatory messages for every attribute to help users provide suitable information. The following fields must be filled in, as shown in Table 6.2:

Table 6.2 Description of the Question Template Fields

Field	Description
Question	Write your question.
Description:	Provide more detail about your question. (Optional.)
Upload file:	If you want to upload a file.
Tag	This is a keyword to distinguish the question.
Select department	Department of the course to which the experience applies.
Select Course	Course to which the experience applies.

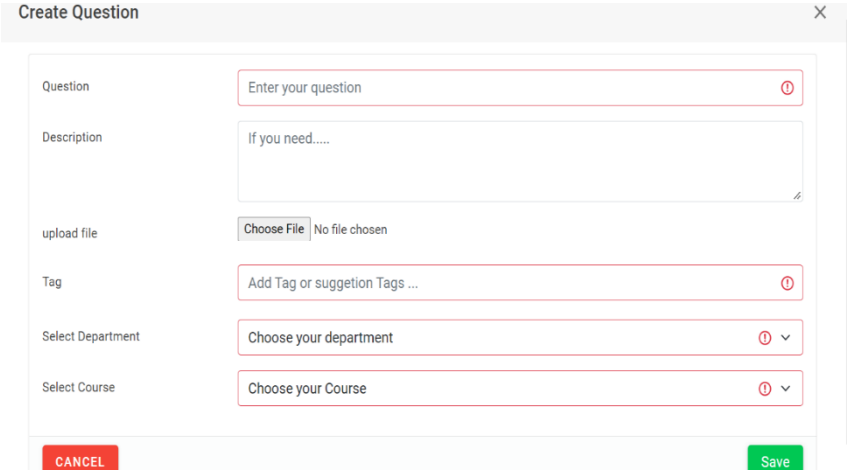


Figure 6.12 Question Template

Answer a question:

This function allows users to answer a question, as shown in Figure 6.13. They can attach a file or multimedia if necessary.

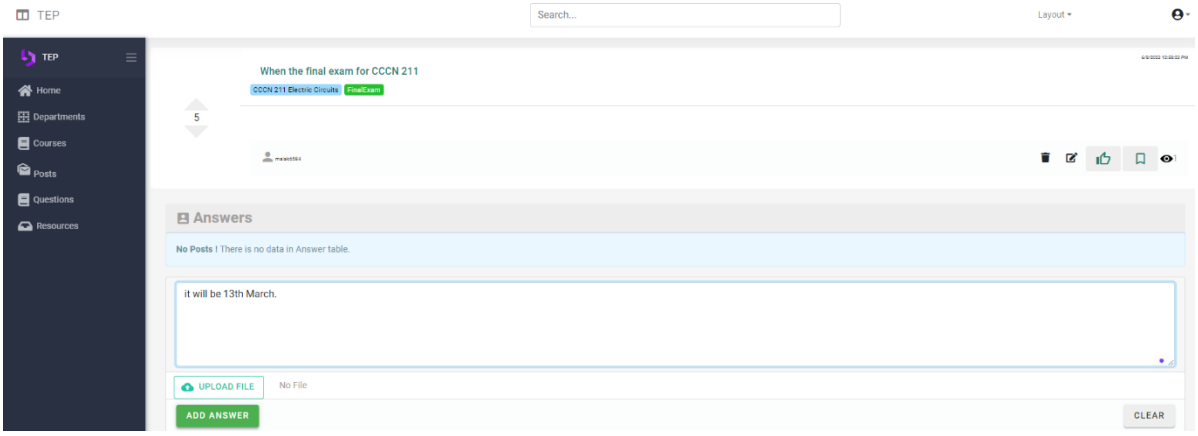


Figure 6.13 Answer a Question

6.4.6 Resources

This page provides document management and explicit knowledge. The user can see all resources related to their modules, as shown in Figure 6.14. Documents are categorised by module. Once the user selects the course from the menu in the right-hand corner, all resources related to that course will be displayed. The resources are organised into tabs, such as slides, labs, exams, references, and scheduled meetings, with filter options available. Coordinators of the modules should upload these resources, and other users can view and download them.

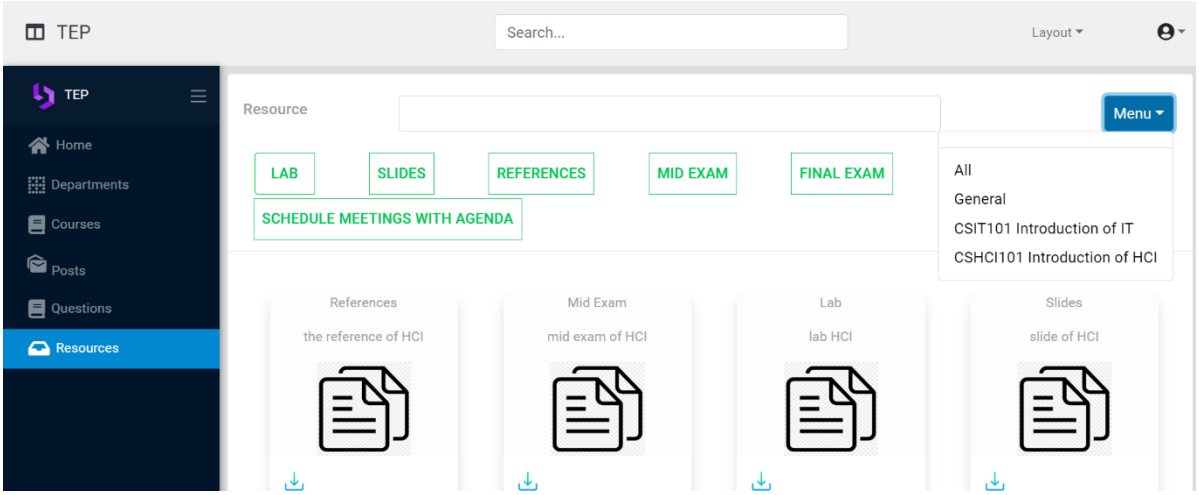


Figure 6.14 The Resources Page

6.4.7 Search and Retrieval

This function provides the knowledge search and retrieval that allows users to reuse existing knowledge. There are two ways for the user to search for a post or question. The first is to use the search box at the top of the page. This allows the user to write words related to the post content or the question content, and it will retrieve the posts or questions that contain these words, as shown in Figure 6.15 for a post and in Figure 6.16 for a question.

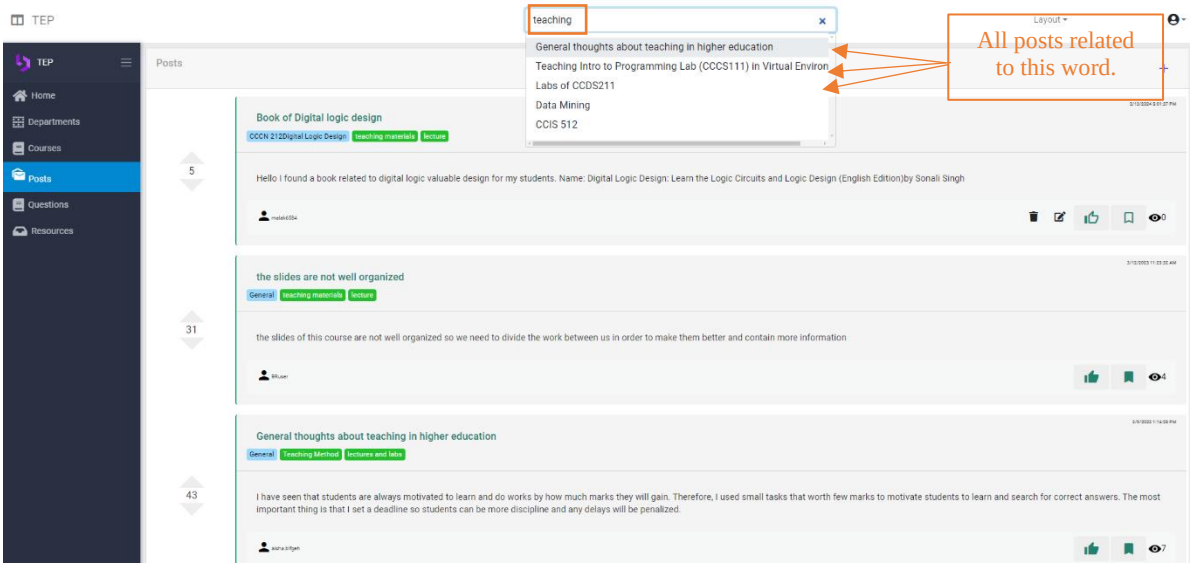


Figure 6.15 Search and Retrieval of a Post Using Keywords

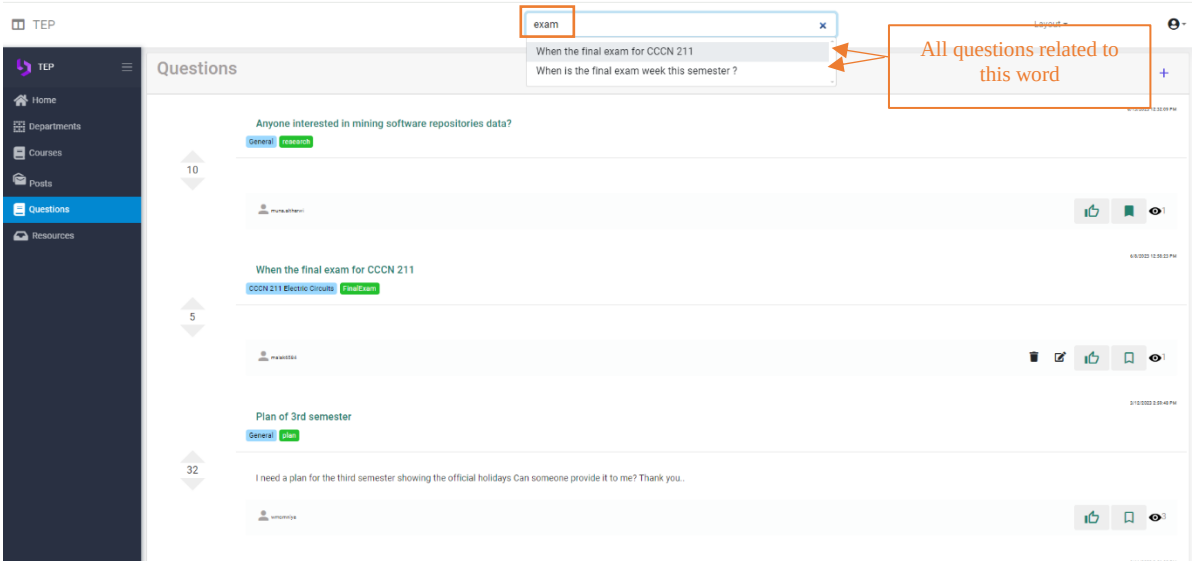


Figure 6.16 Search and Retrieval of a Question Using Keywords

The second way is to use the tag that appears under the post title or the question. These tags will help users find all posts or questions related to this tag when they click on them. In the example shown in Figure 6.17, the user clicks the 'teaching materials' tag under the post, and in the example shown in Figure 6.18, the user clicks the 'FinalExam' tag under the question.

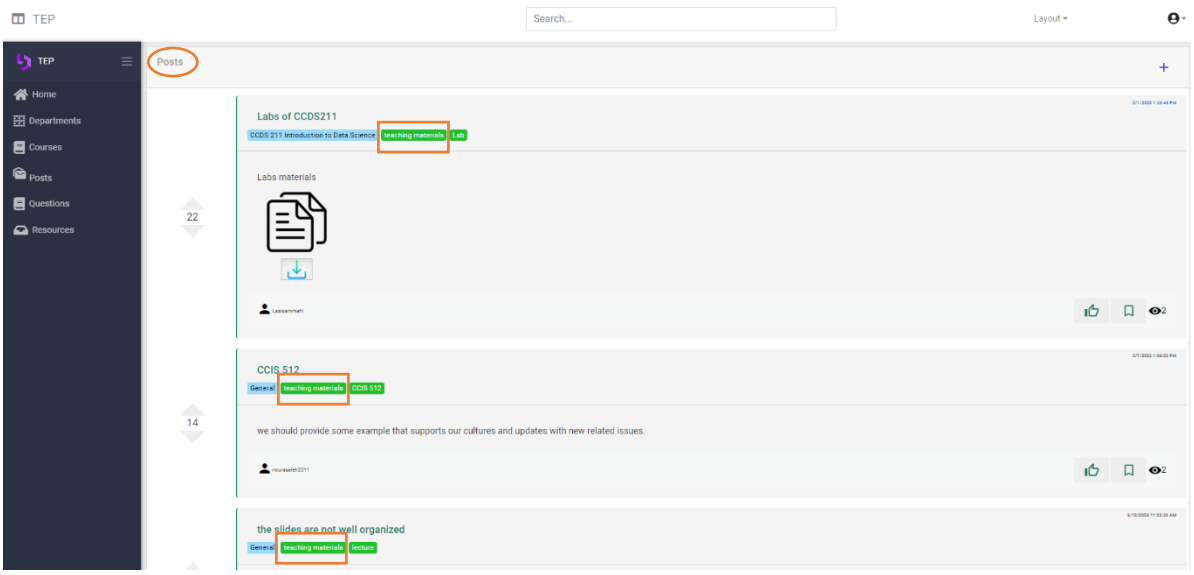


Figure 6.17 Search and Retrieval by Tag under a Post

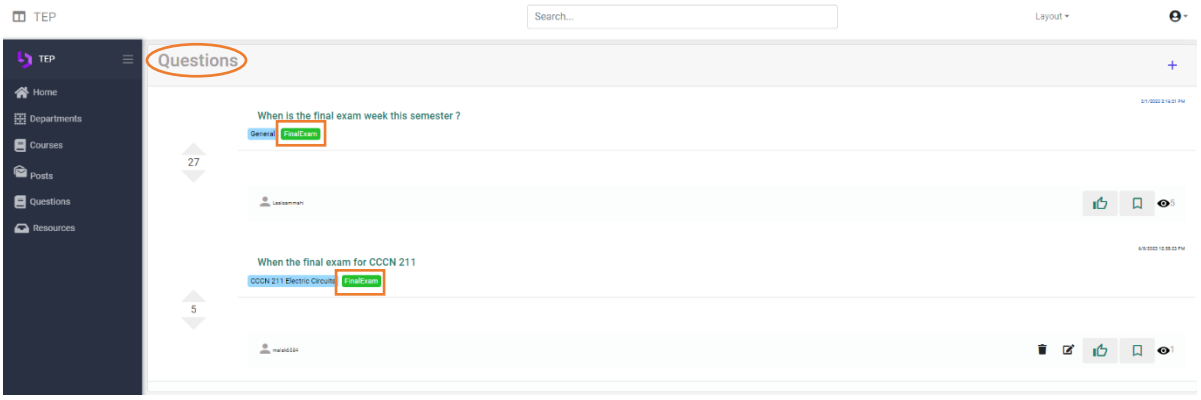


Figure 6.18 Search and Retrieval by Tag under a Question

6.4.8 Social Features

Users can interact with knowledge contributions (in the post, comment, question or answer) by pressing ‘Like’ or ‘Favourite’. These features will encourage users to contribute their knowledge to this community (as shown in Figure 6.19).

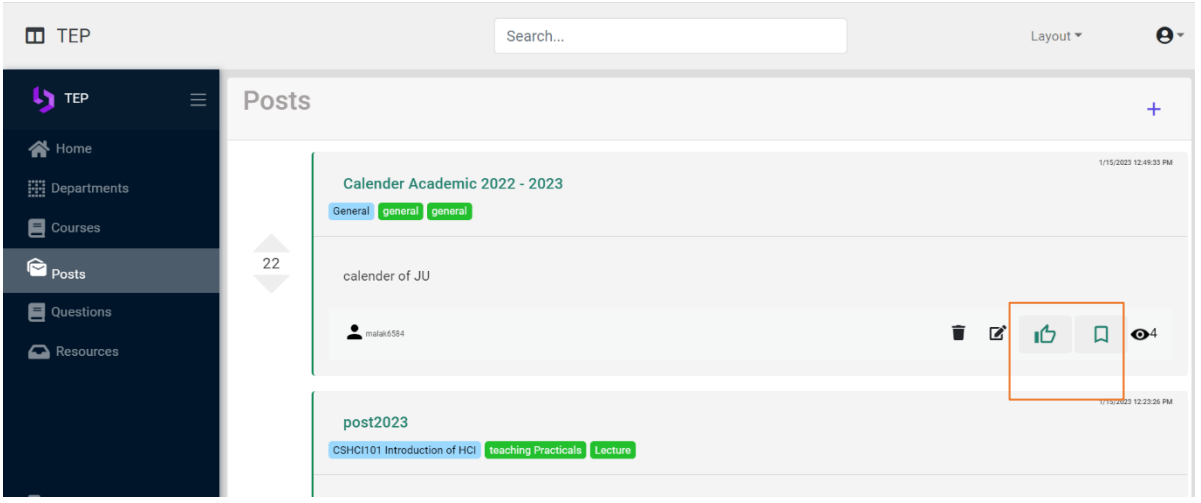


Figure 6.19 Social Features 'Like' and 'Favourite'

6.4.9 Gamification

This feature provides the reward for knowledge shared and interacting with the system more generally. The gamification follows these rules:

1. When a user creates a post or asks a question, they get five points.
2. When a user writes a comment or answers a question, they earn 10 points. The original author also gets 10 points.

3. When the user rates a comment or an answer to a question (by liking or favouriting), they earn two points for a like and five for a favourite. The original author gets the same number of points.
4. The points are automatically accumulated on the points page.
5. When the number of points reaches a certain threshold, the user gets a medal.

The medals are categorised into bronze (1-100 points), silver (101-500 points), gold (501-1,000 points), and adamantium (1,001 or more points), as shown in Table 6.3. The leaderboard uses the medals to present the 10 most active users on the platform.

Table 6.3 Types of Reward Medals

1 –100 points	
101 – 500 points	
501 – 1000 points	
1001 or more	

6.5 Summary

This chapter provides information and details on the implementation of the proposed system, whose design is discussed in Chapter 5. The chapter presents the technical tools used to implement the system and discusses the user interaction with the system's functions. All system functions were thoroughly tested to ensure that the output was correct and free of any errors or bugs after implementation. Then, the system was deployed on Azure to experiment with it and obtain feedback from end-users. The next chapter provides further details about the experimental design used to evaluate the system with actual end-users.

Chapter 7 Evaluation of the Teaching Experience Platform (TEP)

7.1 Introduction

The evaluation study evaluates the usefulness of the TEP system in order to provide an effective system to facilitate and support the sharing of teaching-related knowledge among CS academics in HEIs. Chapter 4 covered the investigation studies to explore knowledge sharing in HEIs for learning and teaching purposes, and the findings from Chapter 4 revealed the challenges faced by CS academics when exchanging teaching-related knowledge with peers. Based on the results of that study, the prototype was designed and validated with end users, as presented in Chapter 5. In Chapter 6, the proposed system was implemented and tested.

This chapter addresses the fourth objective (RO4) of the thesis, which is to evaluate the PU of the proposed TEP with actual end users aimed at addressing RQ4, to what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics? This chapter represents the evaluation phase, as discussed in Section 2.2.3. This involves experimenting with the system, collecting data through workshops and questionnaires, and analysing users' answers and feedback. The PU of the functions and features provided in the system to facilitate and motivate the sharing of teaching-related knowledge among CS academics is assessed.

This chapter begins by describing the experiment stage with end users in Section 7.2. Then, evaluation approaches in terms of workshops and questionnaires are discussed in Section 7.3. Section 7.4 presents the evaluation results, and Section 7.5 contains the discussion.

7.2 Experiments with End Users

7.2.1 Method (Measures of Evaluation)

The evaluation phase is measured by user experience (UX). This is defined as people's perceptions and responses related to the use or expected use of the product, system or service (ISO FDIS 9241-210 [300]). The framework developed by Zarour and Alharbi [301] demonstrated the relationship between UX measurement methods and UX aspects (see Figure 7.1). To provide a satisfactory UX, usefulness is one of the necessary measurement aspects used in the IS field [302, 303]. Therefore, the perceived usefulness (PU) is measured, which could influence the experience of using TEP in this research.

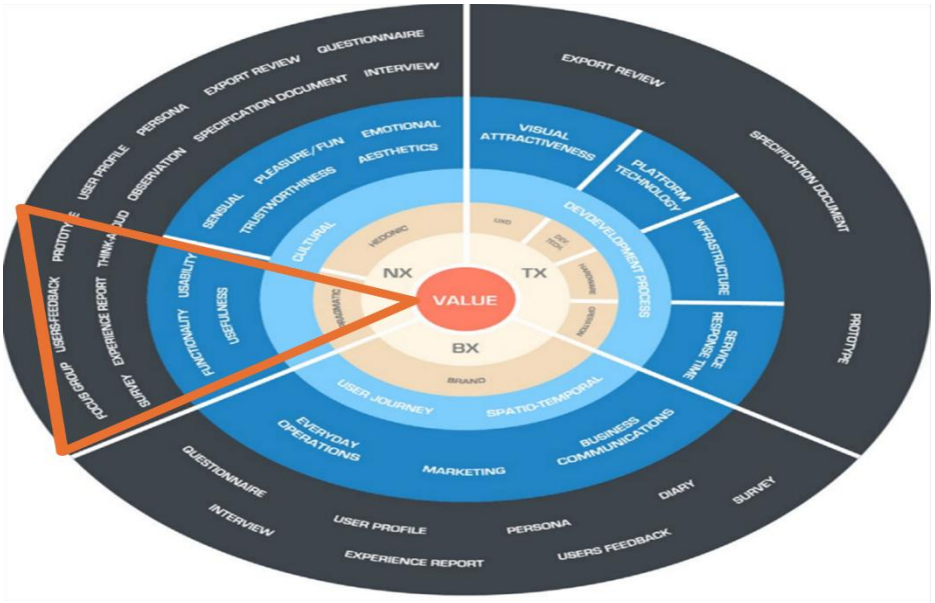


Figure 7.1 Proposed Framework Covering Gathered UX Dimensions, Aspect Categories, Aspects, and Measurement Methods (Adapted from [301])

According to MacDonald and Atwood [304], usefulness is defined as 'the extent to which a system's functions enable users to complete a set of tasks and achieve specific objectives in a particular usage context'. The measure of CS academics' perceptions of the usefulness of the TEP system functions is based on the rationale provided by Alotaibi et al. [4], Mohamad [305], Ardichvili et al. [306], and Chandran and Alammari [307]. They found that if users can see that the system facilitates their knowledge sharing, they will be motivated to participate in it. Therefore, users are more likely to utilise a system if they believe it will enhance their performance or productivity, which underscores the importance of assessing their perceptions of usefulness. In this research, the experiment was designed to evaluate the TEP system.

7.2.2 Population and Sample

The sample of the evaluation study includes all CS academics currently employed full time in the faculty of CS at Jeddah University, including professors, associate professors, assistant professors, lecturers and teaching assistants. Their level of experience ranged from novice to experienced academics teaching in HEIs. The study population was chosen because of easy access to this community to minimise the constraints of time and finance. In addition, the researcher was able to contact staff and senior management at this faculty to arrange the experiment in the appropriate timeframe.

7.2.3 Procedure

The experiment involved several stages, as follows:

Prior to experimenting with TEP:

The best way to help users is by using user manuals and video tutorials [308]. User manuals can provide detailed information about the system's functions, while video tutorials can provide a visual overview of how to interact with the functions. Researchers suggest using text-based and video tutorials is effective and enable users to concentrate well without feeling overwhelmed [308]. Thus, the researcher created a user manual that included tasks to help users interact with each function of the TEP. In addition, videos were recorded about each function of the TEP. A pilot study was conducted to ensure the user manual and videos were clear to guide the users in every task in the TEP system. Five doctoral researchers at Newcastle University were involved in this pilot study. They were satisfied with the user manual and videos but suggested speeding up the videos.

The experimental period:

The researcher emailed the Dean of the CS faculty at Jeddah University to request the CS academics' email addresses. After that, an invitation email was sent to CS academics in the Faculty of Computer Science at Jeddah University to invite them to take part in the experiment. The invitation included a cover letter elaborating on the overall research aim and the researcher's contact details. The researcher received responses by email from 30 CS academics who agreed to participate in the experiment and the evaluation of the TEP. The researcher then sent the e-consent form to the participants. After participants signed the consent form, they were sent the user manual file and videos that guided them in completing all the tasks to experiment with the TEP.

The system was made available to the 30 academics during the second and third academic terms of 2022/2023. The experiment took seven weeks. Participants began using the system and engaged in the tasks according to the user manual and video tutorials.

The end of the experiment:

At the end of the experiment, the participants who logged in to the TEP were sent an email containing a link to a questionnaire to evaluate the PU of all functions available on the TEP. After submitting their answers to the questionnaire, the participants who logged in to the TEP were invited to participate in workshops by email.

7.3 Evaluation Method

To evaluate the usefulness of the TEP, questionnaires and workshops were employed to obtain user feedback at the conclusion of the experiment, providing an accurate evaluation and in-depth results about the user experience of the TEP to address RQ4 (to what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics?), as demonstrated in the next section.

7.3.1 Questionnaire

The questionnaire aimed to evaluate CS academics' perceptions of the usefulness of TEP functions for facilitating the sharing of teaching-related knowledge. A common method in the evaluation phase of an experiment is a questionnaire [25]. This is useful to gather a wide variety of data from large populations [25]. The questionnaire items were constructed according to each function of the TEP, inspired by Davis [238] and Mohammad [305] (see Appendix E).

The first section of the questionnaire covered demographic data such as gender, age, academic position and teaching experience in years. The second section was divided into five functions: the knowledge capture function (four items), the search and retrieval function (two items), the resources function (two items), the discussion board function (two items), and the knowledge evaluation function (five items). All items of the questionnaire used a five-point Likert scale, with 1 for strongly disagree and 5 for strongly agree. According to Pimentel [250], the mean range has equal length (4/5 = 0.80). A very low level of agreement is represented by a mean score from 1 to less than 1.80, low level from 1.80 to less than 2.60, medium level from 2.60 to less than 3.40, high level from 3.40 to less than 4.20, and very high level from 4.20 to 5.00.

The hypothesis was that the proposed features of the system would meet the teaching experience sharing requirements of CS academics, allowing them to efficiently and effectively capture, store, retrieve, evaluate, and reuse teaching experiences. Thirty participants completed the questionnaire. Descriptive and inferential statistics were applied to the quantitative data analysis, and no missing data was present, as discussed in the results section.

7.3.2 Workshops

The workshops aimed to enhance the understanding of the user experience of the TEP as a technological approach to support the management of sharing teaching-related knowledge. The aim of the TEP, and thus the reason for its functions and features, was to enable CS academics to capture, store, retrieve, evaluate, and reuse teaching experiences easily and effectively. At the end of the experiment, the 30 participants who logged in to the experimental platform were invited by

email to participate in a workshop to evaluate the system's functions. To manage the quality of the workshop, the Six Ps framework [309] was used to design this workshop. The Six Ps framework covers the purpose, participants, principles, products, place, and process of the workshop (see Table 7.1).

Table 7.1 The Six Ps Framework

Purpose	Why are we holding the workshop? Goals: to provide proof of concept for the TEP's functions and features.
Participants	Who is involved? CS academics in the Faculty of Computer Science at Jeddah University.
Principles	How should we function as a group? Guidelines for the workshop: • Meet with each group individually and engage in discussion to get their feedback.
Products	What should the workshop produce? Feedback following the TEP experiment.
Place	Where should we gather? • Online Zoom meeting. • Time: April 2023.
Process	When should things happen, and in what order? • Send the e-consent form. • Arrange the appropriate online appointment with participants. • Ask the participants for feedback.

Seventeen participants responded to the invitation. Online Zoom meetings were arranged to meet with the system participants and ask them questions, as shown in Table 7.2. All these workshops were recorded and transcribed manually in an MS Word document to prepare for qualitative analysis using MAXQDa. Inductive coding for thematic analysis was employed to extract themes mentioned by the interviewees [280], which is a highly effective method for such investigations. The qualitative analysis process and validation followed the procedure laid out in Chapter 4, Section 4.4.5.

Table 7.2 Workshop Questions

Topic	Function	Question
Knowledge capture (knowledge creation) article feature	POST	What are the benefits of using the POST template for capturing teaching experience? What are the drawbacks of using the POST template for capturing teaching experience?
Knowledge retrieval	Keyword – tag (search function)	What are the benefits of using search functions to retrieve teaching experience? What are the drawbacks of using search functions to retrieve teaching experience?
Knowledge storing/ resource system (documentation feature)	Repository	What are the benefits of using the resource system in the platform? What are the drawbacks of using the resource system in the platform?
Knowledge transfer	Discussion board (Q&A)	What are the benefits of using the discussion board in the platform? What are the drawbacks of using the discussion board in the platform?
Knowledge evaluation	Comment-like-favourite-view-vote	What are the benefits of using the knowledge evaluation functions to evaluate the quality of the teaching experience? What are the drawbacks of using the knowledge evaluation functions to evaluate the quality of the teaching experience?

7.4 Results

7.4.1 Questionnaire

The questionnaire aimed to assess the PU of TEP functions from the perspective of CS academics. Results are discussed in the next sections.

7.4.1.1 Demographic data

Thirty participants took part in the questionnaire. There were more female participants (73.3%, N = 22) than males (26.7%, N = 8). Half of the participants were 31-40 years old, while older (41-50) and younger (< 30 years) academics were less well represented (26.7% and 20%, respectively). With regards to academic position/rank, 53.3% of the participants were lecturers, 33.3% were assistant professors, and 6.7% worked as associate professors, while participants who worked as assistant lecturers and professors were less well represented in the survey (3.3% each). 36.7% of the participants had between 6-10 years of experience in teaching, 33.3% had 2-5 years of experience, and 23.3% had between 11-15 years of experience. Those with less than two years of

experience were less well represented in the survey (6.7%). Full demographic statistics are shown in Table 7.3.

Table 7.3 Demographic Data

Variable	Frequency	Percentage
Gender		
Male	8	26.7
Female	22	73.3
Age		
< 25	1	3.3
26-30	6	20
31-40	15	50
41-50	8	26.7
Academic Position		
Assistant Lecturer	1	3.3
Lecturer	16	53.3
Assistant Professor	10	33.3
Associate Professor	2	6.7
Professor	1	3.3
Experience (in years)		
< 2	2	6.7
2-5	10	33.3
6-10	11	36.7
11-15	7	23.3

7.4.1.2 Reliability

To assess the reliability of the overall consistency of variables, Cronbach's alpha helps gauge internal consistency. Typically, values between 0.70 and 0.95 suggest reliable data. Lower values could indicate a lack of questions, weak item connections, or mixed underlying concepts [310]. Hence, in this study, Cronbach's alpha was used to determine whether the scales used are reliable. Table 7.4 shows Cronbach's Alpha values, which ranged between 0.922 and 0.994 with an overall 0.990. This suggests a strong internal consistency [311]. This is supported by Nunnally [312] who established that an alpha (α) of 0.70 or above provides evidence for the internal consistency and reliability of a scale's items.

Table 7.4 Reliability Test for All Variables in the Study (N = 30)

	N of Items	Cronbach's Alpha
Knowledge capture function	4	.959
Search and retrieval function	2	.952
Resources function	2	.994
Discussion board function	2	.922
Evaluation knowledge	5	.971
Overall	15	.990

7.4.1.3 Descriptive statistics

Descriptive data analysis was conducted to investigate the main patterns in the questionnaire data. All statistical calculations were performed using IBM SPSS Statistics Version 27. The frequency distribution was calculated for each statement, mean, standard error of the mean, standard deviation, and agreement level.

7.4.1.3.1 Knowledge capture function

Table 7.5 shows that the participants responded positively about the usefulness of the POST template on the TEP. The standard deviation values were between 1.033 and 1.224, while the overall mean score was 4.291±1.107, which is very high. Most CS academics (N = 28, 93.4%, mean = 4.37) found the POST template on the TEP enables them to document clear teaching experiences to be understood by others. Twenty-seven participants (90%, mean = 4.30) stated that the POST template makes it easier to document their teaching experience, and 27 (89.3%, mean = 4.37) found that the POST template helps them to document their complete teaching experience. Twenty-five participants indicated that the POST template enables them to document teaching experience more quickly (83.3%, mean = 4.13). The mean score is greater than 4.20, which indicates a strong agreement. This shows that the template made it easier to document complete teaching experiences more quickly and clearly.

Table 7.5 Item Analysis of the Perceived Usefulness of the Knowledge Capture Function (N = 30)

Knowledge capture function	SA	A	N	D	SD	Mean		Std. Deviation	Level
						Statistic	Std. Error		
POST template makes it easier to document my teaching experience.	18 60%	9 30%	0	0	3 10%	4.30	.22	1.21	Very high
POST template helps me to document my complete teaching experience.	20 66%	7 23.3%	0	0	3 10%	4.37	.22	1.22	Very high
POST template enables me to document clear teaching experiences to be understood by others.	17 56.7%	11 36.7%	0	0	2 6.7%	4.37	.19	1.03	Very high
POST template enables me to document teaching experience more quickly.	15 50%	10 33.3%	2 6.7%	0	3 10%	4.13	.22	1.22	High
Knowledge capture function						**4.29**	**.20**	**1.11**	**Very high**

7.4.1.3.2 Search and retrieval function

The data presented in Table 7.6 indicates that most CS faculty members found the search and retrieval function extremely useful. The standard deviation values in this instance were between 1.21 and 1.22. The overall mean score was 4.27±1.19, which is very high. Most participants (N = 27, 90%, mean = 4.30) preferred the tags feature provided on the system, because it enabled them to reduce the time and effort to find answers to their queries, whether teaching experience documents or questions on the discussion forums. The keyword search function was less preferred. All items had mean scores greater than 4.20, which indicates a strong agreement.

Table 7.6 Item Analysis of the Perceived Usefulness of the Search and Retrieval Function (N = 30)

Search and retrieval function	SA	S	N	D	SD	Mean		Std. Deviation	Level
						Statistic	Std. Error		
Keyword searching helps me to reduce time and effort to find the posts or questions I need to perform my job.	17 56.7%	9 30%	1 3.3%	0	3 10%	4.23	.22	1.22	Very high
The tagging function helps me to reduce time and effort to find the posts or questions I need to perform my job.	18 60%	9 30%	0	0	3 10%	4.30	.22	1.21	Very high
Search and retrieval function						**4.27**	**.22**	**1.19**	**Very high**

7.4.1.3.3 Resources function

In general, CS academics found that the resources function was useful. The standard deviation values were between 1.221 and 1.224, while the overall mean score was 4.450±1.220, which is very high. Table 7.7 shows that most participants (N = 27, 90%) found the system provided access to the teaching experience documents and all related resources for teaching anytime and anywhere. The mean values here were 4.47 and 4.43, respectively.

Table 7.7 Item Analysis of the Perceived Usefulness of the Resources Function (N = 30)

Resources function	**SA**	**S**	**N**	**D**	**SD**	**Mean**		**Std. Deviation**	**Level**
						Statistic	**Std. Error**		
The Teaching Experience Platform (TEP) helps me access teaching experiences anytime from anywhere.	23 76.7%	4 13.3%	0	0	3 10%	4.47	.22	1.22	Very high
The Teaching Experience Platform (TEP) helps me access resources anytime from anywhere.	22 73.3%	5 16.7%	0	0	3 10%	4.43	.22	1.22	Very high
Resources function						**4.45**	**.22**	**1.22**	**Very high**

7.4.1.3.4 Discussion board function

The answers to the two items about the usefulness of the discussion forums, as shown in Table 7.8, yielded mean values of 4.43 and 4.33, respectively, indicating that the majority of the academics (N = 28, 93.3%) found that asking questions related to teaching on the discussion forums was useful for contributing to teaching practices. In addition, 27 academics (90%) stated that this function enables them to communicate with their colleagues when they need to accomplish their jobs. The standard deviation values were between 1.04 and 1.21, while the overall mean score was 4.38±1.089, which is very high. The mean score is greater than 4.20, which indicates a strong agreement.

Table 7.8 Item Analysis of the Perceived Usefulness of the Discussion Board Function (N = 30)

Discussion board function	SA	S	N	D	SD	Mean		Std. Deviation	Level
						Statistic	Std. Error		
The discussion board made it easier for me to ask questions related to teaching to accomplish my job.	19 63.3%	9 30%	0	0	2 6.7%	4.43	.19	1.04	Very high
The discussion board enables me to communicate easily with others when I need answers to questions related to teaching.	19 63.3%	8 26.7%	0	0	3 10%	4.33	.22	1.21	Very high
Discussion board function						**4.38**	**.19868**	**1.089**	**Very high**

7.4.1.3.5 Knowledge evaluation

The survey results on the five items, as shown in Table 7.9, show that CS academics found these functions helpful in evaluating the usefulness of other teaching experiences. The standard deviation values were between 1.073 and 1.224, while the overall mean score was 4.17±1.09, which is high. This evidence shows that academics believe using these functions will help them evaluate others' knowledge. The reputation score feature was most preferred among CS academics (N = 26, 86.6%, mean = 4.27), followed by written comments (N = 26, 86.7%, mean = 4.23) and the like (N = 26, 86.7%, mean = 4.13) and favourite features (N = 25, 83.3%, mean = 4.13). The view feature was the least preferred (N = 25, 83.3%, mean = 4.07).

Table 7.9 Item Analysis of the Perceived Usefulness of the Knowledge Evaluation Function (N = 30)

Knowledge evaluation (social features)	**SA**	**S**	**N**	**D**	**SD**	**Mean**		**Std. Deviation**	**Level**
						Statistic	**Std. Error**		
The written comments function enables me to evaluate the usefulness and applicability of teaching experiences in my job.	15 50%	11 36.7%	2 6.7%	0	2 6.7%	4.23	.19584	1.07	Very high
The like function enables me to evaluate the usefulness and applicability of teaching experiences in my job.	14 46.7%	12 40%	1 3.3%	0	3 10%	4.13	.21832	1.19	High
The favourite function enables me to evaluate the usefulness and applicability of teaching experiences in my job.	15 50%	10 33.3%	2 6.7%	0	3 10%	4.13	.22352	1.22	High
The view function enables me to evaluate the usefulness and applicability of teaching experiences in my job.	13 43.3%	12 40%	2 6.7%	0	3 10%	4.07	.21937	1.20	High
The reputation score function enables me to evaluate the usefulness and applicability of teaching experiences in my job.	16 53.3%	10 33.3%	2 6.7%	0	2 6.7%	4.27	.19730	1.08	Very high
Evaluation						**4.17**	**.20002**	**1.09**	**High**

7.4.1.3.6 Inferential statistics

Based on these results, the TEP is a useful system. The participants expressed positive feedback and unanimously agreed on the usefulness of the TEP, see Table 7.10. The one-sample t-test was used to analyse the PU of the TEP. The hypotheses for the one-tail test were as follows:

Null hypothesis H0: The mean score for PU is equal to 3.40 (beginning of high level on the Likert scale).

Alternative hypothesis H1: The mean score for PU is greater than 3.40.

Table 7.10 One-Sample Statistics

	N	**Mean**	**Std. Deviation**	**Std. Error Mean**
Overall	30	4.3117	1.11067	0.203

With test value 3.40, the *p* value being less than 0.05 confirms that the null hypothesis can be rejected. The observed average score (4.3117) is statistically different from the hypothesised value (3.40). The fact that the average score is higher than the test value indicates that users perceived the TEP and its functionalities as highly useful. The 95% confidence interval (0.4969 to 1.3264) provides a 95% confidence level that the true population mean difference from the test value lies within this range, see Table 7.11.

Table 7.11 One-Sample Test

Test value = 3.40							
			Significance		Mean difference	95% Confidence interval of the difference	
	t	*df*	One-sided *p*	Two-sided *p*		Lower	Upper
Overall	4.496	29	< .001	< .001	.91167	.4969	1.3264

Both Cohen's *d* and Hedges' correction indicate a large effect size, meaning the observed difference in PU is not only statistically significant but also practically meaningful, see Table 7.12.

Table 7.12 One-Sample Effect Sizes

				95% Confidence interval	
		Standardiser[a]	**Point estimate**	**Lower**	**Upper**
Overall	Cohen's *d*	1.11067	.821	.400	1.231
	Hedges' correction	1.14046	.799	.390	1.198

a. Mann-Whitney Test. Other Kruskal-Wallis Test

Table 7.14 The Differences in Perceived Usefulness of the TEP by Demographic Characteristics

Variable	N	Mean ± SD	*p* value
Gender[a]			
Male	8	4.9450 ± .10447	.002
Female	22	4.0814 ± 1.22128	
Age			
< 30	7	3.9557 ± 1.79455	.263
31-40	15	4.4800 ± .39509	
41-50	8	4.3075 ± 1.36036	
Academic position			
Assistant Lecturer/ Lecturer	17	4.2529 ± 1.16767	.408
Assistant Professor	10	4.6950 ± .35037	
Associate Professor/ Professor	3	3.3667 ± 2.07926	

Experience (in years)			
< 5	12	4.1958 ± 1.37728	.581
6-10	11	4.4973 ± .42858	
11-15	7	4.2186 ± 1.44168	

Table 6.14 presents the perceived usefulness of the TEP among academics by demographic characteristics. Male academics reported significantly higher perceived usefulness of the TEP compared to female academics (p = .002). Therefore, the null hypothesis for gender was rejected. This indicated that there is a statistically significant difference between male and female CS academics in terms of their perceived usefulness of the TEP.No significant differences were found in perceived usefulness based on age groups ($p > .05$). Assistant Professors reported the highest perceived usefulness, followed by Assistant Lecturers/Lecturers and Associate Professors/Professors (although the differences were not statistically significant, $p > .05$). No significant differences were found in perceived usefulness based on years of experience ($p > .05$).

7.4.2 Workshops

The workshops aimed to obtain the participants' feedback concerning using each function of the TEP. The findings of the workshops identified five overarching themes: perceptions concerning the use of the POST template for knowledge capture, perceptions concerning the use of the TEP for knowledge search and retrieval, perceptions concerning the use of the TEP discussion forum, perceptions concerning the use of the TEP for document management (resources), and perceptions concerning using the TEP's social features. Demographic data is provided first, after which each theme is discussed.

7.4.2.1 Demographic data

The demographic data of the interviewed participants in the workshops is provided in Table 7.13. The workshop had 17 participants. There were more female participants (N = 15) than males (N = 2). With regards to their academic position/rank, there were eight lecturers, five assistant professors, two associate professors, one professor, and one assistant lecturer. Eight of the participants had between 6-10 years' experience in teaching, and five had less experience, with 2-5 years of experience. Four of the participants had 11-15 years of experience in teaching.

Table 7.13 Demographic Data of Participants in the Workshops

Name	**Position**	**Gender**	**Years of experience**
P1	Lecturer	Female	6-10
P2	Assistant Professor	Female	6-10

P3	Assistant Professor	Female	6-10
P4	Associate Professor	Female	11-15
P5	Assistant Professor	Male	6-10
P6	Lecturer	Male	2-5
P7	Lecturer	Female	2-5
P8	Lecturer	Female	6-10
P9	Professor	Female	11-15
P10	Assistant Professor	Female	11-15
P11	Assistant Lecturer	Female	2-5
P12	Assistant Professor	Female	6-10
P13	Lecturer	Female	11-15
P14	Lecturer	Female	2-5
P15	Associate Professor	Female	6-10
P16	Lecturer	Female	2-5
P17	Lecturer	Female	6-10

7.4.2.2 Perceptions concerning the use of the POST template for knowledge capture

The participants were asked to share their views on utilising the POST template to capture their teaching experiences. All participants expressed satisfaction or moderate satisfaction with the POST template. They highlighted that the template allows them to document their teaching experiences in a standardised and appropriately detailed manner, which allows others to read it easily. For example, P4 stated: 'This is suitable and very clear. It will make it easy to document the teaching experience. The template makes it easy to document [experience] in an organised and more detailed way'.

Most participants agreed that the template attributes were sufficient to document teaching experiences with accuracy and detail. Some participants indicated the POST template attributes allowed them to provide more detail compared with the form that they currently use for quality assurance in their faculty. For example, P6 stated: 'Based on my experience, I think the POST template available on this platform is a better option than the T7 form we currently use for our quality assurance files. The T7 form is quite rigid and limited in its approach, whereas the POST template offers more flexibility, allowing us to document additional details without any constraints'.

In addition, participants emphasised that the template's clear structure makes it easy to document their teaching experiences quickly, saving time and effort, which is particularly important in the context of often high teaching loads. P9 stated: 'This is a compelling feature, given the pressure of teaching. It saves time and effort from my point of view'.

The participants further stated that the explanatory message provided for each attribute was helpful. P3 said: 'When I see the explanatory messages, I know what I want to write in each box in the template', and P11 said: 'Users may not understand some attributes in the template, like "teaching experience type" and "applied in" without clarifying messages on the template. But when I saw the explanatory message, I could fill it in with the appropriate information. So, it is clear now'.

While few participants suggested that the 'teaching experience type' and 'applied in' attributes could be presented as a dropdown list, they found the suggested words menu that appeared when they started typing to be a good alternative. These findings indicate that all workshop participants were highly satisfied with the teaching experience template document and found the system useful. They also noted that the template provides a standardised and detailed format for documenting teaching experiences, making it easy for others to read.

Moreover, most participants expressed the importance of the capturing of teaching experiences function on the platform through the POST template. They emphasised that this function improves the teaching process by documenting their experiences and solving problems faced by academics during the semester. They mentioned they were able to save teaching experiences for a long time on the platform and reuse it when needed. This makes it sustainable. P10 indicated: 'The post function is the most important aspect, because the user can add any file or links that could help [them] understand the material. Additionally, users can add comments or recommendations to the responsible people. This documents the teaching experiences in every way and describes the issue and how to solve it'.

Furthermore, participants were impressed that this function could save time and effort searching for information, especially when they were busy with teaching. P4 said: 'The benefit of the POST template is that it saves time and effort for users. In addition, they can save this information for a long time to reuse it when they need it'. P2 said: 'The POST template is a useful tool for documenting teaching experiences and any challenges faced during the semester. This documentation is valuable to coordinators for improving module content'.

In addition, the capturing teaching experiences function helps to transfer and exchange the teaching-related knowledge about the module to others, especially to academics who have not taught the module before. P6 said: 'In my opinion, the platform is valuable for exchanging teaching ideas with peers... For example, when I will teach a new module for the first time, the posts which

were written by experts who taught this module before will help me to prepare the module'. P9 said: 'This function contributed to taking the ideas related to the modules that I am teaching currently or will be taught next semester. It is amazing to access the modules to see the comments from experts who have taught it'.

7.4.2.3 Perceptions concerning the use of the TEP for knowledge search and retrieval

The participants were asked to share their views on utilising the search and retrieval functions to find specific teaching-related knowledge on the platform. In general, participants provided positive and supportive feedback regarding the knowledge retrieval features, as most of them were satisfied with this function. For example, P5 said: 'It is an excellent method for searching and retrieving information'. All participants unanimously agreed that typing keywords was an effortless, highly effective and quick method of retrieving information. P8 said: 'The search feature is a useful tool that helps users quickly retrieve posts or questions. To use the search feature, simply type in a search term in the search box. The search method will then fetch all included posts that contain the search term. This makes it an effective way to find the information you need quickly and easily'.

Most participants were impressed with the tags and the ease and speed of accessing all relevant information that came from the POST template attributes and questions template attribute. This process was both efficient and convenient, resulting in time savings. P9 and P10 said: 'The search function by using tags is excellent and returns results for any word, including both posts and questions'. P14 said: 'This efficient process allows users to quickly access the required knowledge and saves a lot of time and effort'. They continued: 'I like the tagging system that takes into account the module names, types of teaching experiences, and the context in which the experience was applied (such as labs, lectures, or workshops). In my opinion, this is very helpful, because it makes it easy to quickly find the information I need. For example, if I want to see all the posts related to a particular module, I just have to click on the tag for that module name'. The participants acknowledged the usefulness of the search and retrieval functions when they needed to find information related to the modules that they will teach. They noted that it is much easier to find the required teaching practices by browsing a single platform than seeking knowledge from experts face to face.

The findings indicated that the search and retrieval functions provide the simplest and fastest way to find teaching practices on the platform. The academics had a favourable experience using search and retrieval functions, which benefits the academic community.

7.4.2.4 Perceptions concerning the use of the TEP discussion forum

All participants agreed that the discussion forum helped them communicate with their colleagues anytime, anywhere. For example, P3 said: 'This function helps me to connect with my colleagues easily by asking questions or answering their questions or visiting the profile of this user'. P14 said: 'This function can help me contact the member who asked the question on the discussion board by visiting the user's profile'. One participant expressed that sometimes they need to have meetings to ask simple questions. This function will instead enable them to write down questions for their colleagues, and then their colleagues can answer the questions in their free time. P3 said: 'There are some questions I need to ask my colleagues; thus, I can write my question on the discussion board, and then in their free time, they can answer it'. Another participant indicated that this function could save time and effort. P2 said: 'No need for meetings or phone calls to ask questions; just write it on the discussion board, because sometimes the meeting time is not appropriate for most academics'. Moreover, participants noted the effectiveness of the general discussion board, mainly if they wanted to ask a question unrelated to a specific course. For example, P3 said: 'The nice thing about the general discussion forum is that we can ask questions unrelated to any courses. It could be related to teaching activities'. Therefore, the discussion forum on the platform is appropriate for academics to communicate with peers when they want to ask questions at any time.

7.4.2.5 Perceptions concerning the use of the TEP for document management (resources)

Participants expressed that the document management function is important, because it makes it easy for them to share, obtain, and update resources. For example, P8 said: 'It can be considered an important function to share the latest resource with my colleagues'. P12 stated: '[It is] the most important feature we require and gain the most advantage from, however, we should not underestimate the post and discussion board. It should be our top priority as it is the genuine way of participating that we look forward to in college'. In addition, participants indicated that this function would combine all resources in one place by category. This will save time and make it easy to find all the necessary resources. P13 said: 'We need this function as it will save time'. However, a few participants indicated that more categories should be added to the resources, such as quality assurance forms and meeting schedules.

7.4.2.6 Perceptions concerning using the TEP's social features

The participants were asked to express their overall opinion about using the knowledge evaluation tools (social features) on the platform. Regarding gamification tools, most participants indicated that leaderboards and points motivated them to contribute to this platform. 'I liked the idea of motivational points; factors such as points motivate someone to help more' (P6). P13 said: 'When I see a user with more points, I perceive them as being more knowledgeable and experienced, and I tend to trust them more. It also motivates me to know that they have worked hard on the platform'. In addition, participants were impressed that using like and favourite buttons to value the post and comments encouraged them to save the post or questions they are interested in their favourites. P16 said: 'I appreciated the feature of saving it to my favourites so that I can return to it in the future'. The participants expressed that adding comments on their posts encourages them to share their experiences with peers, thus increasing their knowledge contribution on the platform. P17 said: 'This motivates me to contribute more to the platform'.

7.5 Discussion

The main objective of the experimental stage with actual users was to evaluate whether the TEP functions facilitate the capture, storage and retrieval of teaching-related knowledge and motivate CS academics to use this system. The evaluation was conducted using qualitative and quantitative data. Workshops were held to obtain valuable feedback from users about their TEP experience, which produced qualitative results. A questionnaire measured the PU of the TEP functions and produced quantitative results.

The main findings indicate that using the system's provided template for documenting teaching-related knowledge is effective and valuable for academics, as it helps them capture complete, clear, and consistent teaching practices more quickly and clearly. The results from the workshops indicate the benefits of capturing teaching-related knowledge on the TEP. This enhances the teaching process by allowing CS academics to document their experiences and solve problems during the semester, as well as save this information for a long time. In addition, academics were satisfied the template attributes were sufficient to document teaching experiences accurately and in detail. The proposed TEP thus makes it easier to document complete teaching experiences quickly and clearly.

The results relating to the searching and retrieving knowledge function indicate that participants had a robust favourable agreement on the effectiveness and speed of seeking and

retrieving knowledge by tags or keywords. The survey results show that the participants preferred the tag feature to find and retrieve knowledge in the TEP. Participants in the workshops also stated that the tag feature provides accurate access to the required knowledge whenever and wherever, saving a lot of time and effort. The search and retrieval functions in the TEP thus greatly helps reuse of required knowledge and enhances the academic experience for members of the academic community.

Participants were delighted with the resource function and agreed that it was useful for accessing the teaching experience documents and all related resources for teaching anytime and anywhere. The participants noted that it would combine all resources in one place by category. This will save time and make finding all the necessary resources easy.

Participants strongly agree with the usefulness of the discussion forum in communicating with their colleagues when they needed, anytime, anywhere. In more feedback, they expressed that this function on the TEP allows them to ask and answer questions in their free time; thus, there is no need to meet face to face. Given the heavy teaching loads, this is very beneficial.

Participants agreed that the knowledge evaluation functions help them evaluate others' teaching experiences in the TEP using written comments, like, favourite, view and reputation scores (i.e., gamification tools). The survey results showed that the reputation score feature was most preferred by users. In the workshops, participants indicated that points and leaderboards motivated them to contribute their knowledge in order to get a good reputation among peers. Therefore, the knowledge evaluation features (i.e., social features) encouraged users to use the TEP and contribute their knowledge to peers.

7.6 Summary

This chapter discussed the experimental stage of the proposed TEP with end users. This involved workshops and a questionnaire conducted after the system was experimentally used by end users to evaluate the PU of the TEP.

The summary of findings in Section 7.5 answered the fourth question (RQ4: To what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics?). The overall empirical results obtained from the experimental stage showed a highly favourable agreement on using the TEP and the effectiveness of its functions and features to facilitate and motivate CS academics to share their knowledge among peers.

Chapter 8 Discussion

8.1 Introduction

This thesis investigates the usefulness of the TEP in facilitating the management of teaching-related knowledge sharing among CS academics in HEI, enabling them to exchange teaching-related knowledge and manage their teaching practices successfully.

The TEP was implemented in three phases. In the first phase, problem identification, a literature review and three investigation studies were conducted about knowledge sharing in HEIs. The literature review aimed to explore the existing literature concerning knowledge sharing and KM in HEIs and the existing KM systems used for managing knowledge in HEIs. It also aimed to identify gaps in the literature. The main findings of the literature review indicated that most existing KMS in HEIs have been developed for a generic knowledge context, leading to a lack of knowledge-sharing management related to teaching experience.

Regarding the investigation studies, the first study aimed to investigate CS academics' perceptions of using social media to enhance their teaching practices by sharing knowledge. An online questionnaire was conducted to collect the quantitative data in the first study, as shown in Section 4.2. The first study answers RQ1: How can existing social media applications be used to share knowledge for teaching and learning purposes in HEIs? The study shows that pre-service teachers utilise social media platforms for various educational purposes, including information retrieval, knowledge acquisition, and knowledge sharing.

The second study investigated the factors that affect CS academics' WSK with peers in Saudi Arabian HEIs. These factors included ATKS, ERA, EC, and the IT platform, as shown in Section 4.3.

The third study aimed to comprehend the perspectives of CS academics about sharing teaching-related knowledge among colleagues, as well as the factors that influence knowledge sharing, such as motivation, barriers, and the technology utilised for knowledge sharing within the CS faculties, as shown in Section 4.4. Online questionnaires were used in the second study, and online interviews were used in the third study. Both were conducted with CS academics who work in the computer science faculty of HEIs in order to answer the second research question, RQ2: To what extent are CS academics in HEIs aware of the importance of knowledge sharing? These studies aimed to identify any issues or challenges related to the sharing of teaching-related knowledge among academics in HEIs in order to provide suitable solutions.

The second phase, discussed in Chapter 5, covers the design of the TEP system, combining SSM and JAD to create a system that prioritises the needs of the user [241]. The problem situation was identified using SSM as an analysis tool, and JAD was used to determine and get approval for system requirements from actual users (CS academics) by using a prototype of the proposed system. The findings of this study answer RQ3: What features and functions will CS academics require in the proposed platform to encourage knowledge sharing? In addition, the TEP system was implemented using C# and hosted on Azure labs.

The third phase evaluated whether the TEP's functions facilitate the capture, storage and retrieval of teaching-related knowledge and motivate CS academics to use the system. The evaluation was conducted using qualitative and quantitative data. Workshops were held to obtain feedback from users about their TEP experience, which produced qualitative results. A questionnaire measured the perceived usefulness of the TEP functions and produced quantitative results. The empirical findings of this study are discussed in Section 7.4 and answer RQ4: To what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics?

The next section discusses all findings in more detail according to research questions.

8.2 RQ1: How can existing social media applications be used to share knowledge for teaching and learning purposes in HEIs?

The first study assesses the 'how' by showing that pre-service teachers utilise social media tools during summer training to engage with peers and professionals for various educational purposes, including information retrieval, knowledge acquisition, and knowledge sharing. This facilitates their ability to collaborate and actively participate with their peers, resulting in a beneficial influence on their academic accomplishments [183, 187, 189] .

A significant proportion of respondents concurred that the utilisation of social media platforms for the purpose of disseminating content or knowledge had the potential to enhance the educational experiences of pre-service educators. A comparison of these findings with those of other studies confirms that using social media for learning purposes and interaction with peers and teachers positively affects their academic performance [261]. This implies that the act of exchanging ideas and information has the potential to facilitate rapid and effortless acquisition of knowledge, thereby enhancing the process of learning. According to Castro-Romero [185], the utilisation of social media platforms has the potential to augment students' educational experiences and foster their engagement with both peers and instructors. This is achieved through the

facilitation of shared content, discussions, and communication within virtual learning communities. Furthermore, integration of these technologies can lead to transformative and significant modifications in the realm of collaborative learning within higher education, specifically in the context of professional training. While previous studies have examined how using social media can enhance the educational experience between students and professionals in HEIs, there remains a gap in the understanding of social media use for teaching and learning through professional training for CS pre-service teachers. The first study specifically addresses this by exploring CS pre-teachers' perspectives in two different Saudi universities.

The findings of first study indicate a significant correlation between the utilisation of social media platforms for the purpose of sharing content among colleagues and the establishment of a conducive learning environment. Nevertheless, it is imperative to acknowledge certain factors that may exert an influence on the efficacy of these technologies. These factors, including ease of utilisation, utility, and motivation, warrant careful consideration [189]. The findings of the first study indicate that CS pre-service teachers hold positive views towards the use of social media platforms as a means of strengthening teacher training and facilitating an enhanced learning experience. This is a significant conclusion. It has been proven in previous research that the use of social media platforms for educational purposes can help improve teaching practices among academics working in higher education and learning outcomes for students [186, 188, 255, 256]. The results of the questionnaire that was carried out among CS pre-service teachers in the first study suggest that the social media platforms that are now being utilised for the purpose of professional and peer communication within the training programme are effective. Consequently, it is of the utmost importance for individuals to make use of social media platforms as a means of disseminating information and engaging in conversation with both peers and experts. This will allow them to overcome the limitations of time and space that they encounter during their training and in their professional lives. The findings of this study are consistent with those of previous research that has shown the widespread adoption of social media as a communication medium for the purpose of socialising [257-260]. This conclusion is in line with the research carried out by Alshehri [183]. This is in contrast to the widespread perception that social networking has very little benefits to bring to society [254].

Although social media platforms have garnered attention in academia as potential tools for knowledge sharing and engagement with larger audiences, as well as being great communication tools [313], there are some limitations that make them less than ideal for sharing teaching-related

knowledge among academics at a university level. A major disadvantage of utilising social media for educational purposes is the concern surrounding privacy [314, 315]. Social media sites are essentially public or semi-public environments, and although they include privacy management features, they typically lack the strong security safeguards required to protect critical academic data. Academics and students may feel uneasy about publishing their work, debates, or personal information on platforms that allow easy access, monitoring, or potential exploitation by third parties.

The problem of copyright and material ownership is also a significant concern when utilising social media for educational purposes. Social media platforms frequently maintain specific rights to utilise shared content. This might result in scenarios where academic content, such as lecture notes, recorded sessions, or research materials, becomes subject to the terms and conditions of the platform, which may not be in line with the intentions of the institution or the originator.

The issue of plagiarism and academic integrity is another significant concern when utilising social media for educational purposes. The effortless dissemination, duplication, and adaptation of content on social media platforms might offer challenges in upholding academic integrity. Students might be inclined to utilise content sourced from social networking platforms without providing appropriate attribution, resulting in a rise in instances of plagiarism. Furthermore, the absence of effective plagiarism detection techniques on social media poses challenges for educators in monitoring and ensuring academic integrity.

Similarly, there are considerations with regards to the university's research and development (R&D) projects. Universities frequently leverage their distinct academic material as a basis for the development of novel research endeavours or teaching technologies. Publicly releasing this content may restrict the university's capacity to create exclusive research or obtain patents related to novel educational methods. Consequently, the university's capacity to secure research funds may be diminished, as funding organisations typically favour programmes that have a distinct competitive edge or potential for commercial exploitation.

Lastly, publicly and freely sharing teaching experiences and materials on social media or other online platforms could diminish the university's competitiveness and affect its financial situation. The uniqueness of a university's programmes, courses, and materials affects prospective students and staff's choice to study or work there. Making materials public reduces that uniqueness. These materials might then also be used by other universities. Consequently, the university may

face difficulties in distinguishing itself in an ever more competitive academic environment, which can further hinder the ability to attract top-tier students and staff.

These considerations illustrate the need for closed online communities, which may not work on public social media platforms. These communities serve as a secure alternative to public social media platforms, allowing for more in-depth discussions and sharing of teaching-related knowledge among peers alongside the general social media features. A vCoP is a good example. VCoP are specifically created to prioritise privacy. They often guarantee that any content shared within the system is considered the intellectual property of either the institution or the individual creator (as opposed to the social media platform), thus providing enhanced protection for academic work.

Despite the negatives of social media, it has important parts that can be incorporated in a vCoP to improve the learning experience, as the current research shows in the TEP system. VCoP can integrate features like interactive discussion forums, real-time collaboration tools, and multimedia sharing capabilities. This allows for a combination of the engagement and connectivity found in social media with the security, focus, and academic rigour of a dedicated educational platform. Incorporating social media features into special online communities can lead to a more interactive and engaging platform for knowledge sharing and collaboration. In this way, organisations can enhance information dissemination, facilitate communication, and encourage active participation among users [316]. It can be concluded from the first study that social media features are useful and that they should be incorporated into a bespoke online community as a vCoP. Furthermore, a vCoP provides a suitable environment for KM and brings value to academics, as it combines informatics and decision-making approaches, supplying an iterative cycle of knowledge creation and application. There is a growing impetus to promote the incorporation of these technologies into professional development programmes, with the aim of enhancing the competencies of both pre-service and in-service educators.

The first study's findings present a persuasive case for the incorporation of social media features within a vCoP to enhance teaching and learning. The diverse elements of social media offer new prospects for promoting sustainable professional development and lifelong learning. That is, the utilisation of social media applications to interact with peers and professionals for teaching and learning purposes produces individual, communal, and cultural advantages.

The second study expands on these findings by investigating CS academics' perspectives on teaching-related knowledge sharing and the factors influencing knowledge sharing behaviour.

8.3 RQ2: To what extent are CS academics in HEIs aware of the importance of knowledge sharing?

The second and third studies answer RQ2: To what extent are CS academics in HEIs aware of the importance of knowledge sharing? The second study used questionnaires to investigate the factors that affect CS academics' WSK with their peers. These factors include ATKS, ERA, EC, and the IT platform. The third study used interviews to gain a deeper understanding of CS academics' perceptions of teaching-related knowledge sharing among colleagues and knowledge sharing factors, including motivation, barriers and current technology used for knowledge sharing in a school of computing. These studies used quantitative and qualitative data on CS academics' perceptions, which have not been previously explored in the HEI context. As Sections 4.3 and 4.4 show, most CS academics are aware of the importance of exchanging teaching experiences, as well as several potential benefits of knowledge sharing for their teaching practice. The second study's findings (see Section 4.3) revealed that the factors influencing the sharing of teaching-related knowledge, such as ATKS and EC, significantly impact the WSK, which influences the sharing behaviour.

The influence of ATKS was positive and significant at $p < 0.001$. This finding is consistent with the findings of previous studies by Sohailet al. [90] and Alsaadi [15], which showed that individuals' ATKS has a significant influence on their knowledge sharing in HEIs. In addition, the influence of EC on WSK was positive and significant at $p < 0.001$. This finding is not consistent with the findings of Alsaadi [15], who found that the relationship between EC and the WSK was the weakest and not significant at $p > 0.887$ in Saudi HEIs. This difference could be due to demographic differences. This suggests that the relationship between EC and WSK may vary depending on individual factors. CS faculty members in Saudi universities exhibited a favourable disposition towards the exchange of knowledge for the purpose of teaching. The findings align with remarks [139, 274] indicating that a positive attitude has a direct impact on academics' desire to share knowledge.

The results of the third study (Section 4.4) support the idea that CS academics' inclination to exchange teaching experiences with colleagues stems from the advantages they gain, both personally and for the educational institution. Participants in the third study saw sharing teaching-

related knowledge as a method of acquiring knowledge and assisting colleagues, especially inexperienced academics who have not taught before. It can also serve to assist other scholars engaged in the creation of course syllabi in avoiding mistakes that could impact the effectiveness of teaching. Disseminating pedagogical information among CS academics could potentially streamline the process of curriculum preparation, resulting in time and effort savings. Hence, it can be asserted that academics in the field of CS recognise the significance of disseminating teaching-related information as a crucial resource, which has the potential to improve the quality of teaching and manifests in students' achievements. These findings align with Khilji al. [175], who found that successful knowledge sharing among individuals in HEIs leads to enhanced academic performance.

Additionally, the findings show that CS academics believe sharing teaching experiences has a good impact on their institution by improving the learning process, teaching quality, and student outcomes. It also fosters stronger ties among academics in the workplace. These findings align with Bock et al. [139], who found that sharing knowledge among individuals positively influences reciprocal relationships between them. The qualitative data results highlight that the participants prefer to share knowledge regarding courses, as well as implicit knowledge concerning optimal teaching methods, effective student communication, and teaching tools. They mentioned that they struggle to deliver knowledge to their students, especially novice academics. The results support previous studies showing that CS academics are typically trained as researchers and may not be well versed in effective teaching methods [16]. In addition, these findings align with the study by Crick et al. [173], who emphasised that early CS academics in HEI need support to develop their teaching skills, because they struggle with learning and teaching responsibilities. Sharing teaching-related knowledge will benefit them in preparing their modules, leading to improvements in curricular resources and classroom practices.

Interestingly, all CS academics involved in the third study emphasised the significance of recording teaching experiences for future reference and utilisation. They reported that some academics leave their jobs due to retirement or termination of the employment contract in the department, leading to a loss of their experience if it has not been documented. These findings align with previous research that emphasises the need for HEIs to preserve knowledge, particularly when experienced or knowledgeable academics leave and novices come in [165-167]. This enhances academic performance and allows the HEI to stay ahead of the competition [106, 168].

The results identified several obstacles that could hinder the exchange of teaching-related knowledge among CS academics. The main barrier is the lack of efficient communication methods

that facilitate sharing and motivation factors that encourage them. Face-to-face interaction is often challenging due to CS academics' heavy teaching responsibilities. The results of both the second and third studies (see Sections 4.3.6 and 4.4.6) support similar results from previous studies. Skaik and Othman [77], for example, found that the primary reason staff not exchange work-related information face to face was time constraints, which led to limited opportunities. The findings are also consistent with Alotaibi et al. [4], who found that the teaching hours for academics in Saudi universities are about 16 hours a week on average. Therefore, using technology might be a solution to overcome these obstacles in HEIs.

The results obtained from the third study indicate that most CS academics are open to the idea of instituting a reward system to motivate knowledge sharing, such as certificates of appreciation or material incentives. They indicted that a reward system might be a strong motivator for knowledge sharing among academics and could substantially impact their teaching performance. These results are in line with the results of Gururajan and Fink [286], who found that a reward system helps motivate sharing among academics. Additionally, gaining a positive reputation among peers and improving teaching skills are important motivators for sharing knowledge. Academics also value receiving feedback from colleagues, which leads to increased interaction and knowledge sharing. Therefore, rewards and gaining a reputation are likely to motivate academics to share their knowledge with their colleagues.

It is important to note that all participants agreed on the importance of developing a technological platform to share teaching-related knowledge among CS academics in their faculty, as shown in Sections 4.3 and 4.4. They emphasised that utilising such an integrated online platform would enable asynchronous sharing of knowledge and make it accessible anytime, from anywhere and would facilitate easier contact with other academics than face to face. They highlighted that for this platform to function effectively, it requires several enhanced features, such as a discussion forum to ask questions as well as share media and files with peers. A range of existing elements has been combined to explain how social media features can be utilised and consequently, innovate and transform conventional services into interactive knowledge services that give users the ability to create, access, interact with, present, share, and organise customised holdings. This system should come equipped with functional tools that enable users to capture, store and share knowledge effectively while ensuring seamless coordination. In addition, effective motivation factors should be present on the platform to encourage the sharing of knowledge among CS academics.

8.4 RQ3: What features and functions will CS academics require in the proposed platform to encourage knowledge sharing?

The design phase answers RQ3: What features and functions will CS academics require in the proposed platform to encourage knowledge sharing? The design phase of the TEP system employed a blend of SSM, to examine and analyse the requirements, and the JAD technique to validate the prototype. Based on the findings of the literature reviews and investigation studies (first, second and third studies), SSM was used to identify the problem and analyse the requirements for human activities to build a conceptual model of the TEP system. A use case diagram and system architecture were created to build the TEP prototype. The JAD technique was used to validate the prototype of TEP.

The results of the design phase are presented in Chapter 4. JAD sessions with the participants were conducted to validate the TEP prototype. The functions and features of the TEP system were found to be suitable for CS academics' requirements. The participants strongly welcomed the idea of the TEP system. Knowledge capture, storage, and sharing were the system's primary processes, and their primary purpose was to document the teaching experiences by collecting the tacit knowledge of practitioners (CS academics) and managing this knowledge. For this purpose, a number of functions were deployed. The first function of the TEP system was to enable users to create a post and add comments to it. The system's second function was the discussion forum, which enabled users to ask and answer questions. The topic of these questions and answers can be either general or related to specific modules [229]. This will make it easier for people to communicate with one another and exchange their information. The third function was a document management function which was related to modules resources. This allows modules supervisors to upload documents that are associated with modules. Slides, exercises, and examinations are all included in this.

The findings demonstrate that the search and retrieval features were essential to save time. CS academics proposed the utilisation of tags for posts and questions in order to improve the quality of the function. The participants found the functionality and design of the suggested system easy to understand and straightforward to operate. Suggestions for improving the design included providing information messages on each attribute on the templates when users create a post and ask questions, as well as adding a symbol to signify required fields. Users were very satisfied with the amount of time they needed to spend using the platform.

The TEP system was implemented as a web-based system that enabled users to access it on multiple devices, such as tablets and smartphones, as shown in Chapter 6. All functions and features were incorporated into the design of the TEP system. To evaluate the TEP system, the user-experience was evaluated by experimenting with the system in a real environment with actual users (CS academics). This aimed to facilitate effective knowledge-sharing management by CS academics at Saudi HEIs in the teaching context.

8.5 RQ4: To what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics?

Chapter 7 considers the fourth research question: To what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics? Workshops and questionnaires with CS academics were used to evaluate the TEP system. The empirical findings (discussed in Section 6.5) provide evidence that using the system's provided template for documenting teaching-related knowledge is effective and valuable for academics, as it helps them capture complete, clear, and consistent teaching practices quickly. The results from the workshops indicated the benefits of capturing teaching-related knowledge on the TEP. Workshop participants stated that they felt the TEP system has the potential to enhance the teaching process by allowing CS academics to document their experiences and solve problems during the semester and to save this information for a long time and reuse it when they need it in the future. In addition, academics said the template attributes were sufficient to document teaching experiences accurately and in detail. The TEP encourages CS academics to capture, store, and share teaching-related knowledge. This is consistent with the study conducted by Alwazae et al. [317], which found that a template can support the users in knowledge management systems as a systematic format that is easily comprehended to document their knowledge, share it and reuse it across time and space.

The empirical results of the questionnaire relating to the search and retrieval function indicate that participants had a robust favourable agreement on the effectiveness and speed of seeking and retrieving knowledge by tag browsing and keyword search. The results showed that the participants preferred the tags feature to find and retrieve knowledge in the TEP. Participants who attended the workshops also stated that the tag feature provides accurate access to the required knowledge whenever and wherever, saving a lot of time and effort. In addition, the participants agreed that seeking the required teaching-related knowledge is far simpler through browsing the TEP than obtaining information from experts face to face. This is consistent with Veeravalli et al. [318], who found users are more likely to use a system if it is easy.

Participants were delighted with the resource function and agreed that it was useful for accessing the teaching experience documents and all related resources for teaching anytime and anywhere. They noted that it combined all resources in one place by category. The categories featured in the resource function save time and make finding all the necessary resources easy. A study conducted by Stein [69] stated that knowledge storage improves the organisation. This supports the findings of the current study.

Participants strongly agree with the usefulness of the discussion forum in communicating with their colleagues when they needed, anytime, anywhere. They also said that this function on the TEP allows them to ask and answer questions in their free time; thus, there is no need to meet face to face. Given the heavy teaching loads, this is very beneficial.

Regarding the knowledge evaluation functions, the empirical results provide evidence that the functions implemented, i.e. comments, likes, favourites and views, help CS academics evaluate others' teaching-related knowledge in terms of perceived usefulness. Thus, these functions enable knowledge seekers (CS academics) to identify knowledge that is often used and rated as very important. Furthermore, it encourages CS academics to contribute their knowledge to the TEP. The findings are consistent with those of Brzozowski et al. [319], who found that participants' contribution is strongly connected to receiving comments from peers. This aspect will thus be useful to ensure the continued use of the system.

Gamification are implemented on the users' profiles as well as on the leaderboard on the homepage of the TEP system to indicate their contribution level. The empirical results provide evidence that the gamification tools represented by points and leaderboards on the TEP system were regarded by the participants as useful functions that positively influenced their contribution behaviour. The questionnaire results show the reputation score (points) feature was appreciated by users. This motivates users to contribute their knowledge in order to build a good reputation among their peers. This finding highlights that participant contribution to the TEP system is a key success factor. The findings are consistent with those of Tsai and Bagozzi [320]. Therefore, the knowledge evaluation features (i.e., social features and gamification tools) encouraged users to use the TEP and contribute their knowledge to peers.

Overall, implementing the design features proposed and trialled here in online knowledge-sharing communities will likely encourage academics to proactively contribute to the system by sharing their teaching-related knowledge. The evaluation of the users' experiences of the TEP

shows that the system is useful and facilitates the sharing of teaching-related knowledge among CS academics in Saudi HEIs. It enhances professional development, which will lead to improved teaching quality, as well as improving the educational process in general. The findings show the effectiveness of the TEP system as an online professional interactive community. As discussed by Kulkarni et al. [321], there is a substantial correlation between the user-perceived usefulness of KM initiatives and knowledge utilisation. This investigation revealed that academics who found satisfaction in the system's functionalities were inclined to utilise it for knowledge sharing, contributing to the success of the system. This is consistent with Karsen et al. [322], who found that the success of a system depends on the willingness of the employees to use it. The TEP system is useful for academics who are willing to share knowledge. However, academics are researchers, which is a competitive field, and this means some academics do not want to share knowledge. That being said, in the long term, it is better for the university if teaching and learning knowledge is shared. It is necessary for universities to reevaluate their policies and take proactive measures to incentivise their academics to actively participate in fostering a culture of knowledge exchange, ultimately benefiting the university as a whole.

8.6 Implication of the Study

The study on the creation and execution of a Teaching Experience Platform (TEP) for knowledge sharing among computer science educators carries important implications that reach far beyond its immediate scope. The implications extend across societal, cultural, and academic domains. The implications for society are rooted in the development of a knowledge-driven economy. The TEP is in harmony with worldwide initiatives aimed at fostering knowledge-driven economies through the encouragement of expertise sharing and dissemination. Specifically, individuals in academia, as generators of knowledge, play a vital role in societal innovation when their instructional methods are enhanced through collaborative platforms. Through the enhancement of teaching methodologies, the TEP plays a crucial role in nurturing proficient graduates who are vital for fostering economic advancement in areas like artificial intelligence, cybersecurity, and software engineering.

The platform's design fosters digital adoption among educators, addressing the critical need in societies with diverse levels of technological literacy.

This initiative enables educators in under-resourced institutions or areas to obtain and disseminate teaching strategies, thereby minimizing gaps in educational quality. By promoting inclusivity, the platform effectively addresses the digital divide that exists between institutions in developed and

developing regions. The TEP fosters an environment that promotes ongoing professional growth, thereby supporting the concept of lifelong learning for educators. This enables individuals to remain informed about new trends, technologies, and teaching strategies. This advantages both the educators and the students they instruct, equipping the latter with the necessary skills for the challenges posed by contemporary industries.

The cultural implication in environments where the exchange of knowledge is often constrained by established hierarchies or institutional limitations, the TEP promotes a culture that is more collaborative and open within academia: It promotes a shift for educators from solitary methods of teaching towards a focus on collaborative knowledge exchange. The platform's gamification features, such as leader boards and badges, have the potential to encourage participation, even in environments where collaboration is not typically prioritized. The platform facilitates connections among academics from various cultural backgrounds, promoting cross-cultural exchanges of teaching practices. For instance, educators in Saudi Arabia can share their pedagogical approaches with peers in other countries, resulting in a more enriched and diverse array of teaching strategies. Such exchanges can promote a deeper comprehension and appreciation for the diverse cultural perspectives within the educational landscape.

The TEP offers a framework for enhancing educational quality among institutions by allowing educators to exchange effective teaching strategies, lesson plans, and course materials. Engage in collaborative efforts to explore innovative strategies for problem-based learning, flipped classrooms, and various contemporary teaching methods. Progressing in the Field of Educational Inquiry. The data produced by the TEP can act as a valuable asset for those engaged in educational studies. It is possible to analyze patterns of engagement, knowledge-sharing behaviors, and the effectiveness of gamification in fostering collaboration. The findings from this study can guide the development of upcoming platforms and instructional methods, fostering a cycle of ongoing enhancement. Enhancing Collaborative Frameworks The TEP fosters collaboration both at the individual level and across institutions: This initiative fosters collaborations between institutions for the development of curricula, the execution of joint research endeavors, and the exchange of faculty members. Through the cultivation of these networks, the platform plays a vital role in enhancing the strength and interconnectedness of academic communities.

Saudi Arabia Vision 2030 represents a significant strategic initiative focused on economic diversification, enhancing quality of life, and establishing Saudi Arabia as a prominent player on the global stage across multiple sectors, such as education and innovation. The results of this study on the Teaching Experience Platform (TEP) closely correspond with the goals of Vision 2030,

especially regarding the improvement of education quality, the promotion of innovation, and the development of a knowledge-based economy.

A primary objective of Vision 2030 is to transform the education system, equipping future generations with the essential skills to succeed in a competitive global economy. The TEP plays a crucial role in achieving this objective by promoting ongoing professional growth for educators through the exchange of innovative teaching methods, lesson plans, and pedagogical strategies. This is consistent with the objectives of Vision 2030, which emphasizes enhancing teaching quality and empowering educators as essential agents of transformation. By promoting collaboration among educators, the TEP cultivates a culture of lifelong learning, ensuring that teachers are adequately prepared to address the changing needs of students.

The gamification features of the TEP encourage educators to participate actively with the platform, exchange their insights, and implement best practices. This aligns with the goal of improving the effectiveness of education across all levels as outlined in Vision 2030.

The TEP utilizes digital tools and technologies to enhance educational practices, aligning with the digital transformation goals set forth in Vision 2030. Through the incorporation of elements like gamification, discussion forums, and mechanisms for knowledge sharing, the platform equips educators to navigate the evolving digital landscape of education.

Innovation is central to Vision 2030, focusing on the development of a knowledge-based economy propelled by inquiry, technology, and skilled individuals. The emphasis on knowledge sharing and collaboration plays a crucial role in advancing this vision. The TEP promotes a culture of creativity and experimentation in education by empowering educators to share and adopt innovative teaching strategies. This is in accordance with the objectives of Vision 2030, which seeks to foster innovation throughout various sectors. The platform produces insightful data regarding instructional methods, participation behaviors, and cooperative dynamics. This data provides a solid basis for additional exploration in the fields of education, innovation, and technology, aligning with Vision 2030’s dedication to promoting research and development.

The TEP fosters connections among educators from various institutions and countries, enhancing Saudi Arabia's position in the global education landscape. By establishing the nation as a frontrunner in digital and collaborative teaching methodologies, the platform aligns with Vision 2030’s goal of elevating Saudi Arabia to the ranks of the world’s top-performing countries. The platform enhances the significance of educators by equipping them with resources to innovate and

thrive. This is in accordance with the objectives of Vision 2030, which aims to establish a vibrant education sector driven by competent and enthusiastic individuals.

The Teaching Experience Platform (TEP) aims to enhance collaboration, facilitate knowledge sharing, and promote professional development within the community of computer science educators. Nonetheless, the foundational concepts and groundbreaking attributes extend beyond their immediate environment. The platform holds the promise of motivating comparable initiatives across different nations and educational settings globally, tackling shared challenges in education while accommodating distinct local requirements. Numerous educational systems, irrespective of their geographic or economic contexts, encounter comparable challenges. Challenges encompass restricted collaboration avenues among educators, inequalities in resource distribution, and the necessity for ongoing professional growth to stay abreast of swift technological and pedagogical advancements. The design of the TEP addresses these challenges, presenting a flexible framework for replication. In areas where teaching resources are scarce, a platform similar to TEP could facilitate connections among educators from various institutions and locations, allowing them to exchange best practices, lesson plans, and instructional strategies. This form of digital collaboration has the potential to close resource disparities and enhance equity in education, particularly within underserved communities.

The TEP's modularity and adaptability stand out as significant strengths, enabling the customization of its features to meet diverse educational needs and cultural contexts. Other countries might consider adopting and customizing the essential features of TEP, including gamification, discussion forums, and mechanisms for knowledge sharing. In numerous developing countries, institutions of higher learning encounter obstacles stemming from antiquated teaching methods and a lack of adequate professional development opportunities. A platform inspired by TEP could tackle these challenges by facilitating access to a unified collection of educational materials, facilitating partnerships among educators from both urban and rural institutions, providing gamified incentives to promote involvement and interaction. A notable aspect of TEP is its incorporation of gamification to inspire educators and enhance collaboration. Incorporating gamification elements like badges, leaderboards, and rewards may motivate the development of comparable platforms by promoting engagement in professional growth initiatives, encouraging a feeling of accomplishment and collaboration among educators. recognizing the value of teamwork, including joint lesson plan development and engaging in peer review processes. An adaptation of TEP in Africa could incorporate gamification to improve teacher training programs in line with the education goals set by the African Union. Implementing gamification in learning modules has the

potential to enhance engagement and boost teacher retention rates within professional development programs.

A significant global issue in education is the necessity for cross-cultural and interdisciplinary learning. The capacity of TEP to unite educators from various backgrounds has the potential to foster platforms that encourage. Cross-Cultural Collaboration of educators from diverse cultural backgrounds can share teaching strategies and tailor them to meet local requirements, promoting mutual understanding and innovation. Interdisciplinary Teaching by fostering collaboration among scholars from diverse fields, such platforms could promote the creation of interdisciplinary courses and research initiatives, tackling intricate global issues. An example of a TEP-inspired platform in Asia might involve uniting educators from various linguistic and cultural backgrounds to collaboratively develop teaching content that tackles regional issues, including climate change and sustainable development.

The implementation of a reward system has demonstrated a powerful influence on knowledge sharing within the academic community, potentially leading to substantial improvements in teaching effectiveness. Incorporating elements like badges, points, leaderboards, or tangible incentives serves to enhance participation while simultaneously cultivating a sense of achievement and acknowledgment, both of which are essential for promoting collaboration within academic communities.

Investigations have shown that incentive structures can overcome obstacles to knowledge exchange, including insufficient time, motivation, or perceived advantages. Establishing a systematic approach to recognize and reward contributions increases the likelihood that scholars will share innovative teaching strategies, lesson plans, and research findings. The sharing of knowledge can improve teaching methods, providing advantages for both teachers and their learners.

Furthermore, an effectively structured reward system engages both intrinsic and extrinsic motivational elements. Fundamentally, it resonates with scholars' aspirations to make meaningful contributions to their discipline and achieve acknowledgment from their peers. External rewards like certifications, professional development credits, or institutional accolades offer concrete advantages that validate their hard work.

In the context of platforms such as the Teaching Experience Platform (TEP), implementing a reward system could significantly boost engagement and collaboration among educators. Utilizing gamification elements like points for contributions, levels for active engagement, and leaderboards to highlight top contributors can foster a competitive yet cooperative atmosphere on the platform.

This has the potential to enhance teaching effectiveness, foster innovation in educational methodologies, and cultivate a dynamic, knowledge-centric academic environment.

The application of game design elements in contexts outside of gaming has been extensively examined for its ability to improve engagement, motivation, and retention across multiple fields, particularly in education. The incorporation of gamification strategies into platforms such as the Teaching Experience Platform (TEP) has demonstrated potential in tackling issues like low adherence and elevated drop-out rates. Gamification has emerged as an effective strategy to enhance commitment to educational initiatives by utilizing both intrinsic and extrinsic motivators. Investigations indicate that gamified settings can promote ongoing involvement by incorporating components like rewards, feedback, and competition. Badges and Rewards: Studies show that offering badges or rewards for task completion or milestone achievements enhances user commitment to the platform [241]. Participants view these rewards as acknowledgment of their contributions, encouraging them to maintain their involvement. Leaderboards foster a feeling of accomplishment and rivalry, motivating individuals to remain engaged. Nevertheless, Feng et al. [242] warn that the design of leaderboards requires careful consideration to prevent discouraging users who frequently find themselves at the bottom of the rankings.

Personalization: Techniques that incorporate gamification and adjust to personal preferences and progress have shown to enhance adherence rates, as users experience a stronger connection to the platform. A notable challenge faced by educational platforms is the elevated drop-out rates, especially within online learning settings. Gamification has demonstrated its effectiveness in addressing this issue by enhancing the engagement and interactivity of learning experiences. Engagement as a Retention Strategy: Incorporating elements like challenges, quests, and social features effectively minimizes drop-out rates by sustaining user interest over time [323]. Effectively structured gamification systems decompose learning into manageable, attainable objectives, alleviating the cognitive strain that frequently results in drop-out. Encouraging Community Engagement: Incorporating social gamification features, like team-oriented challenges and cooperative tasks, cultivates a feeling of belonging, which research indicates can significantly lower drop-out rates [324].

While gamification offers numerous advantages, it also presents certain challenges. Inadequately executed gamification systems may result in a lack of engagement or potentially increased drop-out rates. Important factors to take into account is mitigating excessive competition. Intense competition may discourage individuals who perceive themselves as unable to match the achievements of top performers [242]. Balancing intrinsic and extrinsic motivation is crucial, as an

over-reliance on rewards may undermine intrinsic motivation, causing users to disengage when the rewards are no longer present [323]. Inclusivity is essential; gamification designs should consider the varied needs and preferences of users to promote widespread participation and ongoing engagement. The discussion in Chapter 3 highlights the significance of intentional gamification design in reaching specific objectives. Essential insights consist of adaptive gamification, which customises challenges and rewards based on user progress and skill levels, was emphasised as a crucial element in enhancing adherence rates [242]. The integration of collaborative gamification strategies, including team-based tasks, significantly boosts user engagement and mitigates feelings of isolation, which is often a prevalent factor leading to drop-out in digital platforms [324].

Research indicates that ongoing feedback, provided through gamified features such as progress bars or instant rewards, maintains user motivation and helps avoid disengagement [241]. The insights derived from gamification literature hold significant relevance for the design and execution of the Teaching Experience Platform by incorporating badges, points, and leaderboards, TEP can motivate ongoing engagement. Nonetheless, the platform needs to find a way to harmonize competition and collaboration to promote inclusivity. Strategies for Reducing Drop-Out Rates: Integrating team-oriented challenges and flexible gamification strategies can diminish the chances of drop-out by cultivating a nurturing and interactive educational atmosphere. To ensure sustained engagement over time, TEP should prioritize intrinsic motivators, including the cultivation of a sense of community and opportunities for professional development, rather than depending exclusively on external rewards. Gamification presents considerable opportunities for enhancing adherence and minimizing drop-out rates in educational platforms such as TEP. Through meticulous design of gamification components that resonate with user needs, TEP has the potential to foster an engaging, motivating, and sustainable atmosphere for academic collaboration and knowledge exchange. The results presented here expand on the discussions in Chapter 3, highlighting the significance of gamification as a strategic asset for achieving success on platforms. Reputation scores, commonly implemented in gamified platforms such as the Teaching Experience Platform (TEP) to encourage knowledge sharing and collaboration, can yield considerable advantages in enhancing engagement and nurturing community. Nonetheless, the implementation brings forth a range of ethical considerations regarding possible misuse or unforeseen outcomes. These encompass concerns like manipulating the system, psychological impact, and equity. It is essential to tackle these issues to guarantee the ethical and fair application of gamification in educational platforms.

Although reputation scores can serve as an effective mechanism for enhancing engagement and collaboration, it is essential to implement them carefully to avoid ethical concerns like system manipulation, psychological impact, and inequity. An approach that emphasizes quality rather than quantity, safeguards user privacy, and fosters inclusivity can effectively address these risks. By tackling these ethical implications, platforms such as TEP can foster a positive, equitable, and sustainable environment that genuinely serves the interests of all users.

8.7 Summary

This chapter discussed the answers generated by all studies in this research according to the research questions (RQ1-RQ4). With regards to RQ1, the answer presents a persuasive case for incorporating social media features within a vCoP to enhance teaching and learning. The answer to RQ2 shows most CS academics are aware of the importance of exchanging teaching experiences for their institution, the learning process, teaching quality, and student outcomes. In addition, CS academics emphasised the significance of recording teaching experiences for future reference and utilisation. They agreed on the importance of developing a technological platform to share teaching-related knowledge among CS academics in their faculty in order to overcome the obstacles that could hinder the exchange of teaching-related knowledge among CS academics.

Regarding RQ3, the TEP system is suitable for CS academics' requirements, which are creating posts, discussion forums, document management, and search and retrieval features. Some suggestions from CS academics were incorporated into the TEP system after the prototype was validated. In terms of RQ4, the user experience of the TEP showed that the system is useful and facilitates the sharing of teaching-related knowledge among CS academics in Saudi HEIs. It enhances an online professional interactive community. In the next chapter, the conclusion of this thesis is presented.

Chapter 9 Conclusion and Future Work

9.1 Introduction

The main goal of this research was to facilitate the sharing of teaching-related knowledge among CS academics in HEIs through an online interactive community that incorporates a KM approach with social features, named the Teaching Experience Platform (TEP). In addition, this research aimed to evaluate the CS academics' experiences in terms of the perceived usefulness of TEP and their perspectives.

There are four research questions, as discussed in Chapter 1:

RQ1: How can existing social media applications be used to share knowledge for teaching and learning purposes in HEIs?

RQ2: To what extent are CS academics in HEIs aware of the importance of knowledge sharing?

RQ3: What features and functions will CS academics require in the proposed platform to encourage knowledge sharing?

RQ4: To what extent does the TEP facilitate the sharing of teaching-related knowledge for CS academics?

To answer these questions, Chapter 3 reviewed the existing literature on knowledge, types of knowledge, knowledge management processes, and the context of HEIs. In Chapter 4, investigation studies were conducted to identify challenges with regards to teaching and learning knowledge sharing in HEIs. This provided valuable insights from participants regarding the existing knowledge sharing practices and answered RQ1 and RQ2. In Chapter 5, the TEP system was designed by using a blend of SSM to examine the requirements and the JAD technique to validate the prototype to answer RQ3. Chapter 6 concerns the implementation of the TEP system. The evaluation of CS academics' experience of the TEP system via user experience is discussed in Chapter 7. This evaluation was completed via the use of the perceived usefulness questionnaire and workshops to answer RQ4. Chapter 8 provided an overall discussion of the findings. The current chapter presents research contributions in Section 9.2, limitations in Section 9.3 and avenues for future work in Section 9.4.

9.2 Research contributions

This research makes five main contributions to the literature on teaching-related knowledge sharing among CS academics. The first contribution is a discussion of the feasibility of using social media

platforms to share knowledge related to teaching and learning purposes in HEI from CS pre-service teachers' perspectives, as discussed in Section 4.2. The findings indicate the utilisation of social media platforms to share content or knowledge has the potential to enhance educational experiences. However, some limitations make them less than ideal for sharing teaching-related knowledge among academics at a university level, such as privacy, copyright and material ownership, which might impact the university's competitiveness and affect its financial situation. Therefore, the findings present a persuasive case for the incorporation of social media features (tools) within a vCoP in the educational setting to enhance teaching and learning. These communities could offer new prospects for promoting sustainable professional development and lifelong learning. The findings show that developing professional development programmes for pre-service teachers in the School of Computing is an endeavour that is of the upmost importance Qian et al. [262]. This need becomes even more apparent when considering the context of Saudi Arabia, as indicated by Almuqrin and Mutambik [10] and Amasha and Alkhalaf [263].

The second contribution is an exploration of CS academics' perspectives towards teaching-related knowledge sharing and the factors that contribute to an academic's WSK in HEIs, as discussed in Chapter 4 (see Sections 4.2, 4.3 and 4.4). Knowledge sharing is an important activity that depends on human behaviour. Previous studies have highlighted that in order to develop an effective KMS, the human behaviour of the users needs to be taken into account. In this case, this research focuses on exploring the human behaviour of CS academics, so that the KMS meets academic needs. Prior to the current study, there was no in-depth research exploring CS academics' behaviour in terms of sharing teaching-related knowledge in HEIs. The current study thus fills the gap in the literature on KMS development. The findings provide valuable insights into actual CS academics' knowledge-sharing behaviour in Saudi HEIs and illustrate CS academics' requirements. These requirements were then used to design and develop a technical solution.

The third contribution of this research is the design and implementation of the TEP. Unlike previous studies, this platform was developed with attention both to aspects of user behaviour (social) and to technology (IT platform). In the KM field, researchers generally focus on either the users' behaviour or technological aspects, not both. In the TEP system, social features and gamification tools were incorporated, encouraging more active participation to gain recognition or rewards, thus creating a more interactive and collaborative environment. Hence, social features and gamification can be considered as solutions to motivate individuals (users) to use the system.

Therefore, this contribution to the KM field provides an effective environment for supporting KM processes in HEIs.

The fourth contribution of this research is the methodology of design of the TEP system, utilising a mix of SSM and JAD to prioritise the actual users' needs in relation to the system, as detailed in Chapter 5. This combination enhances a deeper understanding of complex problems in terms of human activities while ensuring that user needs and requirements are central to the system development process. It should be remembered that understanding users' actual, real-world context can significantly enhance design utility [325]. Based on the findings, it was concluded that the functions and features of the TEP system are suitable for the case study of CS academics. Furthermore, it is anticipated that these features will facilitate the effective use of knowledge-sharing management by CS academics at Saudi HEIs in the context of teaching. This design provides an effective environment to facilitate the sharing of teaching experiences among CS academics, resulting in direct benefits for both knowledge contributors and seekers.

The fifth contribution is that this thesis used questionnaires and workshops to evaluate the user experience based on the perceived usefulness of the TEP system with actual end users (CS academics), as discussed in Chapter 7. There is a lack of evaluation of KMS in a real-life setting. The findings indicate that implementing the design features proposed and trialled here in the TEP will likely encourage academics to proactively contribute to the system by sharing their teaching-related knowledge. Therefore, this design is of great value and provides an effective environment to facilitate and support the sharing and reuse of experiences and best practices among CS academics, resulting in direct benefits for both CS academics and the educational institutions in which they work.

These empirical results revealed that academics who found satisfaction in the system's functionalities were inclined to utilise it for knowledge sharing. They show that TEP system is useful for aiding CS academics in Saudi HEIs to share teaching-related knowledge. Therefore, the TEP system is likely to lead to a marked improvement in work processes, thus helping universities achieve their performance objectives and subsequently fulfil the objectives of the Saudi Vision 2030 (see Section 1.1). This provides new insights to future developers to design a system for sharing teaching-related knowledge that enhances and improves the quality of education in CS.

9.3 Limitations

This section discusses certain limitations to this thesis. It is imperative to approach the interpretation of the study's findings with meticulous attention to specific limitations. The research had limitations in terms of the sample sizes and respondent selection from two Saudi universities. Convenience sampling was employed due to time constraints and challenges in recruiting academics. Despite these limitations, the study used various data collection methods, such as questionnaires, interviews and workshops, in order to ensure the validity of the results. The diverse sample included CS academics with varied experience levels and academic positions, resulting in accurate and comprehensive results and allowing for a deep understanding of the perspective of CS academics.

The evaluation of the TEP system was conducted at Jeddah University due to time and financial constraints. In addition, recruiting academics for the evaluation of the TEP was difficult because of their packed schedules, making it challenging to engage them in a research project unrelated to teaching.

The TEP system experiment unfortunately lasted for only seven weeks because of the time constraints of the entire PhD programme. A longer experiment would have allowed for better and more in-depth observations of the system's usage statistics. It would also have allowed the identification of any deficiencies. Extending the duration of the experiment could offer valuable information on the effectiveness of the TEP system and users' behaviours.

The demographic data appeared to have more females than males. This is due to the big response rates the researcher received from the female academics in comparison to the male ones. This may be attributed to the fact that the researcher is a female.

The perceptions and experiences of the CS academics at Saudi Universities may differ from those of others in other countries. Therefore, it is crucial to consider the variations in educational systems and professional training across different countries and use diverse sampling methods in future studies for improved external validity.

9.4 Future work

This research can be expanded to include a large number of CS academics either at different Saudi universities or in different countries. This would strengthen the results and allow for the generalisation of the findings. Future work can also integrate the TEP system with the current systems in place at universities, for example, with the LMS the university's faculty currently

utilises. This will help CS academics to document their teaching experience, which would lead to more collaboration and exchange among peers.

It would be useful to conduct a long-term study to investigate the effects of the system on its real usage by analysing user behaviours.

Although most of the academics in this study are aware of the importance of sharing knowledge, other academics do not desire to share their knowledge. It is recommended that the leadership of universities change their policies to encourage the academics in HEIs to share their knowledge, which can be an essential part of their work in their departments. One possible incentive could be by applying a reward system. This reward system could either monetary or certificates of appreciation or acknowledgement.

The imbedding of artificial intelligence (AI) can ensure the system is ethical in terms of detecting any abuse, bullying or harassment. Additionally, AI could be helpful in identifying trending topics, expertise areas, and knowledge gaps within the system.

Assessing the influence of the Teaching Experience Platform (TEP) on the quality of instruction necessitates a thorough methodology that integrates various data collection techniques and robust research designs. The quality of teaching is a complex concept that can be shaped by various elements, such as innovative teaching methods, student performance, and opportunities for professional growth. This essay examines the various data types and studies required to evaluate the platform's effectiveness and emphasizes how this investigation could guide its future development. To quantitatively assess TEP’s impact, it is crucial to consider various metrics associated with user engagement, student performance, and teaching evaluation. A crucial aspect to examine is the manner in which educators engage with the platform. Metrics including login frequency, time spent on the platform, and engagement in features such as discussion forums, resource sharing, and gamified elements (e.g., badges or leaderboards) can yield significant insights into user behavior. Elevated engagement levels could be linked to a greater uptake of novel instructional strategies. Another significant factor is the influence of TEP on student outcomes. These metrics can be quantified by examining grades, course completion rates, and dropout rates. Advancements in these domains may suggest that educators utilizing TEP are implementing more effective instructional strategies, consequently enriching student learning experiences.

Information gathered from teaching evaluation forms, such as student feedback, peer reviews, and institutional assessments, can provide insights into the perceived effectiveness of

educators prior to and following the implementation of TEP. These assessments offer a straightforward assessment of instructional effectiveness from various viewpoints. Metrics associated with knowledge sharing—like the quantity of resources uploaded, shared, or downloaded—can underscore the platform's significance in promoting collaboration. Monitoring collaborative initiatives launched through TEP, including co-created lesson plans or interdisciplinary studies, highlights its significance. The full scope of TEP's influence cannot be captured by quantitative data alone. Qualitative methods are crucial for grasping the intricate ways in which the platform influences teaching practices. Gathering feedback from educators via interviews, surveys, and focus groups can yield valuable insights into their experiences with TEP. These methods can reveal how the platform fosters innovative teaching strategies, tackles challenges, and enhances professional development.

Watching educators in their classrooms provides a direct evaluation of how TEP impacts their approaches. For instance, it is possible to document the integration of innovative strategies learned from the platform and their effects on student engagement and participation. Promoting the practice of reflective journaling among educators can uncover long-term shifts in their methodologies. Journals serve as a valuable tool for documenting the implementation of innovative techniques, the obstacles faced, and the evolution of personal development throughout the journey. Comparative studies can effectively highlight TEP's impact by analyzing the distinctions between users and non-users or evaluating scenarios before and after adoption. Collecting baseline data prior to the implementation of TEP allows for the identification of shifts in teaching quality following the adoption of the platform. Metrics like student performance, teaching evaluations, and engagement levels can be analyzed over time for comparative insights.

Establishing experimental groups (educators utilizing TEP) and control groups (non-users) enables an evaluation of TEP's distinct impact. Variations in results, including the implementation of novel approaches or enhancements in student achievement, can underscore the platform's efficacy. Longitudinal studies are crucial for comprehending the long-term effects of TEP. Monitoring educators over extended periods offers valuable insights into enduring transformations in teaching methodologies and ongoing professional growth. These investigations can determine if the enhancements noted right after platform implementation are sustained or increase over time. A mixed-methods approach integrates both quantitative and qualitative data to provide a comprehensive assessment. For instance, one can analyze user engagement metrics alongside feedback from educators to understand how specific platform features drive teaching

improvements. Linking qualitative insights with quantitative data aids in recognizing trends and formulating actionable recommendations. In addition to evaluating individual teaching quality, it is essential to examine the platform's influence on institutional collaboration and professional development. The quantity and caliber of collaborative initiatives launched through TEP, including co-authored studies or joint curriculum creation, can illustrate its significance in promoting academic collaborations.

Monitoring certifications, workshops, and various professional development activities accessed via TEP serves as proof of its contribution to enhancing educators' capabilities. Insights on these opportunities can enhance their effectiveness. The information and analyses presented above can guide TEP's ongoing enhancement efforts. For instance, examining engagement patterns can reveal features that are not being fully utilized, whereas qualitative feedback can inform the creation of new tools or resources. Furthermore, broadening the investigation to encompass various cultural and educational settings guarantees the platform's scalability and flexibility. Assessing the influence of TEP on teaching quality necessitates a comprehensive strategy that integrates numerical data, descriptive feedback, and extended studies. By evaluating user engagement, student outcomes, teaching evaluations, and professional development opportunities, one can gain a comprehensive understanding of the platform’s effectiveness. These findings will not only confirm TEP’s role in enhancing education but also inform its development to more effectively support educators and institutions worldwide. By engaging in careful and thorough assessment, TEP can persist in influencing the evolution of education and instructional practices.

9.5 Summary

This work has shown that sharing teaching-related knowledge amongst academics can enable the development of teaching skills and thus help enhance university outcomes. However, there are limitations and barriers that prevent the full sharing of knowledge within higher education. The primary concern for sharing knowledge is aligning effective practice with current academic work. This can be mitigated through the use of technology. The main goal of this research was to facilitate the sharing of teaching-related knowledge among CS academics in HEIs through an online interactive community that incorporates a knowledge management approach with social features. This research discovered requirements and used them to build, test, and implement a highly successful Teaching Experience Platform (TEP).

References

1. 2030, V. *Human Capability Development Program*. 2021; Available from: https://www.vision2030.gov.sa/v2030/vrps/hcdp/.
2. Fullwood, R., J. Rowley, and R. Delbridge, *Knowledge sharing amongst academics in UK universities.* Journal of knowledge management, 2013. **17**(1): p. 123-136.
3. Jeyanthi, P.M. and S.K. Shrivastava, *The determinant parameters of knowledge transfer among academicians in colleges of Chennai region.* Theoretical Economics Letters, 2019. **9**(4): p. 752-760.
4. Alotaibi, H., R. Crowder, and G. Wills, *Adoption of Web based knowledge sharing system amongst academic staff.* Journal of Advanced Management Science, 2017. **5**(1): p. 57-63.
5. Alasmari, T.M., *Can mobile learning technology close the gap caused by gender segregation in the Saudi educational institutions?* Journal of Information Technology Education. Research, 2020. **19**: p. 655.
6. Ghabban, F., A. Selamat, and R. Ibrahim, *New model for encouraging academic staff in Saudi universities to use IT for knowledge sharing to improve scholarly publication performance.* Technology in Society, 2018. **55**: p. 92-99.
7. Hussein, A.-R.H. and A.B. Nassuora, *Jordanian student's attitudes and perceptions towards knowledge sharing in institutions of higher education.* International Journal of Academic Research, 2011. **3**(4): p. 401-405.
8. Fan, Z. and L.-S. Beh, *Knowledge sharing among academics in higher education: A systematic literature review and future agenda.* Educational Research Review, 2023: p. 100573.
9. Al-Kurdi, O.F., R. El-Haddadeh, and T. Eldabi, *The role of organisational climate in managing knowledge sharing among academics in higher education.* International Journal of Information Management, 2020. **50**: p. 217-227.
10. Almuqrin, A. and I. Mutambik, *The explanatory power of social cognitive theory in determining knowledge sharing among Saudi faculty.* Plos one, 2021. **16**(3): p. e0248275.
11. Malik, H.A.M., et al., *Challenges of computer science and IT in teaching-learning in Saudi Arabia.* Sukkur IBA Journal of Computing and Mathematical Sciences, 2018. **2**(1): p. 29-35.
12. Charband, Y. and N.J. Navimipour, *Online knowledge sharing mechanisms: a systematic review of the state of the art literature and recommendations for future research.* Information Systems Frontiers, 2016. **18**(6): p. 1131-1151.
13. Fullwood, R., J. Rowley, and J. McLean, *Exploring the factors that influence knowledge sharing between academics.* Journal of Further and Higher education, 2019. **43**(8): p. 1051-1063.
14. Lo, M.F. and F. Tian, *How academic leaders facilitate knowledge sharing: a case of universities in Hong Kong.* Leadership & Organization Development Journal, 2020. **41**(6): p. 777-798.
15. Alsaadi, F.M., *Knowledge Sharing Among Academics in Higher Education Institutions in Saudi Arabia*. 2018, Nova Southeastern University.
16. Camp, T., et al., *Generation CS: the growth of computer science.* ACM Inroads, 2017. **8**(2): p. 44-50.
17. Hazzan, O., N. Ragonis, and T. Lapidot, *Guide to Teaching Computer Science: An Activity-Based Approach*. 2020: Springer Nature.

18. Al-Ghamdi, S. and M. Tight, *Selecting and developing high-quality academic staff*, in *Higher education in Saudi Arabia: Achievements, challenges and opportunities*. 2013, Springer. p. 83-93.
19. Andrews, T., et al., *Colleagues as change agents: How department networks and opinion leaders influence teaching at a single research university.* CBE—Life Sciences Education, 2016. **15**(2): p. ar15.
20. Pifer, M.J. and V.L. Baker, *Managing the process: The intradepartmental networks of early-career academics.* Innovative Higher Education, 2013. **38**(4): p. 323-337.
21. Diriye, A., *The Role of Organizational Culture in Knowledge Sharing in Higher Education Institutions: A Social Capital Perspective.* 2020.
22. Behari-Leak, K., *New academics, new higher education contexts: A critical perspective on professional development.* Teaching in Higher Education, 2017. **22**(5): p. 485-500.
23. Cuny, J. *Cs education: Catching the wave*. in *Proceedings of the 47th ACM Technical Symposium on Computing Science Education*. 2016.
24. Field, A., *How to design and report experiments.* 2002.
25. Lazar, J., J.H. Feng, and H. Hochheiser, *Research methods in human-computer interaction*. 2017: Morgan Kaufmann.
26. Creswell, J.W. and J.D. Creswell, *Research design: Qualitative, quantitative, and mixed methods approaches*. 2017: Sage publications.
27. Zohrabi, M., *Mixed method research: Instruments, validity, reliability and reporting findings.* Theory and practice in language studies, 2013. **3**(2): p. 254.
28. Seliger, H.W., *Second language research methods*. 1989, Oxford University Press.
29. Gillham, B., *Developing a questionnaire.* 2008.
30. ., S. *SurveyMonkey - Free online survey software and questionnaire tool*. 2022; Available from: https://www.surveymonkey.co.uk/welcome/sem/?program=7013A000000mweBQAQ&utm_bu=CR&utm_campaign=71700000059189067&utm_adgroup=58700005405718088&utm_content=43700049188975070&utm_medium=cpc&utm_source=adwords&utm_term=p49188975070&utm_kxconfid=s4bvpi0ju&language=&test=&gclsrc=aw.ds&gclid=EAIaIQobChMIxPS1svqi-AIV4mDmCh158gX4EAAYAiAAEgKmC_D_BwE
31. Flick, U., *An introduction to qualitative research.* 2022.
32. Merriam, S.B., *Qualitative Research and Case Study Applications in Education. Revised and Expanded from" Case Study Research in Education.".* 1998: ERIC.
33. Courage, C. and K. Baxter, *Understanding your users: A practical guide to user requirements methods, tools, and techniques*. 2005: Gulf Professional Publishing.
34. Creswell, J.W., *A concise introduction to mixed methods research*. 2014: SAGE publications.
35. Levitt, H.M., et al., *Journal article reporting standards for qualitative primary, qualitative meta-analytic, and mixed methods research in psychology: The APA Publications and Communications Board task force report.* American Psychologist, 2018. **73**(1): p. 26.
36. Checkland, P. and J. Scholes, *Soft systems methodology in action*. 1999: John Wiley & Sons.
37. Carmel, E., J.F. George, and J.F. Nunamaker Jr, *Supporting joint application development (JAD) with electronic meeting systems: a field study.* 1992.
38. Jifa, G., *Data, information, knowledge, wisdom and meta-synthesis of wisdom-comment on wisdom global and wisdom cities.* Procedia Computer Science, 2013. **17**: p. 713-719.

39. Wang, Y., *Formal cognitive models of data, information, knowledge, and intelligence.* WSEAS Transactions on Computers, 2015. **14**(3): p. 770-781.
40. Zins, C., *Conceptual approaches for defining data, information, and knowledge.* Journal of the American society for information science and technology, 2007. **58**(4): p. 479-493.
41. Aamodt, A. and M. Nygård, *Different roles and mutual dependencies of data, information, and knowledge—An AI perspective on their integration.* Data & Knowledge Engineering, 1995. **16**(3): p. 191-222.
42. Compton, P. and R. Jansen, *A philosophical basis for knowledge acquisition.* Knowledge acquisition, 1990. **2**(3): p. 241-258.
43. Nonaka, I., *A dynamic theory of organizational knowledge creation.* Organization science, 1994. **5**(1): p. 14-37.
44. Mansourvar, M. and N.M. Yasin, *Web portal as a knowledge management system in the universities.* World Academy of Science, Engineering and Technology, 2010. **70**(1): p. 968-974.
45. Gobet, F., *Three views on expertise: Philosophical implications for rationality, knowledge, intuition and education.* Education and Expertise, 2018: p. 58-74.
46. Mihály, P., *Personal knowledge: towards a post-critical philosophy*. 1962: University of Chicago Press.
47. Mohsen Allameh, S., et al., *Developing a model for examining the effect of tacit and explicit knowledge sharing on organizational performance based on EFQM approach.* Journal of Science & Technology Policy Management, 2014. **5**(3): p. 265-280.
48. Rowley, J., *The wisdom hierarchy: representations of the DIKW hierarchy.* Journal of information science, 2007. **33**(2): p. 163-180.
49. Collins, H., *Tacit and explicit knowledge*. 2019: University of Chicago press.
50. Von Krogh, G., I. Nonaka, and L. Rechsteiner, *Leadership in organizational knowledge creation: A review and framework.* Journal of management studies, 2012. **49**(1): p. 240-277.
51. Fauzi, M.A., et al., *Evaluating academics' knowledge sharing intentions in Malaysian public universities.* Malaysian Journal of Library and Information Science, 2019. **24**(1): p. 123-143.
52. Brown, J.S. and P. Duguid, *Organizational learning and communities-of-practice: Toward a unified view of working, learning, and innovation.* Organization science, 1991. **2**(1): p. 40-57.
53. Leonard, D. and S. Sensiper, *The role of tacit knowledge in group innovation.* California management review, 1998. **40**(3): p. 112-132.
54. Lundvall, B.-ä. and B. Johnson, *The learning economy.* Journal of industry studies, 1994. **1**(2): p. 23-42.
55. Lundvall, B.-Å., *The economics of knowledge and learning*, in *Product inovation, interactive learning and economic performance*. 2004, Emerald Group Publishing Limited. p. 21-42.
56. Jensen, M.B., et al., *Forms of knowledge and modes of innovation.* The learning economy and the economics of hope, 2007. **155**.
57. Jalili, Y.A. and S. Ghaleh, *Knowledge sharing and the theory of planned behavior: a meta-analysis review.* VINE Journal of Information and Knowledge Management Systems, 2020.
58. Kuo, F.-Y. and M.-L. Young, *Predicting knowledge sharing practices through intention: A test of competing models.* Computers in Human Behavior, 2008. **24**(6): p. 2697-2722.
59. Alavi, M. and D. Leidner, *Knowledge management systems: issues, challenges, and benefits.* Communications of the Association for Information systems, 1999. **1**(1): p. 7.

60. Hansen, M.T., N. Nohria, and T. Tierney, *What's your strategy for managing knowledge.* Knowledge management: critical perspectives on business and management, 2005. **77**(2): p. 322.
61. Lo, M.F. and P.M.L. Ng. *Role of codification and personalization in organizational learning, innovation and performance: A conceptual framework and research propositions*. in *International Conference on Intellectual Capital and Knowledge Management and Organisational Learning*. 2015. Academic Conferences International Limited.
62. Sambamurthy, V. and M. Subramani, *Special issue on information technologies and knowledge management.* MIS quarterly, 2005: p. 1-7.
63. Alavi, M. and J.S. Denford, *Knowledge management: Process, practice, and web 2.0.* Handbook of organizational learning and knowledge management, 2012: p. 105-124.
64. Migdadi, M.M., *Knowledge management processes, innovation capability and organizational performance.* International Journal of Productivity and Performance Management, 2022. **71**(1): p. 182-210.
65. Lee, V.-H., et al., *Knowledge management: a key determinant in advancing technological innovation?* Journal of knowledge management, 2013. **17**(6): p. 848-872.
66. Chen, Y.-Y. and H.-L. Huang, *Knowledge management fit and its implications for business performance: A profile deviation analysis.* Knowledge-based systems, 2012. **27**: p. 262-270.
67. Hashim, H.S., Z.A. Al-Sulami, and N. Ali, *The role of information technology tools to support knowledge transferring processes throughout SECI model: An empirical study.* International Research Journal of Engineering and Technology (IRJET), 2017. **4**(10).
68. Olivera, F., *Memory systems in organizations: an empirical investigation of mechanisms for knowledge collection, storage and access.* Journal of management studies, 2000. **37**(6): p. 811-832.
69. Stein, E.W., *Organization memory: Review of concepts and recommendations for management.* International journal of information management, 1995. **15**(1): p. 17-32.
70. Argote, L., S.L. Beckman, and D. Epple, *The persistence and transfer of learning in industrial settings.* Management science, 1990. **36**(2): p. 140-154.
71. Huber, G.P., *Organizational learning: The contributing processes and the literatures.* Organization science, 1991. **2**(1): p. 88-115.
72. Stein, E.W. and V. Zwass, *Actualizing organizational memory with information systems.* Information systems research, 1995. **6**(2): p. 85-117.
73. Masa'deh, R.e., et al., *The role of knowledge management infrastructure in enhancing job satisfaction: a developing country perspective.* Interdisciplinary Journal of Information, Knowledge & Management, 2019. **14**.
74. Kukko, M., *Knowledge sharing barriers in organic growth: A case study from a software company.* The Journal of High Technology Management Research, 2013. **24**(1): p. 18-29.
75. Dixon, N.M., *Common knowledge: How companies thrive by sharing what they know*. 2000: Harvard Business School Press.
76. Kearns, G.S. and A.L. Lederer, *A resource-based view of strategic IT alignment: how knowledge sharing creates competitive advantage.* Decision sciences, 2003. **34**(1): p. 1-29.
77. Skaik, H.A. and R. Othman, *Investigating academics' knowledge sharing behaviour in United Arab Emirates.* Journal of Business and Economics, 2015. **6**(1): p. 161-178.
78. Al-Kurdi, O., R. El-Haddadeh, and T. Eldabi, *Knowledge sharing in higher education institutions: a systematic review.* Journal of Enterprise Information Management, 2018.

79. Cabrera, A. and E.F. Cabrera, *Knowledge-sharing dilemmas.* Organization studies, 2002. **23**(5): p. 687-710.
80. Wang, S. and R.A. Noe, *Knowledge sharing: A review and directions for future research.* Human resource management review, 2010. **20**(2): p. 115-131.
81. Yi, J., *A measure of knowledge sharing behavior: scale development and validation.* Knowledge Management Research & Practice, 2009. **7**(1): p. 65-81.
82. Van den Hooff, B., et al. *Knowledge sharing in knowledge communities*. in *Communities and Technologies: Proceedings of the First International Conference on Communities and Technologies; C&T 2003*. 2003. Springer.
83. Chua, A. *Knowledge sharing: a game people play*. in *Aslib Proceedings*. 2003. MCB UP Ltd.
84. Nickerson, J.A. and T.R. Zenger, *A knowledge-based theory of the firm—The problem-solving perspective.* Organization science, 2004. **15**(6): p. 617-632.
85. Ling, C.W., M.S. Sandhu, and K.K. Jain, *Knowledge sharing in an American multinational company based in Malaysia.* Journal of workplace learning, 2009.
86. Srivastava, A., K.M. Bartol, and E.A. Locke, *Empowering leadership in management teams: Effects on knowledge sharing, efficacy, and performance.* Academy of management journal, 2006. **49**(6): p. 1239-1251.
87. Ketvirtis, S., *Knowledge sharing: Leveraging trust and leadership to increase team performance*. 2011, Northwestern.
88. Trivellas, P., et al., *The impact of knowledge sharing culture on job satisfaction in accounting firms. The mediating effect of general competencies.* Procedia Economics and Finance, 2015. **19**: p. 238-247.
89. Argote, L. and P. Ingram, *Knowledge transfer: A basis for competitive advantage in firms.* Organizational behavior and human decision processes, 2000. **82**(1): p. 150-169.
90. Sohail, M.S. and S. Daud, *Knowledge sharing in higher education institutions: Perspectives from Malaysia.* Vine, 2009.
91. Al-Hawamdeh, S., *Knowledge management: cultivating knowledge professionals*. 2003: Elsevier.
92. Jarrah, H.Y. and M.S. Alkhazaleh, *Knowledge Sharing Behavior in the Curricula of United Arab Emirates Universities and Educational Organizations.* International Journal of Instruction, 2020. **13**(3): p. 1-16.
93. Alavi, M. and D.E. Leidner, *Knowledge management and knowledge management systems: Conceptual foundations and research issues.* MIS quarterly, 2001: p. 107-136.
94. Markus, L.M., *Toward a theory of knowledge reuse: Types of knowledge reuse situations and factors in reuse success.* Journal of management information systems, 2001. **18**(1): p. 57-93.
95. Oshri, I., *Knowledge reuse*, in *Encyclopedia of Knowledge Management, Second Edition*. 2011, IGI Global. p. 905-913.
96. Petrides, L.A. and L. Ngyuen, *Knowledge management trends: challenges and opportunities for educational institutions.* Knowledge management and higher education: A critical analysis, 2006: p. 21-33.
97. Omerzel, D.G., et al., *Knowledge management and organisational culture in higher education institutions.* Journal for East European Management Studies, 2011: p. 111-139.
98. Rowley, J., *Is higher education ready for knowledge management?* International journal of educational management, 2000. **14**(7): p. 325-333.
99. Tippins, M.J., *Implementing knowledge management in academia: teaching the teachers.* International Journal of Educational Management, 2003. **17**(7): p. 339-345.

100. Veer Ramjeawon, P. and J. Rowley, *Knowledge management in higher education institutions: enablers and barriers in Mauritius.* The Learning Organization, 2017. **24**(5): p. 366-377.
101. Deng, Z. *Notice of Retraction: A probe into the educational knowledge management and teachers' professional development*. in *2011 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC)*. 2011. IEEE.
102. Andrews, T.C., et al., *Colleagues as Change Agents: How Department Networks and Opinion Leaders Influence Teaching at a Single Research University.* CBE—Life Sciences Education, 2016. **15**(2): p. ar15.
103. Auerbach, A.J. and E. Schussler, *A vision and change reform of introductory biology shifts faculty perceptions and use of active learning.* CBE—Life Sciences Education, 2017. **16**(4): p. ar57.
104. Aurelie Bechina Arntzen, A., L. Worasinchai, and V.M. Ribiere, *An insight into knowledge management practices at Bangkok University.* Journal of knowledge management, 2009. **13**(2): p. 127-144.
105. Steyn, G., *Harnessing the power of knowledge in higher education.* Education, 2004. **124**(4).
106. Trivella, L. and N.K. Dimitrios, *Knowledge management strategy within the higher education. The case of Greece.* Procedia-Social and Behavioral Sciences, 2015. **175**: p. 488-495.
107. Devi Ramachandran, S., S. Choy Chong, and H. Ismail, *The practice of knowledge management processes: A comparative study of public and private higher education institutions in Malaysia.* Vine, 2009. **39**(3): p. 203-222.
108. Kidwell, J.J., K. Vander Linde, and S.L. Johnson, *Applying corporate knowledge management practices in higher education.* Educause quarterly, 2000. **23**(4): p. 28-33.
109. Quarchioni, S., S. Paternostro, and F. Trovarelli, *Knowledge management in higher education: a literature review and further research avenues.* Knowledge Management Research & Practice, 2022. **20**(2): p. 304-319.
110. Fernández-López, S., et al., *The effect of strategic knowledge management on the universities' performance: an empirical approach.* Journal of Knowledge Management, 2018. **22**(3): p. 567-586.
111. Birgeneau, R.J., *Foreword: The role of the university and basic research in the new economy.* Creating, 2005.
112. Esposito, V., et al., *Dealing with knowledge in the Italian public universities: The role of performance management systems.* Journal of Intellectual capital, 2013. **14**(3): p. 431-450.
113. Bhusry, M. and J. Ranjan, *Knowledge collaboration in higher educational institutions in india: Charting a knowledge management solution.* International Journal of Computer Science Issues (IJCSI), 2011. **8**(5): p. 332.
114. Corcoran, N. and A. Duane, *Using social networks and communities of practice to promote staff collaboration in higher education.* Connecting adult learning and knowledge management: strategies for learning and change in higher education and organizations, 2019: p. 157-174.
115. Alammari, A.M. and D. Chandran. *Populating contents of the Saudi eLearning objects repository "Maknaz" from information technology & knowledge management perspective*. in *2014 Asia-Pacific Conference on Computer Aided System Engineering (APCASE)*. 2014. IEEE.

116. Trehan, A. and P. Kushwaha, *The implementation of knowledge management system in B-schools.* International Journal of Multidisciplinary Management Studies, 2012. **2**(2): p. 252-260.
117. Ramayah, T., J.A. Yeap, and J. Ignatius, *Assessing knowledge sharing among academics: A validation of the knowledge sharing behavior scale (KSBS).* Evaluation review, 2014. **38**(2): p. 160-187.
118. Othman, R., *Determinants of Academicsâ€™ Knowledge Sharing Behavior in United Arab Emirates Universities.* Journal of Education and Vocational Research, 2014. **5**(1): p. 1-12.
119. Songsangyos, P., *The knowledge management in higher education in Chiang Mai: A comparative review.* Procedia-Social and Behavioral Sciences, 2012. **69**: p. 399-403.
120. Abdullah, S.A. and R.B. Sulaiman, *A systematic review and model development of the factors that affect knowledge sharing in educational institutions.* International Journal of Science and Research (IJSR), 2016. **5**(2): p. 1898-1903.
121. Duan, H., S. Wu, and F. Ye. *The application of the knowledge representation based on concept algebra in the knowledge management system of petroleum enterprise*. in *2013 IEEE International Conference on Green Computing and Communications and IEEE Internet of Things and IEEE Cyber, Physical and Social Computing*. 2013. IEEE.
122. Yang, J.-T., *Knowledge sharing: Investigating appropriate leadership roles and collaborative culture.* Tourism management, 2007. **28**(2): p. 530-543.
123. Hendriks, P., *Why share knowledge? The influence of ICT on the motivation for knowledge sharing.* Knowledge and process management, 1999. **6**(2): p. 91-100.
124. Azeem, M., et al., *Expanding competitive advantage through organizational culture, knowledge sharing and organizational innovation.* Technology in Society, 2021. **66**: p. 101635.
125. Antonova, A., A. Csepregi, and A. Marchev Jr, *How to extend the ICT used at organizations for transferring and sharing knowledge.* IUP Journal of Knowledge Management, 2011. **9**(1): p. 37.
126. Martin, J.S. and R. Marion, *Higher education leadership roles in knowledge processing.* The learning organization, 2005. **12**(2): p. 140-151.
127. Seonghee, K. and J. Boryung, *An analysis of faculty perceptions: Attitudes toward knowledge sharing and collaboration in an academic institution.* Library & Information Science Research, 2008. **30**(4): p. 282-290.
128. Al Kurdi, O.F.A., A. Ghoneim, and A. Al Roubaie, *Knowledge sharing culture in higher education: Critical.* Higher Education in the Twenty-First Century II. doi, 2015. **10**(2.1): p. 2056.7043.
129. Nonaka, l., H. Takeuchi, and K. Umemoto, *A theory of organizational knowledge creation.* International journal of technology Management, 1996. **11**(7-8): p. 833-845.
130. Howell, K.E. and F. Annansingh, *Knowledge generation and sharing in UK universities: a tale of two cultures?* International journal of information management, 2013. **33**(1): p. 32-39.
131. Khalil, O.E. and T. Shea, *Knowledge sharing barriers and effectiveness at a higher education institution.* International Journal of Knowledge Management (IJKM), 2012. **8**(2): p. 43-64.
132. Saad, A. and H. Haron. *A case study of higher education academics' shared knowledge and classification*. in *2013 International Conference on Research and Innovation in Information Systems (ICRIIS)*. 2013. IEEE.
133. Jolaee, A., et al., *Factors affecting knowledge sharing intention among academic staff.* International Journal of Educational Management, 2014. **28**(4): p. 413-431.

134. Norulkamar, U. and A. Hatamleh, *A review of knowledge sharing barriers among academic staff-a Malaysian perspective.* Sains Humanika, 2014. **2**(2).
135. Ali, O.F., A. Gohneim, and A. Roubaie. *Knowledge sharing culture in higher education institutions: critical literature review*. in *European, Mediterranean & Middle Eastern Conference on Information Systems*. 2014.
136. Annansingh, F., et al., *Academics' perception of knowledge sharing in higher education.* International Journal of Educational Management, 2018. **32**(6): p. 1001-1015.
137. Abdullah, N.L., et al., *Psychological contract and knowledge sharing among academicians: mediating role of relational social capital.* International business research, 2011. **4**(4): p. 231.
138. O'dell, C. and C.J. Grayson, *If only we knew what we know: Identification and transfer of internal best practices.* California management review, 1998. **40**(3): p. 154-174.
139. Bock, G.-W., et al., *Behavioral intention formation in knowledge sharing: Examining the roles of extrinsic motivators, social-psychological forces, and organizational climate.* MIS quarterly, 2005: p. 87-111.
140. Akosile, A. and W. Olatokun, *Factors influencing knowledge sharing among academics in Bowen University, Nigeria.* Journal of Librarianship and Information Science, 2020. **52**(2): p. 410-427.
141. Charband, Y. and N. Jafari Navimipour, *Knowledge sharing mechanisms in the education: A systematic review of the state of the art literature and recommendations for future research.* Kybernetes, 2018. **47**(7): p. 1456-1490.
142. Davenport, T.H. and L. Prusak, *Working knowledge: How organizations manage what they know*. 1998: Harvard Business Press.
143. Nguyen, T.-M., P.T. Nham, and V.-N. Hoang, *The theory of planned behavior and knowledge sharing: A systematic review and meta-analytic structural equation modelling.* VINE Journal of Information and Knowledge Management Systems, 2019.
144. Alsuraihi, M.D., K. Yaghi, and A.B. Nassuora, *Knowledge sharing practices among Saudi academics: A case study of King Abdulaziz University.* Journal of Current Research in Science, 2016. **4**(1): p. 63.
145. Alammari, A. and D. Chandran, *Impact of knowledge sharing adoption on universities' virtual learning communities.* 2017.
146. Fullwood, R. and J. Rowley, *An investigation of factors affecting knowledge sharing amongst UK academics.* Journal of Knowledge Management, 2017. **21**(5): p. 1254-1271.
147. Yu, C.-P. and T.-H. Chu, *Exploring knowledge contribution from an OCB perspective.* Information & management, 2007. **44**(3): p. 321-331.
148. Blankenship, S.S. and W.E. Ruona, *Exploring knowledge sharing in social structures: Potential contributions to an overall knowledge management strategy.* Advances in developing human resources, 2009. **11**(3): p. 290-306.
149. Mills, A.M. and T.A. Smith, *Knowledge management and organizational performance: a decomposed view.* Journal of knowledge management, 2011. **15**(1): p. 156-171.
150. Bock, G.W. and Y.-G. Kim, *Breaking the myths of rewards: An exploratory study of attitudes about knowledge sharing.* Information Resources Management Journal (IRMJ), 2002. **15**(2): p. 14-21.
151. Thi Chung, D. and P. Thi Tram Anh, *Factors affecting knowledge sharing behaviour in public higher education institutions: An empirical study of Vietnam.* Cogent Business & Management, 2022. **9**(1): p. 2155002.
152. Razak, N.A., et al., *Theories of knowledge sharing behavior in business strategy.* Procedia Economics and Finance, 2016. **37**: p. 545-553.

153. Jeon, S., Y.G. Kim, and J. Koh, *An integrative model for knowledge sharing in communities-of-practice.* Journal of knowledge management, 2011. **15**(2): p. 251-269.
154. Zhang, X. and J.Y. Jiang, *With whom shall I share my knowledge? A recipient perspective of knowledge sharing.* Journal of Knowledge Management, 2015. **19**(2): p. 277-295.
155. Alotaibi, H., R. Crowder, and G. Wills, *Investigating factors for E-knowledge sharing amongst academic staff.* 2014.
156. Kim, S. and H. Lee, *The impact of organizational context and information technology on employee knowledge-sharing capabilities.* Public administration review, 2006. **66**(3): p. 370-385.
157. Soliman, A.Y., et al. *A Framework for Constructing and Assessing Knowledge Management Systems for Engineering Institutes*. in *2019 IEEE Global Engineering Education Conference (EDUCON)*. 2019. IEEE.
158. Msweli, N. *Instructors' perception of the competencies required to teach DS in HEI*. in *Proceedings of the NEMISA Digital Skills Conference: Scaling data skills for multidisciplinary impact education*. 2023.
159. Shulman, L.S., *Knowledge and teaching: Foundations of the new reform.* Teacher Education: Major Themes in Education.–New York: Macmillan, 2006: p. 119-145.
160. Singh, A. *Knowledge based expert systems in organization of higher learning*. in *Proceedings of the International Conference and Workshop on Emerging Trends in Technology*. 2010.
161. Yan, W. *Improving Teaching Effectiveness in Higher Education*. in *2022 International Conference on Science Education and Art Appreciation (SEAA 2022)*. 2022. Atlantis Press.
162. Santosh, S. and S. Panda, *Sharing of knowledge among faculty in a mega open university.* Open Praxis, 2016. **8**(3): p. 247-264.
163. Guzdial, M., *Teaching other teachers how to teach CS better.* Communications of the ACM, 2021. **64**(5): p. 8-9.
164. Sallis, E. and G. Jones, *Knowledge management in education: Enhancing learning & education*. 2013: Routledge.
165. Dehghani, R. and R. Ramsin, *Methodologies for developing knowledge management systems: an evaluation framework.* Journal of Knowledge Management, 2015. **19**(4): p. 682-710.
166. Roziana, S., R. Azizah, and A. Hamidah. *What Deter Academia to Share Knowledge within Research-Based University Status*. in *Proceedings of World Academy of Science, Engineering and Technology*. 2013. World Academy of Science, Engineering and Technology (WASET).
167. Hannay, L., S. Ben Jaafar, and L. Earl, *A case study of district leadership using knowledge management for educational change.* Journal of Organizational Change Management, 2013. **26**(1): p. 64-82.
168. Popescu, G.H., *Organizational e-learning and knowledge management in higher education.* Journal of Self-Governance and Management Economics, 2017. **5**(1): p. 87-93.
169. Lister, R., et al., *Differing ways that computing academics understand teaching.* 2007.
170. Ben-Ari, M., *Constructivism in computer science education.* Journal of computers in Mathematics and Science Teaching, 2001. **20**(1): p. 45-73.
171. Green, N., et al. *A scalable intelligent tutoring system framework for computer science education*. in *International Conference on Computer Supported Education*. 2015. SCITEPRESS.

172. Yadav, A., et al. *POGIL in computer science: faculty motivation and challenges*. in *Proceedings of the 50th ACM Technical Symposium on Computer Science Education*. 2019.
173. Crick, T., et al. *Supporting early-career academics in the UK computer science community*. in *Proceedings of the 5th Conference on Computing Education Practice*. 2021.
174. Foote, A. and L.A. Halawi, *Knowledge management models within information technology projects.* Journal of Computer Information Systems, 2018. **58**(1): p. 89-97.
175. Khilji, N., Y. Duan, and J. Tehrani. *A Conceptual framework of knowledge sharing for enhanced performance in the heis*. in *21st European Conference on Knowledge Management*. 2020.
176. Tausczik, Y. and X. Huang, *Knowledge generation and sharing in online communities: Current trends and future directions.* Current opinion in psychology, 2020. **36**: p. 60-64.
177. Duane, A. and N. Corcoran, *Using social media to enable staff knowledge sharing in higher education institutions.* Australasian Journal of Information Systems, 2018.
178. Khalilova, T.A., *KNOWLEDGE MANAGEMENT SYSTEM IN HIGHER EDUCATION INSTITUTIONS.* Economic and Social Development: Book of Proceedings, 2020. **4**: p. 88-94.
179. Holsapple, C.W., *The inseparability of modern knowledge management and computer-based technology.* Journal of knowledge management, 2005. **9**(1): p. 42-52.
180. Panahi, S., J. Watson, and H. Partridge, *Towards tacit knowledge sharing over social web tools.* Journal of knowledge management, 2013. **17**(3): p. 379-397.
181. Paroutis, S. and A. Al Saleh, *Determinants of knowledge sharing using Web 2.0 technologies.* Journal of knowledge management, 2009. **13**(4): p. 52-63.
182. Amin, N.A.N., et al., *The utilization of web 2.0 for knowledge sharing: The case of tertiary education in brunei darussalam*, in *Handbook of Research on Managerial Practices and Disruptive Innovation in Asia*. 2020, IGI Global. p. 1-25.
183. Alshehri, O. and V. Lally, *Students' Perceptions of the Use of Social Media in Higher Education in Saudi Arabia.* International Journal of Educational and Pedagogical Sciences, 2019. **13**(1): p. 28-31.
184. Junco, R., G. Heiberger, and E. Loken, *The effect of Twitter on college student engagement and grades.* Journal of computer assisted learning, 2011. **27**(2): p. 119-132.
185. Castro-Romero, O., *Social Media as learning tool in higher education: the case of Mexico and South Korea.* Sinéctica, 2015(44): p. 1-16.
186. Sobaih, A.E.E., et al., *To use or not to use? Social media in higher education in developing countries.* Computers in Human Behavior, 2016. **58**: p. 296-305.
187. Chugh, R. and U. Ruhi, *Social media in higher education: A literature review of Facebook.* Education and Information Technologies, 2018. **23**(2): p. 605-616.
188. Al-Maatouk, Q., et al., *Applying Communication Theory to Structure and Evaluate the Social Media Platforms in Academia.* International Journal, 2020. **9**(2).
189. Saini, C. and J. Abraham, *Modeling educational usage of social media in pre-service teacher education.* Journal of Computing in Higher Education, 2019. **31**(1): p. 21-55.
190. Donelan, H., *Social media for professional development and networking opportunities in academia.* Journal of further and higher education, 2016. **40**(5): p. 706-729.
191. Vie, S., *Training online technical communication educators to teach with social media: Best practices and professional recommendations.* Technical Communication Quarterly, 2017. **26**(3): p. 344-359.
192. Dragseth, M.R., *Building student engagement through social media.* Journal of Political Science Education, 2020. **16**(2): p. 243-256.

193. Alyoussef, I.Y., M.M. Alamri, and W.M. Al-Rahmi, *Social media use (SMU) for teaching and learning in Saudi Arabia.* Int. J. Recent Technol. Eng, 2019. **8**: p. 942-946.
194. Barnett, S., et al., *General practice training and virtual communities of practice-a review of the literature.* BMC family practice, 2012. **13**: p. 1-12.
195. Wenger, E., *Communities of practice: A brief introduction.* 2011.
196. Wang, D., et al., *School context and instructional capacity: A comparative study of professional learning communities in rural and urban schools in China.* International Journal of Educational Development, 2017. **52**: p. 1-9.
197. Tsiotakis, P. and A. Jimoyiannis, *Critical factors towards analysing teachers' presence in on-line learning communities.* The Internet and Higher Education, 2016. **28**: p. 45-58.
198. Ali, A. and I.A. Qazi, *Countering misinformation on social media through educational interventions: Evidence from a randomized experiment in Pakistan.* Journal of Development Economics, 2023. **163**: p. 103108.
199. Levy, M., *WEB 2.0 implications on knowledge management.* Journal of knowledge management, 2009. **13**(1): p. 120-134.
200. Orenga-Roglá, S. and R. Chalmeta, *Methodology for the implementation of knowledge management systems 2.0: A case study in an oil and gas company.* Business & Information Systems Engineering, 2019. **61**: p. 195-213.
201. McAfee, A.P., *Enterprise 2.0: The dawn of emergent collaboration.* MIT Sloan management review, 2006.
202. Saad, A. and H. Haron, *Knowledge Sharing Networks Used by Academicians in Malaysian Public University.* Sains Humanika, 2014. **2**(2).
203. Rahmatia, D. and K. Surendro. *Knowledge management system design model for smart enterprise*. in *International Conference on ICT for Smart Society*. 2013. IEEE.
204. Ardichvili, A., et al., *Cultural influences on knowledge sharing through online communities of practice.* Journal of knowledge management, 2006. **10**(1): p. 94-107.
205. Meneses-Ortegón, J.P., et al. *Knowlegde management for co-creating educational material with high ability students, teachers and parents*. in *2018 IEEE Global Engineering Education Conference (EDUCON)*. 2018. IEEE.
206. Šajina, R. and T. Orehovacki. *Development and evaluation of an application for sharing information about courses*. in *2018 41st International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO)*. 2018. IEEE.
207. Abdullah, R., Z.D. Eri, and A.M. Talib. *A model of knowledge management system for facilitating knowledge as a service (KaaS) in cloud computing environment*. in *2011 International Conference on Research and Innovation in Information Systems*. 2011. IEEE.
208. Rajalakshmi, S. and R.W. Banu. *Analysis of tacit knowledge sharing and codification in higher education*. in *2012 International Conference on Computer Communication and Informatics*. 2012. IEEE.
209. Svetsky, S., et al., *Computer support for knowledge management within r&d and the teaching of bachelor students.* International Journal of Emerging Technologies in Learning (iJET), 2013. **8**(2013).
210. Jessy, A., M. Rao, and K.S. Bhat, *Web portal: An E-content knowledge management tool.* Pearl: A Journal of Library and Information Science, 2016. **10**(4): p. 224-233.
211. Irawan, S. *Hybrid soft system methodology (ssm) and becerra approach for modeling knowledge management system*. in *Journal of Physics: Conference Series*. 2019. IOP Publishing.
212. Becerra-Fernandez, I. and R. Sabherwal, *Knowledge management: Systems and processes*. 2014: Routledge.

213. Maligat, D., et al. *Web-based knowledge management system for camarines norte state college*. in *IOP Conference Series: Materials Science and Engineering*. 2020. IOP Publishing.
214. Sensuse, D.I., et al., *Knowledge management system design method with joint application design (JAD) adoption.* VINE Journal of Information and Knowledge Management Systems, 2021. **51**(1): p. 27-46.
215. Buxton, A., *JANET and the librarian.* The Electronic Library, 1988. **6**(4): p. 250-263.
216. El Bast, A.N., et al. *University customized knowledge management system (KMS)*. in *2015 Fifth International Conference on Digital Information and Communication Technology and its Applications (DICTAP)*. 2015. IEEE.
217. Dneprovskaya, N.V. and I.V. Shevtsova. *The knowledge management system development for smart education*. in *2018 IEEE International Conference" Quality Management, Transport and Information Security, Information Technologies"(IT&QM&IS)*. 2018. IEEE.
218. Zhang, L. and R. Kaschek. *Developing a knowledge management support system for teaching database normalization*. in *Fifth IEEE International Conference on Advanced Learning Technologies (ICALT'05)*. 2005. IEEE.
219. Cabrera, L.G., J.R.B. Almagro, and I.R. Ruano. *A higher education social network to share and promote teaching innovation experiences*. in *2014 IEEE Frontiers in Education Conference (FIE) Proceedings*. 2014. IEEE.
220. Alamro, S., et al., *Template-Driven Documentation for Enterprise Recruitment Best Practices.* 2019.
221. Alwazae, M., E. Perjons, and P. Johannesson, *Applying a template for best practice documentation.* Procedia Computer Science, 2015. **72**: p. 252-260.
222. Schacht, S. and A. Maedche, *Project knowledge management while simply playing! Gaming mechanics in project knowledge management systems.* Gamification in education and business, 2015: p. 593-614.
223. TASI, C. and C. HUNG, *ASSESSING KNOWLEDGE MANAGEMENT SYSTEM SUCCESS: AN EMPRICAL STUDY IN TAIWAN S HIGH TECH INDUSTRY*. 2007.
224. Sensuse, D. *Knowledge management systems development and implementation: a systematic literature review*. in *IOP Conference Series: Earth and Environmental Science*. 2021. IOP Publishing.
225. Kosmol, L. *Sharing is caring-information and knowledge in industrial symbiosis: a systematic review*. in *2019 IEEE 21st conference on business informatics (CBI)*. 2019. IEEE.
226. Maharani, N.Z., et al., *Motivations and Potential Solutions in Developing a Knowledge Management System for Organization at Higher Education: A Systematic Literature Review.* Journal of Information Systems Engineering and Business Intelligence, 2024. **10**(2): p. 270-289.
227. Petkov, D., et al., *On the suitability of soft systems methodology and the work system method in some software project contexts.* International Journal of Information Technologies and Systems Approach (IJITSA), 2013. **6**(2): p. 22-34.
228. Moores, T.T. and F.H. Gregory, *Cultural problems in applying SSM for IS development.* Journal of Global Information Management (JGIM), 2000. **8**(1): p. 14-19.
229. Muslikhah, K. *Designing knowledge management system prototype for mental health practitioners*. in *Proceedings of the International HCI and UX Conference in Indonesia*. 2015.
230. Weber, R.O., *Addressing failure factors in knowledge management.* Electronic Journal of Knowledge Management, 2007. **5**(3): p. pp334-347-pp334-347.

231. Yang, L.F. *On some issues of knowledge management system: a review*. in *2008 4th International Conference on Wireless Communications, Networking and Mobile Computing*. 2008. IEEE.
232. Holste, J.S. and D. Fields, *Trust and tacit knowledge sharing and use.* Journal of knowledge management, 2010. **14**(1): p. 128-140.
233. Duggan, E.W. and C.S. Thachenkary, *Integrating nominal group technique and joint application development for improved systems requirements determination.* Information & Management, 2004. **41**(4): p. 399-411.
234. Avison, D. and G. Fitzgerald, *Information systems development: methodologies, techniques and tools*. 2003: McGraw Hill.
235. Peffers, K., et al., *A design science research methodology for information systems research.* Journal of management information systems, 2007. **24**(3): p. 45-77.
236. Björgvinsson, E., P. Ehn, and P.-A. Hillgren. *Participatory design and" democratizing innovation"*. in *Proceedings of the 11th Biennial participatory design conference*. 2010.
237. Naz, R. and M. Khan, *Rapid applications development techniques: A critical review.* International Journal of Software Engineering and Its Applications, 2015. **9**(11): p. 163-176.
238. Davis, F.D., *Perceived usefulness, perceived ease of use, and user acceptance of information technology.* MIS quarterly, 1989: p. 319-340.
239. Venkatesh, V. and F.D. Davis, *A theoretical extension of the technology acceptance model: Four longitudinal field studies.* Management science, 2000. **46**(2): p. 186-204.
240. Venkatesh, V., et al., *User acceptance of information technology: Toward a unified view.* MIS quarterly, 2003: p. 425-478.
241. Balbaa, M.E. and M. Abdurashidova, *Enhancing Student Engagement and Learning Outcomes Through Gamification in Education.* Technology and Education, 2023: p. 13.
242. Feng, Z., Y. Gao, and T. Zhang, *Gamification for visualization applications in the construction industry.* Industry 4.0 for the Built Environment: Methodologies, Technologies and Skills, 2022: p. 495-514.
243. Falciani, I., *What is GBL vs Gamification, Types, Benefits.* 2020.
244. Carpenter, J.P., et al., *Using social media in pre-service teacher education: The case of a program-wide twitter hashtag.* Teaching and Teacher Education, 2023. **124**: p. 104036.
245. Van Nes, F., et al., *Language differences in qualitative research: is meaning lost in translation?* European journal of ageing, 2010. **7**: p. 313-316.
246. Tyupa, S., *A theoretical framework for back-translation as a quality assessment tool.* New Voices in Translation Studies, 2011. **7**(1): p. 35-46.
247. Lancaster, G.A., S. Dodd, and P.R. Williamson, *Design and analysis of pilot studies: recommendations for good practice.* Journal of evaluation in clinical practice, 2004. **10**(2): p. 307-312.
248. Hassan, Z.A., P. Schattner, and D. Mazza, *Doing a pilot study: why is it essential?* Malaysian family physician: the official journal of the Academy of Family Physicians of Malaysia, 2006. **1**(2-3): p. 70.
249. Weiss, R.J. and R.J. Townsend, *Using Excel to clean and prepare data for analysis.* Bản checklist những lỗi thường gặp (xem hình bên dưới), 2005. **3**.
250. Pimentel, J.L., *A note on the usage of Likert Scaling for research data analysis.* USM R&D Journal, 2010. **18**(2): p. 109-112.
251. Alwagait, E., B. Shahzad, and S. Alim, *Impact of social media usage on students academic performance in Saudi Arabia.* Computers in Human Behavior, 2015. **51**: p. 1092-1097.

252. O'Keeffe, M., *Academic Twitter and professional learning: myths and realities.* International Journal for Academic Development, 2019. **24**(1): p. 35-46.
253. Benko, S., et al., *More than social media: Using Twitter with preservice teachers as a means of reflection and engagement in communities of practice.* Contemporary Issues in Technology and Teacher Education, 2016. **16**(1): p. 1-21.
254. Selwyn, N., *Making sense of young people, education and digital technology: The role of sociological theory.* Oxford review of education, 2012. **38**(1): p. 81-96.
255. Basu, B., *Analyzing the Perception of Social Networking Sites as a Learning Tool among University Students: Case Study of a Business School in India.* International Journal of Educational and Pedagogical Sciences, 2017. **11**(7): p. 1697-1703.
256. Chugh, R., R. Grose, and S.A. Macht, *Social media usage by higher education academics: A scoping review of the literature.* Education and Information Technologies, 2021. **26**(1): p. 983-999.
257. Datu, J., J. Valdez, and N. Datu, *Does Facebooking make us sad? Hunting relationship between Facebook use and depression among Filipino adolescents.* International Journal of Research Studies in Educational Technology, 2012. **1**(2): p. 83-91.
258. Alabdulkareem, S.A., *Exploring the use and the impacts of social media on teaching and learning science in Saudi.* Procedia-Social and Behavioral Sciences, 2015. **182**: p. 213-224.
259. Komaki, S. and T. Igawa, *The widespread misconception about the Japanese major biogeographic boundary, the Watase line (Tokara gap), revealed by bibliographic and beta diversity analyses.* BioRxiv, 2017: p. 186775.
260. Ogbonnaya, U., *Adoption and perceived usefulness of social media by pre-service teachers in Nigeria.* 2019.
261. Ansari, J.A.N. and N.A. Khan, *Exploring the role of social media in collaborative learning the new domain of learning.* Smart Learning Environments, 2020. **7**(1): p. 1-16.
262. Qian, Y., et al., *Who needs what: Recommendations for designing effective online professional development for computer science teachers.* Journal of Research on Technology in Education, 2018. **50**(2): p. 164-181.
263. Amasha, M.A. and S. Alkhalaf, *Using RSS 2.00 as a Model for u-Learning to Develop e-Training in Saudi Arabia.* International Journal of Information and Education Technology, 2016. **6**(7): p. 516.
264. Shannak, R., M. Maqableh, and A. Tarhini, *The impact of knowledge management on job performance in higher education: The case of the University of Jordan.* Journal of Enterprise Information Management, 2017. **30**(2): p. 244-262.
265. Mullinix, K.J., et al., *The generalizability of survey experiments.* Journal of Experimental Political Science, 2015. **2**(2): p. 109-138.
266. Reja, U., et al., *Open-ended vs. close-ended questions in web questionnaires.* Developments in applied statistics, 2003. **19**(1): p. 159-177.
267. Pallant, J., *SPSS survival manual: A step by step guide to data analysis using IBM SPSS*. 2020: McGraw-hill education (UK).
268. Altman, D.G. and J.M. Bland, *Statistics notes: the normal distribution.* Bmj, 1995. **310**(6975): p. 298.
269. Elliott, A.C. and W.A. Woodward, *Statistical analysis quick reference guidebook: With SPSS examples*. 2007: Sage.
270. Miles, M.B. and A.M. Huberman, *Qualitative data analysis: An expanded sourcebook*. 1994: sage.
271. Sekaran, U., *Research methods for business: A skill building approach*. 2016, John Wiley & Sons.

272. Johnson, R.B., *Examining the validity structure of qualitative research.* Education, 1997. **118**(2).
273. Zhang, M., et al., *A Pearson correlation-based adaptive variable grouping method for large-scale multi-objective optimization.* Information Sciences, 2023. **639**: p. 118737.
274. Javaid, J., S. Soroya, and K. Mahmood, *Impact of personal and organizational factors on knowledge sharing attitude of university teachers in Pakistan.* The Electronic Library, 2020. **38**(2): p. 317-336.
275. Al-Adaileh, R.M. and M.S. Al-Atawi, *Organizational culture impact on knowledge exchange: Saudi Telecom context.* Journal of knowledge Management, 2011. **15**(2): p. 212-230.
276. Frankland, J. and M. Bloor, *Some issues arising in the systematic analysis of focus group materials.* 1999.
277. Fossey, E., et al., *Understanding and evaluating qualitative research.* Australian & New Zealand journal of psychiatry, 2002. **36**(6): p. 717-732.
278. Ryan, F., M. Coughlan, and P. Cronin, *Step-by-step guide to critiquing research. Part 2: Qualitative research.* British journal of nursing, 2007. **16**(12): p. 738-744.
279. Bowen, G.A., *Naturalistic inquiry and the saturation concept: a research note.* Qualitative research, 2008. **8**(1): p. 137-152.
280. Fereday, J. and E. Muir-Cochrane, *Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development.* International journal of qualitative methods, 2006. **5**(1): p. 80-92.
281. Thorne, S., *Data analysis in qualitative research.* Evidence-based nursing, 2000. **3**(3): p. 68-70.
282. Cohen, J., *Statistical power analysis for the behavioral sciences*. 2013: routledge.
283. Braun, V. and V. Clarke, *Using thematic analysis in psychology.* Qualitative research in psychology, 2006. **3**(2): p. 77-101.
284. Bryman, A., *Social research methods*. 2016: Oxford university press.
285. Usman, S.H. and I.O. Oyefolahan, *Encouraging knowledge sharing using Web 2.0 technologies in higher education: a survey.* arXiv preprint arXiv:1406.7437, 2014.
286. Gururajan, V. and D. Fink, *Attitudes towards knowledge transfer in an environment to perform.* Journal of knowledge Management, 2010. **14**(6): p. 828-840.
287. Niwe, M. and J. Stirna, *Examining knowledge capture for the B2B domain.* International Journal for Infonomics Society (IJI), 2010. **3**(2): p. 353-362.
288. Sutanto, J., et al., *Does knowledge retrieval improves work efficiency? An investigation under multiple systems use.* International Journal of Information Management, 2018. **40**: p. 42-53.
289. Dai, Y., et al. *User perceived quality of online social information services: from the perspective of knowledge management*. in *2007 IEEE International Conference on Industrial Engineering and Engineering Management*. 2007. IEEE.
290. Fowler, M., *Patterns of enterprise application architecture*. 2012: Addison-Wesley.
291. Wiegers, K.E. and J. Beatty, *Software requirements*. 2013: Pearson Education.
292. *Figma, https://www.figma.com/downloads/*.
293. Brennan, K., *A Guide to the Business Analysis Body of Knowledger*. 2009: Iiba.
294. Story, M., *I LIKE, I WISH, WHAT IF….*
295. Cooper, H.E., et al., *APA handbook of research methods in psychology, Vol 2: Research designs: Quantitative, qualitative, neuropsychological, and biological*. 2012: American Psychological Association.
296. Carmel, E., J. George, and J. Nunamaker. *Supporting joint application development (JAD) and electronic meeting systems: moving the CASE concept into new areas of*

software development. in *Proceedings of the Twenty-Fifth Hawaii International Conference on System Sciences*. 1992. IEEE.
297. Jennings, B.J., *Factors that contribute to knowledge sharing within research based organizations*. 2011, The University of New Mexico.
298. Alharbi, M., M. Devlin, and J. Warrender. *COMPUTER SCIENCE ACADEMICS'PERSPECTIVES REGARDING THE SHARING OF THEIR TEACHING-RELATED KNOWLEDGE: QUALITATIVE STUDY*. in *INTED2024 Proceedings*. 2024. IATED.
299. Alharbi, M., M. Devlin, and J. Warrender. *TEACHING EXPERIENCES SHARING AMONGST ACADEMICS IN SAUDI UNIVERSITIES: COMPUTER SCIENCE ACADEMICS'PERSPECTIVES*. in *INTED2024 Proceedings*. 2024. IATED.
300. Standardization, I.O.f., *Ergonomics of Human-centred System Interaction – Part210: Human-centred Design for Interactive Systems. Geneva:International Organization for Standardization (ISO Standard 9241-210).* 2010.
301. Zarour, M. and M. Alharbi, *User experience framework that combines aspects, dimensions, and measurement methods.* Cogent Engineering, 2017. **4**(1): p. 1421006.
302. Roto, V., M. Obrist, and K. Väänänen-Vainio-Mattila. *User experience evaluation methods in academic and industrial contexts*. in *Proceedings of the Workshop UXEM*. 2009.
303. Ketola, P. and V. Roto. *Exploring user experience measurement needs*. in *Proc. of the 5th COST294-MAUSE Open Workshop on Valid Useful User Experience Measurement (VUUM). Reykjavik, Island*. 2008.
304. MacDonald, C.M. and M.E. Atwood. *What does it mean for a system to be useful? An exploratory study of usefulness*. in *Proceedings of the 2014 conference on Designing interactive systems*. 2014.
305. Mohammed, A.A., *Assessing the success of the perceived usefulness for knowledge management systems: A case study of Iraqi higher education.* International Journal of Knowledge Management (IJKM), 2022. **18**(1): p. 1-24.
306. Ardichvili, A., V. Page, and T. Wentling, *Motivation and barriers to participation in virtual knowledge-sharing communities of practice.* Journal of knowledge management, 2003. **7**(1): p. 64-77.
307. Chandran, D. and A.M. Alammari, *Influence of culture on knowledge sharing attitude among academic staff in eLearning virtual communities in Saudi Arabia.* Information Systems Frontiers, 2021. **23**(6): p. 1563-1572.
308. Käfer, V., D. Kulesz, and S. Wagner, *What is the best way for developers to learn new software tools? An empirical comparison between a text and a video tutorial.* arXiv preprint arXiv:1704.00074, 2017.
309. Radhakrishnan, S., *The Six Ps of Project Management.* PM World Journal, 2021. **10**(V).
310. Tavakol, M. and R. Dennick, *Post-examination analysis of objective tests.* Medical teacher, 2011. **33**(6): p. 447-458.
311. Pallant, J., *SPSS survival manual: A step by step guide to data analysis using SPSS.* 2016.
312. Nunnally, J., *Psychometric Theory 2nd edition (New York: McGraw).* 1978.
313. Fauzi, M.A., F. Mohamad, and N. Abdul Wahab, *Knowledge sharing via social media in higher education: a bibliometric analysis.* Journal of Applied Research in Higher Education, 2023.
314. Stutzman, F., R. Capra, and J. Thompson, *Factors mediating disclosure in social network sites.* Computers in Human Behavior, 2011. **27**(1): p. 590-598.

315. Moran, M., J. Seaman, and H. Tinti-Kane, *Blogs, wikis, podcasts and Facebook: How today's higher education faculty use social media.* Boston, MA: Pearson Learning Solutions. Retrieved December, 2012. **22**: p. 2012.
316. Corcoran, N. and A. Duane. *Social media for knowledge sharing in communities of practice in higher education*. in *3rd European Conference on Social M di R h Media Research EM Normandie, Caen, France*. 2016.
317. Alwazae, M.M., E. Perjons, and P. Johannesson, *Template-driven best practice documentation.* Knowledge Management Research & Practice, 2020. **18**(3): p. 348-365.
318. Veeravalli, S., V. Venkatraman, and M. Hariharan, *Why do people seek knowledge? Tracing factors that affect knowledge seeking intention.* VINE Journal of Information and Knowledge Management Systems, 2020. **50**(2): p. 271-290.
319. Brzozowski, M.J., T. Sandholm, and T. Hogg. *Effects of feedback and peer pressure on contributions to enterprise social media*. in *Proceedings of the 2009 ACM International Conference on Supporting Group Work*. 2009.
320. Tsai, H.-T. and R.P. Bagozzi, *Contribution behavior in virtual communities: Cognitive, emotional, and social influences.* Mis Quarterly, 2014. **38**(1): p. 143-164.
321. Kulkarni, U.R., S. Ravindran, and R. Freeze, *A knowledge management success model: Theoretical development and empirical validation.* Journal of management information systems, 2006. **23**(3): p. 309-347.
322. Karsen, M., C. Cassandra, and D. Maya Kristin, *Tools Comparison for Social Knowledge Management Adoption to Support Collaboration Among Lecturers.* International Journal of Mechanical Engineering and Technology, 2019. **10**(3).
323. Bell, K., *Developing and Quantifying Intrinsically Motivating Instruction: Models and Principles of Gameful Design, Adaptive and Online Experiential Learning*, in *Technology-Enhanced Learning and the Virtual University*. 2023, Springer. p. 481-500.
324. Karunamoorthy, R. and M.M. Tahar. *A Gamification Approach to Teaching and Learning for Pupils with Special Needs in Primary Schools*. in *International Conference on Special Education In South East Asia Region 10th Series 2020*. 2020. Redwhite Press.
325. Elizondo, G.M., *Designing for sustainable behaviour in cross-cultural contexts: a design framework*. 2011, © Gloria María Elizondo Elizondo.

Appendix A: Ethical Research

1- Ethical Certification:

Faculty of Science, Agriculture & Engineering — Newcastle University

CERTIFICATE OF ETHICAL APPROVAL

Project #: 20-ALH-045

Project Title: Investigating into social behaviour on mobile-based social media applications for understanding the quality of student teachers' social interactions in Saudi universities.

This certificate confirms that the application made by **Malak Alharbi (School of Computing), supervised by Jennifer Warrender,** was **APPROVED** on 12/06/2021

It is the responsibility of the applicant to ensure that any conditions of approval are fully met before proceeding with the research. Applicants are also required to notify the Faculty Ethics Committee (sage.ethics@ncl.ac.uk) if they wish to make any changes to the design/methods/participants of the study ***before*** *commencing with any changes.*

If you receive any complaints or encounter any issues during the implementation of your research study, please contact the Ethics Committee via SAGE.Ethics@newcastle.ac.uk. Please **do not** *respond directly to the complaint.*

Signed:  Date: 03/07/2021

عمادة الدراسات العليا
Deanship of Graduate Studies

عمادة الدراسات العليا
رقم المعاملة : ٤٣٠٢٠٣٨٥٦
التاريخ ١٤٤٣/٠١/٢٨
مشفوعات : لا توجد مشفوعات

جامعة جدة
University of Jeddah
(059)

(موافقة تسهيل مهمة باحث واجراء دراسة)

سعادة عميد كلية العلوم وهندسة الحاسب **حفظه الله**

السلام عليكم ورحمة الله وبركاته ،،،

تهديكم عمادة الدراسات العليا أطيب التحية والتقدير، بشأن تسهيل مهمة الباحثة / ملاك بخيت الحربي – طالبة دكتوراه من جامعة نيوكاسل البريطانية تخصص (علوم حاسب آلي / علوم بيانات)، بإجراء بحث بعنوان (التحقيق في السلوك الاجتماعي على تطبيقات الوسائط الاجتماعية المستندة إلى الهاتف المحمول لفهم جودة التفاعلات الاجتماعية للطلاب المعلمين في الجامعات السعودية) وعينة الدراسة هم طلاب وطالبات الكلية.

نأمل من سعادتكم التكرم بالاطلاع والموافقة على تسهيل مهمة الباحث واتخاذ ما ترونه حسب الأنظمة المتبعة لديكم.

وتقبلوا أطيب التحية والتقدير ،،،

عميد الدراسات العليا المكلف

د. نايف بن مستور السلمي

2- Ethical Certification:

Faculty of Science, Agriculture & Engineering — Newcastle University

CERTIFICATE OF ETHICAL APPROVAL

Project #: 21-033-ALH

Project Title: Effectiveness best teaching practices exchange among CS academics in Higher Education Institutes through virtual community

This certificate confirms that the application made by **Malak Alharbi (School of Computing)** was **APPROVED** on 06/01/2022

It is the responsibility of the applicant to ensure that any conditions of approval are fully met before proceeding with the research. Applicants are also required to notify the Faculty Ethics Committee (sage.ethics@ncl.ac.uk) if they wish to make any changes to the design/methods/participants of the study ***before*** *commencing with any changes.*

If you receive any complaints or encounter any issues during the implementation of your research study, please contact the Ethics Committee via SAGE.Ethics@newcastle.ac.uk. Please **do not** *respond directly to the complaint.*

Signed: 

Date: **07 Jan 2022**

عمادة الدراسات العليا
Deanship of Graduate Studies

جامعة جدة
University of Jeddah
(059)

(موافقة تسهيل مهمة باحث واجراء دراسة)

سعـادة عميـد كليـة علوم وهندسة الحاسب **حفظه الله**

السلام عليكم ورحمة الله وبركاته ،،،

تهديكم عمادة الدراسات العليا أطيب التحية والتقدير، بشأن تسهيل مهمة الباحثة / ملاك بخيت الحربي- طالبة الدكتوراه - تخصص (علوم حاسب آلي/علوم بيانات)، بإجراء بحث بعنوان (مدى فاعلية تبادل الخبرات بين أكاديمي وأكاديميات الحاسب الآلي عبر نظام تفاعلي خاص) وعينة الدراسة ستشمل أعضاء هيئة التدريس بكلية علوم وهندسة الحاسب - بجامعة جدة.

نأمل من سعادتكم التكرم بالاطلاع والموافقة على تسهيل مهمة الباحث واتخاذ ما ترونه حسب الأنظمة المتبعة لديكم.

وتقبلوا أطيب التحية والتقدير ،،،

عميد الدراسات العليا

أ.د. إبراهيم بن عبده صعدي

Appendix B: Investigation studies

B.1 First study:

The Questionnaire:

- **Aboud how Pre-service teachers interact with peers and professionals through Social media for theaching and education purposes**

The name of your university:

Genter:

- Male
- Female

1- Which social media applications are your favorite to use daily for learning? (You can choose more than one)

- Facebook
- Twitter
- Instagram
- Others: ……

2- Do you think social media applications are a good learning environment?

- Yes.
- No.
- Maybe.

3- To what extent do you agree with using social media applications for improving the learning experiences of students?

- Strongly agree.
- Agree.
- Neither agree nor disagree.
- Disagree.
- Strongly disagree.

4- What are the forms of your use of social media platforms for learning and education? (You can choose more than one answer)

- content writing
- Add a comment to the content
- Share relevant content with colleagues
- Give an opinion by clicking like or dislike
- Browse to gain knowledge
- Searching for information
- Find social support

Others:……

5- How would you describe your experiences with some existing social media platforms that use to communicate with your peers and teachers?

- Very helpful
- Helpful
- Neither helpful nor unhelpful
- Unhelpful
- Very unhelpful

6- Could you please describe the interface and features of the social media applications you currently use to communicate with your peers and professors? (Explain)

B.2 Second Study

1- Sources of Measurement Items of the questionnaire.

Items	sources
Willingness to share knowledge	Fullwood, Rowley & Delbridge (2013)
Attitudes towards knowledge sharing	Masa'deh, Shannak, Maqableh and Tarhini (2017) , Fullwood, Rowley & Delbridge(2013)
Expected rewards and associations	Bock, Zmud, Kim and Lee (2005) Fullwood, Rowley and Delbridge (2013)
Expected contributions	
Information technology platform	Fullwood, Rowley & Delbridge (2013)

2- The questionnaire of second study:

The exchange of teaching experiences among the computer faculty members at the College of Computing in Saudi universities

Section 1: Demographics Information

The name of your university:

Genter:
- Male
- Female

Age:
- Less than 30
- 31 - 40
- 41 -50
- 51 -60
- More than 60

Academic Rank:
- Assistant Lecturer
- Lecturer
- Assistant Professor
- Associate Professor
- Professor

Teaching experience:
- Less than two years
- 2-5
- 6-10
- 11-15
- More than 16

Section 2:

To what extent do you agree in terms of the following statements?
Please tick or mark the most appropriate answer from "Strongly Disagree" to "Strongly Agree"

Agree Strongly	Agree Strongly	Neither Agree or Disagree	Disagree	Strongly Disagree
SA	A	N	D	SD

1- **Willingness to share knowledge:**

Willingness to share knowledge	**SA**	**A**	**N**	**D**	**SD**
1_1: Sharing teaching experiences with your colleagues improves learning and helps your colleagues to learn.					
1_2: Sharing teaching experiences with your colleagues improves academic performance.					
1_3: Sharing teaching experiences in your discipline with your colleagues is important to improve your teaching practices and that will reflect on student outcomes.					
1_4: Sharing teaching experiences with your peers helps you get your teaching done faster.					
1_5: Sharing teaching experiences with your peers helps to improve their teaching competence.					
1_6: Sharing teaching experiences in your discipline with novice academics might solve challenges they face when teaching new subjects.					
1_7: Sharing teaching experiences in your discipline with novice academics might improve their teaching practices.					
1_8: Sharing teaching experiences will help other academics (coordinators), who are involved in designing course syllabi to avoid errors that might affect the quality of teaching outcomes.					

2- **Attitude toward Sharing knowledge:**

Attitude toward Sharing knowledge	SA	A	N	D	SD
2_1: I enjoy sharing my teaching experience with my colleagues.					
2_2: I feel sharing my teaching experience with other college members is a valuable experience.					
2_3: I share my teaching experience in an appropriate and effective way with other academics to accomplish the goal of our department and college.					
2_4: I would welcome the opportunity to spend significant time with other academics at my university to learn from their work.					

3- **Expected rewards and Associations**

Expected rewards and Associations	SA	A	N	D	SD
3_1: If I share my teaching experiences, I will get promoted.					
3_2: Sharing my teaching experiences would improve my sense of self-worth.					
3_3: I will receive monetary rewards for sharing my teaching experience.					

4- **Expected contribution**

Expected contribution	SA	A	N	D	SD
4_1: Sharing my teaching experiences would help others in the faculty to solve teaching problems.					
4_2: Sharing my teaching experiences would improve work processes in the department and in the university in general.					
4_3: Sharing my teaching experiences would increase the productivity of the university to achieve its objectives.					

5- Information Technology Platform

Information Technology Platform	SA	A	N	D	SD
5_1: My university does not encourage online teaching experience sharing.					
5_2: If there was an online platform to share teaching experiences across departmental boundaries, this would make sharing easier.					
5_3: My university designs an online platform to facilitate teaching experiences exchange across departmental boundaries.					
5_4: The online platform at my university is designed to be user-friendly.					

Section 3:

OQ1: In your opinion, what is the best way to share knowledge with your colleagues?

OQ2: How do you feel about sharing knowledge with other members in your college?

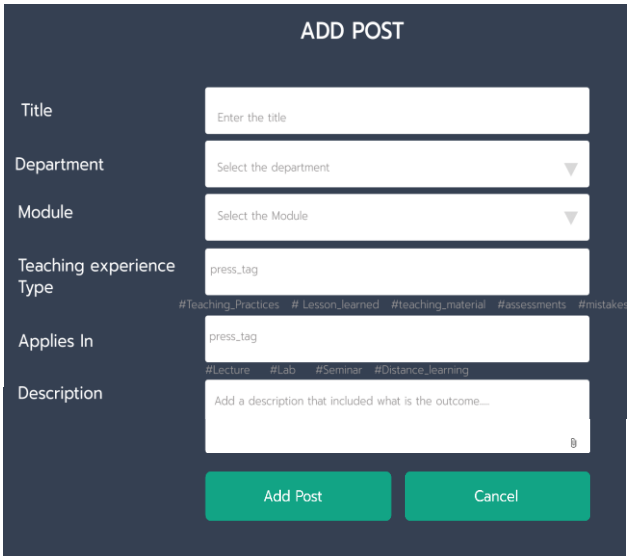
OQ3: What types of technologies need to be implemented to encourage academics to share their knowledge in your college?

Appendix C: Design TEP

1- Description of use cases of the proposed system:

Add post: This use case explains the process of adding a new post.
Edit post: This use case explains the process of editing their post.
Delete post: This use case explains the process of deleting their post.
View posts list: This use case explains the process of viewing the posts list.
Search posts: This use case explains the process of searching for all posts.
Write comment: This use case explains the process of adding a comment to a post.
Edit comment: This use case explains the process of editing their comment.
Delete comment: This use case explains the process of deleting their comment.
Ask a question: This use case explains the process of adding a new question.
Edit question: This use case explains the process of editing their question.
Delete question: This use case explains the process of deleting their question.
Add answer: This use case explains adding a new answer.
Edit answer: This use case explains the process of editing their answer.
Delete answer: This use case explains the process of deleting their answer.
View discussion forum: This use case explains viewing all questions.
Search of question: This use case explains searching the discussion forum.
Rate knowledge: This use case explains the process of rating the knowledge using likes and favourites.
Get points: This use case explains earn points when they interact with the post or the question by using social features or adding an answer or comment.
View resources list: This use case explains the viewing resources list.
Upload resource: This use case explains uploading the resource.
Download resource: This use case explains the academic's downloading process.

2- The Prototype



3- The scenario of the prototype for end user:

1. **Function:** Add Teaching experience post:

Scenario:

If you are teaching a programming course and you have an idea for your teaching practice that was useful for your students when you used it. So, how can you add this knowledge if you want to share this experience with your colleagues who teach the same course through a special platform?

2. **Function:** View knowledge:

Scenario:

If you'd like to see recent posts and the rate of these posts. What do you do?

3. **Function:** Search for specific post:

Scenario:

If you'd like to see the specific post. What do you do?

4. **Function:** Retrieval of a specific post to write a comment and/or rate this post.

Scenario:

If you want to rate this post or write a comment. How can you do that?

Page Break

5. **Function:** Add New a question related to a specific module:

Scenario: When you have a question related to this module. How can you ask your colleagues?

6. **Function:** Search for a specific question:

Scenario: If you want to see a specific question, what do you do?

7. **Function:** Add Answer for this question:

Scenario: if you want to help your colleagues who asked questions, how can you help them?

Page Break

8. **Function:** Rate the question and answer:

Scenario: If you are interested in the questions or answers, how can you show interest?

9. **Function:** Go to the Resources in a specific module:

Scenario: If you want to see the resources for this module. What do you do? Is that enough?

4- JAD report:

Each priority functional requirement was matched to the corresponding KMS tools, which are as follows:

Knowledge creation and capture:

The system provides a Template to create a new Post.

The system has a function to update the Post.

The system has a function to delete the Post.

The system provides comments on the post.

The system has a function to update comments.

The system has a function to delete the comment.

Knowledge storage/ retrieval:

The system provides a view of all posts.

The system provides a search of the posts.

The system has a tag to retrieve the posts under the course.

Discussion Forums:

The system asks a new question and adds the answer for a specific module.

The system has a function to update the question.

The system has a function to delete the question.

The system has a function to update the answer.

The system has a function to delete the answer.

The system has a tag to retrieve the questions under the course.

The system provides general discussion Forums.

The system provides viewing of all discussion boards.

The system provides Resources. Document management

Prioritisation of Requirements:

- The system needs to filter POSTs based on users' teaching experience

- The system needs to filter questions based on users' teaching experience

- The system needs to allow users to access all teaching experience documents for each module.

- The system needs a profile to communicate with users.

-Add a feature to upload the course syllabus and accreditation file to the resources.

- Add clarification messages for each attribute on the question template that is required.

- Add clarification messages for each attribute that the POST template requires.

- Add a symbol for each attribute on the template to indicate the required information and save time when filling the fields.

- The system should allow access from multiple platforms, such as tablets and smartphones.

-The system should be an open space platform allowing registered users to access all posts, discussion forums, and resources.

- Add tags to filter POSTs and organize questions within the discussion forum for a particular course alongside its name.

5- Questionnaire of prototype

about Create Post
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)
add a Comment for the post
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)
view all posts and search
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)
about ask new question for a specific module
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)
about add answer to the question for a specific module
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)
about general discussion
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)

about viewing all discussions board
I think this function was clear.
I think this function was easy.
I think this task does take a short time to complete.
I think this function was necessary. (Moscow rules)
What did you Like? :(Multiple Choice (I Like))
about Create Post
view all posts and search
about ask new question for a specific module
about ask new question in general discussion
about viewing all discussions board
rating the post
rating the questions and answer
Others
Do you have any suggestions? (Open-ended question(What If...? method))
add Syllabus and Accreditation file for the course in the Resources
add mention for post or membership
add Calendar for academic year and for a specific module.
I wish(Open-ended question for discussions in the workshop):
clarify message for all attribute on the post and questions
clarify message for the tags (add tags or type your own words)
sorting attributes on the post to more clear.

Appendix D: implementation of TEP

1- Testing TEP functions:

Test case action	Results	Status
Create POST	When all the details are entered, the system saves the information. However, if a required input is not entered, it shows an error indicating the required field.	Pass
Edit POST	While editing the post, if the details are entered in each text field, the system stores the modified details of the post fields. However, If a field is left empty, it shows the error.	Pass
Delete POST	If pressed delete the post is deleted, and it will deleted from the database with all relations.	Pass
Discussion Board Ask question	When all the details are entered, the system saves the information. However, if a required input is not entered, it shows an error indicating the required field.	
Discussion Board Answer to question	When the answer is entered, the system saves the answer under the question.	Pass
Search	When the write keywords or press stage, it will retrieve posts and questions related to the keywords or tags.	Pass
Social features	When press like or favourite button, it calculates points. And when press Unlike or unfavourite, it take off points	Pass
Gamification tools	The leaderboard is updated which associated with user points.	Pass

Appendix E: Evaluation TEP

Questionnaire:

Section 1: Demographics Information

Genter:
- Male
- Female

Age:
- Less than 30
- 31 - 40
- 41 -50
- 51 -60
- More than 60

Academic Rank:
- Assistant Lecturer
- Lecturer
- Assistant Professor
- Associate Professor
- Professor

Teaching experience:
- Less than two years
- 2-5
- 6-10
- 11-15
- More than 16

Section 2:

To what extent do you agree in terms of the following statements?
Please tick or mark the most appropriate answer from "Strongly Disagree" to "Strongly Agree"

Agree Strongly	Agree Strongly	Neither Agree nor Disagree	Disagree	Strongly Disagree
SA	A	N	D	SD

1- Knowledge capture function

Knowledge capture function	SA	A	N	D	SD
POST template makes it easier to document my teaching experience.					
POST template helps me to document my complete teaching experience.					
POST template enables me to document clear teaching experiences to be understood by others.					
POST template enables me to document teaching experience more quickly.					

2- **Search and retrieval function**

Search and retrieval function	**SA**	**S**	**N**	**D**	**SD**
Keyword searching helps me to reduce time and effort to find the posts or questions I need to perform my job.					
The tagging function helps me to reduce time and effort to find the posts or questions I need to perform my job.					

3- **Resources function**

Resources function	**SA**	**S**	**N**	**D**	**SD**
The Teaching Experience Platform (TEP) helps me access teaching experiences anytime from anywhere.					
The Teaching Experience Platform (TEP) helps me access resources anytime from anywhere.					

4- **Discussion board function**

Discussion board function	**SA**	**S**	**N**	**D**	**SD**
The discussion board made it easier for me to ask questions related to teaching to accomplish my job.					
The discussion board enables me to communicate easily with others when I need answers to questions related to teaching.					

5- **Knowledge evaluation**

Knowledge evaluation (social features)	**SA**	**S**	**N**	**D**	**SD**
The written comment's function enables me to evaluate the usefulness and applicability of teaching experiences in my job.					
The like function enables me to evaluate the usefulness and applicability of teaching experiences in my job.					
The favorite function enables me to evaluate the usefulness and applicability of teaching experiences in my job.					
The view function enables me to evaluate the usefulness and applicability of teaching experiences in my job.					
The reputation score function enables me to evaluate the usefulness and applicability of teaching experiences in my job.					