Mobile Technologies and Knowledge Management in Higher Education Institutions: Students' and Educators' Perspectives

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Abstract

Mobile devices are increasingly included for knowledge management (KM) in academic contexts. The purpose of this study was to examine how the integration of mobile technologies affects KM among students and educators in higher education settings in Saudi Arabia. Interviews with educators and students at two universities explored the factors determining the use of mobile technologies for learning. Content analysis of the participants' responses found that the students and educators perceived four key factors determining mobile technology use: the capacity of mobile technologies to enhance learning processes, teaching practices, and student-student and student-educator communicative interactions, and hardware and infrastructure components. The main conclusion was that Saudi universities must utilise mobile technologies to identify, encapsulate, transform, and disseminate usable knowledge effectively.

Keywords: knowledge management, mobile devices, higher education, learning management system

1. Introduction

Knowledge manifests in a variety of forms: a state of mind, a set of beliefs, as an object or process to guide future actions or to maintain current abilities, or as a set of boundaries to understand information and to determine what information is needed to make decisions (Berge & Muilenburg, 2013). Knowledge starts as information put into context (Laal, 2011). That is, information is drawn from diverse sources, including documents, databases, and people and is then transformed into knowledge or "actionable information" (p. 545) when combined with the experiences and judgments of the information recipient (Laal, 2011). From this perspective, knowledge not only emerges an asset to be used by individuals or institutions to establish links between concepts and events, or to engage in predictive decision making, it also presents as something that may be re-used by others (Kulakli & Mahony, 2014).

Two types of knowledge are typically identified in literature: "explicit knowledge" and "tacit knowledge" (Ahmad, Lodhi, Zaman, & Naseem, 2015). Explicit knowledge is that which is easily organized and can be transferred in the form of manuals and scientific formulas; whereas, tacit knowledge refers more so to the person's beliefs, mental capabilities, and viewpoints and is therefore difficult to codify (Mäkelä, K., 2018; Viberg & Grounlund, 2015). As Laal (2011) explains, "knowledge can be obtained either by transmission from another who has it, by instructions, or by extracting it from experience" (p. 546). Given that knowledge (both explicit and tacit) can be best utilised as an asset or be reused by others, it is thus crucial for the individual, group, or institution to know what they know (Hislop, 2018).

Knowledge management (KM) in an organisational setting is characterised as a systematic process whereby the knowledge required for the organisation to be successful is "created, captured, shared and leveraged" (Laal, 2011, p. 544). A key aspect of the management process is to connect people to the knowledge they require to engage in productive action (Laal, 2011). Put succinctly by Self, Matuszek, Self, and Schraeder (2014), KM is a strategic and systematic process to "get the right information, in the right context, at the right time, to the right people". The main objective of KM is thus to "make knowledge usable for more than one individual" –a group of learners for example; that is, to share knowledge for a productive intent (Kucza, 2001, p11).

Knowledge management in higher education institutions (HEIs) emerges from processes designed to recognise and utilise knowledge assets derived from the teachers and students (Pinto, 2014). Indeed, KM principles are applicable to all aspects of the mission of HEIs (Ramachandran, Chong, & Wong, 2013). These institutions are inherently about best-practice utilisation of knowledge capital and thus are reliant on knowledge storage, access to knowledge, and the delivery of knowledge to achieve their primary goals. As Ramachandran et al. (2013) explain, contemporary HEIs are about more than just the provision of knowledge to students. They are also about the management of knowledge for future use, and the collaboration between educators and students for knowledge creation.

A key strategic objective of any HEI is to utilise knowledge to enhance the academic activities and performances of students and teachers (Bhusry & Ranjan, 2011). Therefore, mobile technologies for learning have understandably emerged as dynamic and increasingly important resources available to universities to create mobile social networks for learning and for KM (Ally & Prieto-Blázquez, 2014). Mobile social networking refers to the social interaction of individuals using mobile applications (apps) and social network sites (e.g., Facebook, Instagram, and Foursquare) to establish connections with each other to explore common interests (Rennie & Morrison, 2013). Within these networks – also known as virtual communities – users access interactive platforms and create path communities to share ideas and information related to their needs and expectations (Mao, 2014). Hence, mobile technologies for learning in combination with wireless networks like Wi-Fi and Bluetooth support KM by enhancing the flexibility of the learning process and the communication pathways among students and between students and teachers (Gikas & Grant, 2013; Ozcan, 2014).

The aim of this article is to examine the qualitative results from a study of the determinants of mobile device use for learning by university educators and students for what they reveal about the relationship between mobile technologies for learning and KM. The main question of focus was:

How does the integration of mobile technologies affect knowledge management among students and educators in academic (higher education) settings?

To answer this question, three sub-questions were addressed:

1) What are students' perspectives of using mobile applications for knowledge management (including formal and informal communication) in academic settings?

2) What are lecturers' perspectives of using mobile applications for knowledge management (including formal and informal communication) in academic settings?

3) How do mobile technologies address the shortcomings of the current learning system for knowledge management?

2. Theory

2.1 Knowledge Management in Organisations

Knowledge management in an organisation plays a significant role in the organisation's success. As Hislop (2018) explained, the benefits of effective KM to an organisation's competitive advantage and operational efficiency include more streamlined decision making, faster response times to organisational issues, and improved process handling. The main challenge associated with KM, however is the conversion of knowledge that currently exists in individuals and operations – knowledge as intellectual capital – into knowledge that is easily and broadly available to other individuals and services (Bhusry & Ranjan, 2011).

Information technologies are key enablers of KM systems through their capacity to support the "capture, storage, transformation and dissemination of knowledge" (Bhusry & Ranjan, 2011, p. 35). Moreover, information communication technologies (ICTs), including mobile devices continue to emerge as useful techno-management tools for KM interventions to enhance the level and quality of knowledge sharing and use (Ahmad, Lodhi, Zaman & Naseem, 2015). As such, technology implementation and use for KM has become an important issue for management as it is increasingly regarded as an integral component of knowledge creation and innovative thinking via information sharing and application (Hislop, 2018).

Omotayo (2015) argued that efficient KM in organisations and academic institutions leads to improved decision making, service delivery (including lesson delivery by teachers), and cost reductions. Notably, however, Pinto (2014) drew a distinction between knowledge in HEIs as academic knowledge derived from the teaching and learning activities, and organisational knowledge (i.e., non-academic institutions) as linked to the business operations such as a critical factor of success and relationships with external entities etc. In turn, the author asserted that effective KM mechanisms and tools can enhance both forms of knowledge by facilitating "the development of an environment of

knowledge creation, collaboration and sharing" (Pinto, 2014, p. 1). Pinto (2014) further posits that the overarching objective of KM is to elicit and combine tacit knowledge held by the individual with the explicit knowledge available to guide the development of individuals and learning institutions.

2.2 Knowledge Management in Higher Education

For HEIs to increase their knowledge assets, their KM frameworks must aim to increase knowledge sharing and collaboration. In turn, this is achieved through the systematisation of knowledge practices to link people (students, educators, scholars, administrative staff, and external bodies), processes, and services (Pinto, 2014). As such, a technology-based approach to the storage and distribution of teachers' and students tacit and explicit knowledge resources can provide greater opportunities for interaction and collaboration to achieve better learning outcomes in both on-campus and off-campus learning situations (Sung, Chang & Liu, 2016).

Most modern universities utilise mobile tools for KM to provide a technological foundation for education service delivery, and to facilitate more convenient and sophisticated interactions among students and between students and teachers (Ilgaz & Gülbahar, 2015). In fact, one of the key aspects of KM in contemporary HEIs is the increase in student demands for access to varied information sources for learning. According to Gikas and Grant (2013), modern students demand new ways of learning and more elaborate communication channels for the creation and management of knowledge. In turn, mobile technologies respond to changing student learning demands by allowing them to quickly and easily check the accuracy of their work, modify their work product, generate class notes, and access the course notes and materials distributed by the teacher (Tsinakos & Ally, 2013). Moreover, mobile devices for learning provide students with opportunities to retrieve and/or share information at any time, and contribute to KM outcomes by improving the organisation of learning materials (Sung et al., 2016).

Students can also use KM toolkits to organise the contents of textbooks to suit their learning needs (Stănescu, Ştefan, Roceanu, Ştefan, & Hamza-Lup, 2009). The KM toolkit apps currently available on mobile devices help students to improve their note-taking, to structure and aggregate information, and to share their knowledge / findings in a logical and well-presented way. Furthermore, students can create folders to store, edit, and share information while engaged in collaborative learning processes (Stănescu et al., 2009). In addition, mobile devices for learning provide students with enhanced opportunities to quickly clarify any gaps or misunderstanding they may have in their knowledge base, as well as to reaffirm their current understandings (Ally & Prieto-Blázquez, 2014). The use of mobile devices by students to retrieve, store and exchange educational resources such as images, videos, and web pages etc. also to support efficient KM outcomes (Gülbahar, Jacobs &König, 2015).

2.3 Knowledge Management and Learning Management Systems

University KM frameworks for the generation and spread of structured and unstructured knowledge invariably include learning management systems (LMS), social networks within the learning environments, and general knowledge exchange practices (Bhusry & Ranjan, 2011). In turn, the integration of LMS into teaching and learning activities plays a vital role in knowledge construction, due to their increasingly critical role in information retrieval, storage, conversion, and exchange (Ouadoud, Chkouri, & Nejjari,2018). The management of data and information in HEIs is primarily technology driven. As such, effective KM combines aspects of the institution's operations, culture, and technological platforms, including its LMS (Siadat et al., 2015; Sami, 2019). Research evidence shows that LMS in HEIs can contribute to effective KM by facilitating and promoting the sharing of best practices, providing quick access to information, and by enhancing academic communication pathways (Bhusry & Ranjan, 2011). This is achieved in HEIs via the "conscious integration of people, processes and technology involved in designing, capturing and implementing [its] intellectual infrastructure" (Bhusry & Ranjan, 2011, p. 34).

3. Methodology

This research paper reports the results of one part of a larger study that utilised a mixed-method design to examine the determinants of mobile device use for learning by educators and students at two HEIs in Saudi Arabia: King Abdul-Aziz University in the western part of the country; and the King Khalid University, located in towns including Abha, al-Namas and Tanomah in the 'Asir Province in South-West Saudi Arabia. Integral to this examination was the collection of quantitative and qualitative data related to the features of mobile technologies that lead users to integrate them into their academic lives. The collection and analysis of the qualitative portion of the study is reported here.

Qualitative data were collected via a series of semi-structured interviews with educators (n = 31) and students (n = 30) drawn from three faculties at the two universities: Mathematics, Computing and Information Technology, and

Linguistics. Each interview utilised a small number of open-ended questions as a basic starting point and was approximately 30 minutes' duration. The aim of the interviews was to access the participants' perspectives of the value of mobile technologies for learning and their beliefs about the ways in which the technologies can be utilised for academic purposes. The interviews were audio recorded then transcribed and translated from Arabic to English.

3.1 Inter-coder Reliability

Testing the reliability of the coding process was important to this study. Elo et al. (2014) recommended inter-coder reliability (ICR) to evaluate the coding in qualitative analysis. In this study, the data coding was performed by two coders. In turn, Perreault and Leigh's (1989) formula was employed to test the reliability of the coding process by identifying the reliability coefficient, Ir. Perreault and Leigh's formula to calculate Ir is: $Ir = \sqrt{\{[(Fo/N) - (1/k)] [k/(k-1)]\}}$;

Where Fo is the agreement between the coders, N refers to the total number of decisions made by the coders and k refers to the number of categories identified by the first coder. According to Wang (2011), an ICR coefficient (Ir) of .80 or greater is acceptable in most situations and Küpper (2015) asserts that ICR reaches the reliability level by 0.9.

In order to achieve ICR in this study, an independent coder recoded two representative groups: group one (six transcripts from the lecturers' interviews); and group two (six transcripts from the students' interviews). Group one included six lecturer interview transcripts including 65 answers. The transcripts were coded using 21 categories identified by the first coder. Both coders agreed on 58 items. Therefore:

Fo = Number of decisions on which the coders agree (Fo = 58)

N = Number of decisions made by a coder (N = 65)

K = Number of coding categories (k = 21)

So,

$Ir = \sqrt{\{[(58/65) - (1/21)] [21/(21-1)]\}} = 0.9417$

On the basis of the ICR coefficient result for group one and the ICR coefficient values recommended by Küpper (2015), the coding of the lecturer interview transcripts in this study can be considered to be reliable. Group two included six student interview transcripts including 82 answers. The transcripts were coded using 17 categories identified by the first coder. Both coders agreed on 75 items. Therefore:

$$Ir = \sqrt{\{[(75/82) - (1/17)] [17/(17-1)]\}} = 0.9535 \tag{1}$$

For this group, the ICR coefficient was .9535. Based on this ICR coefficient results for group two and the ICR coefficient values recommended by Küpper (2015), the coding of the student interview transcripts in this study can be considered to be reliable.

4. Results

Accessing the thoughts and opinions (i.e., qualitative data) of the participants in the study regarding the factors determining their use of mobile technology for learning provided insights into m-learning and education service delivery broadly, and their views on the efficacy of m-learning technologies for KM more specifically. The results from the analysis of the students' data are presented first, followed by the results from the analysis of the teachers' data. Direct comments from each participant cohort are also provided the illustrate their thoughts and insights.

4.1 Students

Underpinning the qualitative data analysis was the objective to assess the students' perspectives of integration of mobile devices for academic communication purposes. The results of the analysis revealed four key factors shaped the students' perceptions of integration of mobile technologies for academic purposes, including KM: the relationship between mobile technologies and learning, communication efficacy, hardware and infrastructure, and institutional support.

4.1.1 Mobile Technologies and Learning

The first factor related to how the mobile technologies impacted on learning, including the effectiveness of mobile technologies for KM. Specifically, the students revealed that their main perspectives of the integration of mobile technologies for KM were related to the way in which the mobile technologies supported accessibility to learning materials, the enrichment of the deliverable information, the availability of the tools for knowledge construction, and

the facilitation of a collaborative learning environment. Students revealed that they felt it was easier to access materials without the lecturer, access learning at their own pace, and communicate in mobile discussions (KNF2, KTB20, & KTB11). Student KTB14 expanded on this, saying, *"Whenever I am faced with a difficulty especially at home regarding homework, I always use mobile applications to research and to clarify with fellow students or even lecturers."*

4.1.2 Communication Efficacy

Knowledge sharing has been established as a key objective of KM. In turn, communication efficacy to facilitate knowledge construction and collaborative learning emerged as a key factor shaping students' perceptions of the integration of mobile technologies for academic purpose. The analysis of the students' qualitative data shows three communication outcomes were given the most focus. The first was identified as using mobile technologies to enhance formal academic communication (e.g., ask questions, seek clarification of topics or themes, make suggestions etc.).

"The use of mobile phone and mobile devices is critical to support communication with my lecturers and classmates as it makes communication easier and more effective. This is because we can communicate at any time and at any place." (KTB14)

"Most difficulties I have during the lecture cannot be addressed inside tutorial classes. So, using mobile tools to communicate with lecturers allows us to ask freely." (KTB19)

Students also felt that mobile technology enhanced informal academic communication (e.g., exchange ideas, pass on information etc.). Participant KNF9 stated, "*You can communicate with the lecturer and other students in an informal manner."* Another said, "*Social networks also provide students chance to have healthy non-formal interactions with the lecturers that positively shape the subsequent learning atmosphere."* (KTB11)

Another advantage mentioned by the student participants is that mobile technology allowed them to engage in fast communicative interactions with lecturers (e.g., provide responses, receive feedback etc.). For example, "*It enables lecturers give live feedback and responses to student queries,"* (KNF6) and "*In the process of sharing or requesting for course materials, I can ask for clarifications and get real-time response."* (KTB17)

4.1.3 Hardware and Infrastructure

Hardware and infrastructure refer to the characteristics of mobile technologies and the quality of the infrastructure supporting its use. In terms of the device characteristics, the results from the qualitative data analysis revealed the students were focused on such aspects as (a) screen size, (b) data storage capacity, (c) access to academic content, (d) battery life, (e) connectivity issues related to enjoyment, convenience, portability, and flexibility, and (f) learning management system issues (KNB7, KNF12, KTB18, KTB22, KTB28).

In terms of the infrastructural elements, the students talked about such aspects as: connectivity issues related to enjoyment, convenience, portability, and flexibility:

"The internet connection of online materials may be challenging, as a slow connection may reduce the quality of the podcast for example." (KNB28). The student participants noted both difficulties and advantages with navigating the learning management system: "It is complicated to navigate to the required information through the university system." (KNF2), and *"With mobile social network, students can receive material notifications instantly unlike for the current LMSs."* (KTB11) Students (KTB13, KNF4) noted that mobile integration with the LMS resulted in improved learning outcomes, improving course engagement, creativity, understanding, and retention.

Institutional support was revealed as a key factor shaping students' perceptions of the integration of mobile technologies for academic purposes (including knowledge management) through their comments that suggested the university should provide technical training to support the effective use of mobile technologies for learning:

I expect that using mobile technologies will support my learning process. However, if I don't get technical support from my lecturers, I will be unenthusiastic to use mobile technology for learning. (KTB15)

Notably, the students intimated that appropriate training would result in more effective knowledge management by providing them with a better understanding of the lesson content:

"Training on how to use mobile technologies is essential. For instance, training would enable one to be disciplined, manage time efficiently and avoid distractions while using mobile devices." (KNF1)

4.2 Educators

The lecturers' semi-structured interview responses also provided valuable insights into their perspectives on the value

of integrating mobile technology use in the classroom for academic purposes, including KM. As with the results from the analysis of the student data, three key factors emerged from the data analysis which most shape their views: the relationship between mobile technologies and learning, the relationship between mobile technologies and teaching, and hardware and infrastructure.

4.2.1 Mobile Technologies and Learning

The results of the analysis revealed two sub-elements of importance to lecturers related to mobile technologies and learning: KM and academic communication outcomes. The lecturers specifically mentioned the potential usefulness of mobile technologies for quick revision by students: *"The ability to use the mobile technologies for revision and peer assessments also benefits my teaching."* (KTM29) Another benefit noted by the lecturers was the ability to provide speedy feedback: *"I decided to use mobile technologies on the basis of their convenience and quickness in allowing for instant assessment and feedback."* (KNF12)

The lecturer participants also cited organising course content, sending notifications and distributing learning materials as advantages:

"I provide students with lecture and tutorial notes about mobile technologies before using them to provide them with knowledge of concepts and skills to use them." (KTM19)

"I usually use Twitter for course notifications including assessments, exam times, and other important information." (KNF18)

"Basically, it improves content delivery. That is, the speed and efficiency with which content reaches students is improved." (KNF15)

4.2.2 Mobile Technologies and Teaching

The relationship between teaching pedagogy and mobile technology emerged as a key factor shaping lecturers' perceptions of mobile technology use for academic purposes and KM. The aspects of pedagogy mentioned by the lecturers included using mobile technologies to communicate with students and enrich the deliverable information:

"I noticed that using mobile technology allows me to mix my teaching materials well. I can include demonstrations and diagrams where necessary, and it is easy to do. I also noticed that it is easy to make references to other material because the students simply use the search option to get what they want." (KNF10)

"I became interested in utilising mobile technologies when I discovered they allowed me to improve communication with my students and my colleagues." (KTM21)

Participants KNM32, KNF11, and KTM24 discussed the usefulness of mobile technology to facilitate group learning activities such as forming groups to communicate and create video presentations. They suggested that students are using specific apps, such as WhatsApp, Facebook, and Viber to accomplish this.

4.2.3 Hardware and Infrastructure

The hardware and infrastructure aspects identified by the lecturers as having the most influence on their perceptions of mobile technology use for academic purposes including KM were: the accessibility, usage ease and portability, and ability to improve the LMS:

"The use of technology has also enabled me to become more directly accessible to my students, especially mobile technologies like smart phones and high-speed internet connections" (KTM21)

"Two of the unique aspects of using of mobile technology in teaching are ease of access and portability. This which makes it efficient, especially when considering the amount of content, it can carry." (KTM28)

Other lecturers (KTM22, KTM14) indicated that the infrastructure and hardware of mobile technologies would improve student interest and engagement.

5. Discussion

The students and educators in this study identified diverse categories regarding mobile technology use for KM in academic settings. This highlights the multifaceted nature of the relationship between mobile technology and KM and the complexities associated with the integration of mobile technologies into university courses and LMS.

In terms of the students' and educators' perspectives of using mobile applications for KM (including formal and informal communication) in academic settings (i.e. research sub-questions 2 and 3), an important consideration expressed by both groups was related to how mobile technologies impact the learning process. Both students and

educators perceived an association between mobile device functionality and its role as a device to support learning (e.g. access to learning materials, support for knowledge construction etc.). This association is reflected in the literature and in mobile technology developments. According to El-Hussein and Cronje (2010), mobile devices for learning are designed and marketed to provide learners with technology tools for personal and educational purposes. Regarding the latter, the technology is a "potent tool for the delivery and reinforcement of content" (El-Hussein & Cronje, 2010, p. 16).

The relationship between teaching pedagogy and mobile technology use was also identified by the educators as important to the integration of mobile technologies for academic purposes and KM. The pedagogical aspects included academic communication with students, distribution of learning materials, and the design of group-based learning activities, etc. Social interaction in academic settings via communication and collaboration is a key driver of knowledge creation, knowledge sharing, and KM (Bhusry & Ranjan, 2011). Thus, the educators' (and students') perspectives generally reflected the view that mobile technology emerges as a mediator of knowledge creation and management in a regulated learning environment to promote "mutually supportive" (p. 448) student-student and student-educator interactions (Liaw, Hatala, & Huang, 2010).

The students' and educators' perspectives of using mobile applications for KM in academic settings also highlighted the importance of communication efficacy to facilitate knowledge sharing, knowledge construction, and collaborative learning. Notably, the participants linked mobile technologies to diverse communication forms including formal academic communication, informal academic communication, and fast communicative interactions between students and lecturers. These findings support the findings reported by Sunalai and Beyerlein (2015) in their integrative literature review of KM practices in HEIs. The authors reported that the key components of KM in HEIs included: knowledge sharing as the distribution of ideas among people; knowledge utilisation as the application of knowledge to one's work; and knowledge creation as the "development of new knowledge or the replacement of existing knowledge" (p. 293).

A research conducted by Baishya and Maheshwari (2019) students used WhatsApp application to create a group for their class to have a constant communication with their colleagues. The authors reported that using WhatsApp group support the enhancement of students' formal and informal communication in different forms (Baishya & Maheshwari, 2019). They also reported that with use of WhatsApp groups, students found another way to enhance their communication with their classmates. Moreover, authors stated that this technology helped students to develop their teamwork skills. Therefore, it has been suggested that integration of such technology requires privacy and security guidelines (Baishya and Maheshwari, 2019). This highlights the implications of communication efficacy related to m-learning technology for KM. Specifically, the links made by the participants between m-learning devices and academic (formal and informal) communication pathways (e.g. to ask questions, make suggestions, and provide quick feedback etc.) endorses the notion that mobile technologies can significantly improve learning and KM via enhanced communicative exchanges (Wang, Shen, Novak, & Pan, 2009).

Furthermore, the participants' perspectives that mobile technologies improve collaborative learning by providing easier access to learning materials and enhancing student engagement reflects the findings presented by Wu et al. (2012). The authors argue that communication effectiveness impacts students' learning and that the affordances of mobile technologies to support participative learning and faster content delivery can improve learning outcomes. It is well-established in the literature that for KM in HEIs to be effective the processes must be supported by the institution's culture, (infra)structures, technological systems, and collaborative practices (Ramakrishnan & Yasin, 2012). Moreover, the primary drive of KM tools in HEIs is to support institutional procedures that enable a 'knowledge creation' and 'knowledge sharing' environment to emerge from the communications and collaboration among the people within the institution (Pinto, 2014). As such, the technological systems and devices used to support these outcomes may be regarded as tools to facilitate the conversion of tacit knowledge to its more explicit form.

Both students and lecturers in this study perceived the specifics of the technology hardware (i.e., device characteristics) and the relevant infrastructure within the learning institution to be important factors in the integration of mobile technologies for academic purposes including knowledge management. Regarding device characteristics, the students' and educators' focus was on device characteristics such as screen size, data storage capacity, and battery life etc. These focus areas align with previous research findings that storage capacity, smooth touch, screen size, and device portability are important characteristics to promote mobile device use (Gerpott, Thomas, & Weichert, 2013; Santos, 2013).

Research sub-question 3 addressed the issue of institutional infrastructure in its explorations of the students and educators' perspectives of how mobile technologies address the shortcomings of the current LMS for knowledge

management at their university. Integrating mobile devices for learning into learning platforms helps to avoid redundant modes of teaching and communication (Al-Emran, Elsherif, & Shaalan, 2016; Wang et al., 2009). Both participant groups in this study perceived a link between the integration of mobile technologies for KM and shortcomings in the institution's LMS. Specifically, attention was drawn to issues related to, and to the importance of, easy and convenient access to study materials, enhanced student-student and teacher-student interactions, easy navigation, and the ability to track and organise study materials.

The findings in this study reflect those reported by Sunalai and Beyerlein (2015). The authors identified three main influences on KM in HEIs are: institutional management mechanisms such as policies and procedures, motivation and reward systems, and infrastructural (technological) support; human orientation factors such as institutional culture, leadership, and individual skills and experiences; and knowledge management mechanisms such as performance reviews and the summative assessment of users. Similarly, Siadat, Matinvafa, Saeednia and Moghadasi (2015) reported that both technical / infrastructural factors and institutional cultural factors have a significant and positive relationship with the development of KM practices. Notably, the authors drew an important connection between technology infrastructure and organisational culture in KM success, arguing that faculty members must have access to, and be supported in the use of advanced technologies to access and manage knowledge.

Research also shows that students generally perceive that the integration of mobile devices for learning into the LMS has the potential to offer convenient access to learning materials, and faster two-way communication and information sharing via social media sites (Gikas& Grant, 2013). Overall, the views of this study's participants regarding the integration of mobile technologies into university LMSs to improve academic communication aligned with those reported in various previous studies (e.g. Santos, 2013; Siau, Lim & Shen, 2001). However, it is well-established in the literature that integrating mobile technologies into a LMS does not guarantee enhanced learning processes. Such benefits can only be realised when the technologies offer solutions to learning problems and are designed and integrated with teachers and students in mind (Conde, García, Rodríguez Conde, Alier, & García-Holgado, 2014).

It is also important to reflect upon the skill sets required of students and educators to use mobile technologies for KM. Siadat et al. (2015) drew attention to the potential for lack of technical skills by teachers to hinder the use of ICTs for KM. As such, they point to the importance of continually updating their skills in how to use technology to support KM processes and goals. It is firmly established in the literature that it is the nature of the technology in combination with the digital literacy skills of the user that determine the effectiveness of technology use (Siadat & Garshasbi, 2014). Therefore, it is vital for HEIs to consider the nature of students' and educators' mobile technology usage demands and how they may impact on KM. Certainly, there are inherent differences in the uses of technology for teaching and for learning (Parr, 2015), and these differences have implications for the way in which the technology is used for KM.

Regarding organisational support relevant to the HEI learning context, the students mentioned that the effective adaptation of podcast sources such as Moodle and Blackboard, as well as other personalised and collaborative technology platforms, have great potential to complement the learning process and to create strong ties between the students' and institution's needs. Thus, it is both the type of technology to be integrated into the LMS and the institutional support structures underpinning the integration process that are of critical importance the way students use the technologies for KM (Karp & Fletcher, 2014).

Overall, this research investigation found that the integration of mobile technologies affects knowledge management among students and educators in academic (higher education) settings in predominantly positive ways. There was a consensus view among the participants that ICTs are integrated into learning programs and LMS by HEIs to improve academic programs and the learning outcomes of students. As such, mobile applications for learning were perceived to enhance KM by providing educators with novel pathways to guide student understanding of the main topics and learning content. In addition, mobile devices were generally perceived to support collaborative learning pathways including group-based knowledge creation and knowledge sharing. Lastly, the participants indicated that the integration of such technologies allowed teachers to track the learning progress of the student and to evaluate their needs and allowed students to access and organise their learning materials more efficiently.

6. Conclusion

Successful knowledge management is reliant on processes that improve the ability and motivation of the individual and institution to learn, share knowledge, and to perform in way that results in positive outcomes. Overall, the findings in this study were rich and insightful, adding further clarity to our understanding of the usage of mobile technologies for academic purposes in HEIs and KM practices. Most students and lecturers have the view that the

affordance of mobile technologies enhance academic communication and teacher-student communication pathways for the creation and management of new knowledge.

Higher education administrators play a key role in shaping the students' and teachers' perceptions of mobile technology integration for academic communication and KM. As such, it is vital to ensure that the integration process is not hindered by lack of technical support or a culture that does not value technology-based learning. Indeed, KM in HEIs is fundamentally related to the practices and tools designed to support the collection and analysis of information, the transformation of knowledge, and the application of novelties. As such, it is crucial that learning institutions have the capabilities to identify valuable knowledge, to have in place sound methods for accessing and merging knowledge, to distribute valuable knowledge amongst faculty staff and students, and to create new knowledge via knowledge sharing.

This study provided a detailed picture for factors that drive students and teachers to use mobile technologies that have implications for the developer of mobile applications, organisation administrators and decision makers alike. The findings in this study presented the necessity of providing training and support to enable the successful implementation of mobile technologies for academic purpose. Both students and educators need to improve their abilities and knowledge to have the best practice in integrating mobile technologies to improve learning outcomes. Moreover, for the university settings, the findings of this study reported the necessity for universities to make and run a clear rules and policies on the way educators and students can integrate mobile technologies in their learning and teaching process. It is also significant that universities are up to date on the latest practice of mobile technologies for academic settings. In addition, this study can be extended to discover the connection between the influence of mobile technologies on the development of teaching and learning. Moreover, further study could be conducted on the relationship between M-learning activities and knowledge management process to support the enhancement of student learning outcomes. Lastly, future study on the role of mobile learning technologies on university learning management system to present the influence of such technologies at the whole-university level.

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References

Ahmad, N., Lodhi, M. S., Zaman, K., & Naseem, I. (2015). Knowledge management: a gateway for organizational performance. *Journal of the Knowledge Economy,* 1-18. https://doi.org/10.1007/s13132-015-0282-3

Al-Emran, M., Elsherif, H. M., & Shaalan, K. (2016). Investigating attitudes towards the use of mobile learning in higher education. *Computers in Human Behavior, 56*, 93-102. https://doi.org/10.1016/j.chb.2015.11.033

Ally, M., & Prieto-Blázquez, J. (2014). What is the future of mobile learning in education? *International Journal of Educational Technology in Higher Education, 11*(1), 142-151. https://doi.org/10.7238/rusc.v11i1.2033

Baishya, D., & Maheshwari, S. (2019). WhatsApp Groups in Academic Context: Exploring the Academic Uses of WhatsApp Groups among the Students. *Contemporary Educational Technology, 11*(1), 55-70. https://doi.org/10.30935/cet.641765

Berge, Z. L., & Muilenburg, L. (Eds.). (2013). *Handbook of mobile learning*. New York, NY: Routledge.

Bhusry, M., & Ranjan, J. (2011). Knowledge collaboration in higher educational institutions in India: Charting a knowledge management solution. *International Journal of Computer Science*, *8*(2), 1-12.

Conde, M. A., García, F., Rodríguez-Conde, M. J., Alier, M., & García-Holgado, A. (2014). Perceived openness of Learning Management Systems by students and teachers in education and technology courses. *Computers in Human Behavior*, *31*, 517-526. https://doi.org/10.1016/j.chb.2013.05.023

El-Hussein, M. O. M., & Cronje, J. C. (2010). Defining Mobile Learning in the Higher Education Landscape. *Educational Technology & Society, 13*(3), 12-21.

Gerpott, T. J., Thomas, S., & Weichert, M. (2013). Characteristics and mobile Internet use intensity of consumers with different types of advanced handsets: An exploratory empirical study of iPhone, Android and other web-enabled mobile users in Germany. *Telecommunications Policy, 37*(4), 357-371. https://doi.org/10.1016/j.telpol.2012.04.009

Gikas, J., & Grant, M. M. (2013). Mobile computing devices in higher education: Student perspectives on learning with cellphones, smartphones & social media. *The Internet and Higher Education*, *19*, 18-26. https://doi.org/10.1016/j.iheduc.2013.06.002

Gulbahar, Y., Jacobs, C., & Konig, A. (2015). Mobile learning in higher education: Current status and future possibilities. In M. Ally and B. H. Khan (Eds.), *International handbook of e-learning volume 2: Implementation and case studies* (pp. 33-42). New York, NY: Routledge.

Hislop, D., Bosua, R., & Helms, R. (2018). *Knowledge management in organizations: A critical introduction*. Oxford University Press.

Ilgaz, H., & Gülbahar, Y. (2015). A snapshot of online learners: e-Readiness, e-Satisfaction and expectations. *The International Review of Research in Open and Distributed Learning*, *16*(2), 1-13. https://doi.org/10.19173/irrodl.v16i2.2117

Karp, M. J. M., & Fletcher, J. (2014). *Adopting new technologies for student success: A readiness framework*. Institute on Education and the Economy: Community College Research Center. https://doi.org/10.7916/D8862DMC

Kucza, T. (2001). *Knowledge management process model*. VTT Electronics, Technical Research Centre of Finland.

Kulakli, A., & Mahony, S. (2014). Knowledge creation and sharing with Web 2.0 tools for teaching and learning roles in so-called University 2.0. *Procedia-Social and Behavioral Sciences, 150*(1), 648-657. https://doi.org/10.1016/j.sbspro.2014.09.084

Laal, M. (2011). Knowledge management in higher education. *Procedia Computer Science*, *3*, 544-549. https://doi.org/10.1016/j.procs.2010.12.090

Liaw, S. S., Hatala, M., & Huang, H. M. (2010). Investigating acceptance toward mobile learning to assist individual knowledge management: Based on activity theory approach. *Computers & Education*, *54*(2), 446-454. https://doi.org/10.1016/j.compedu.2009.08.029

Mäkelä, K. (2018). *Knowledge exploitation through knowledge management and internal communication* (Unpublished master thesis). Turku University of applied science, Turku, southwestern Finland.

Mao, J. (2014). Social media for learning: A mixed methods study on high school students' technology affordances and perspectives. *Computers in Human Behavior*, *33*(1), 213-223. https://doi.org/10.1016/j.chb.2014.01.002

Omotayo, F. O. (2015). Knowledge management as an important tool in organisational management: A review of literature. *Library Philosophy and Practice, 1*.

Ouadoud, M., Chkouri, M. Y., & Nejjari, A. (2018). Learning management system and the underlying learning theories: towards a new modeling of an LMS. *International Journal of Information Science and Technology*, *2*(1), 25-33.

Ozcan, A. (2014). Mobile phones democratize and cultivate next-generation imaging, diagnostics and measurement tools. *Lab on a Chip*, *14*(17), 3187-3194.

Parr, C. (2015). 6 significant challenges impeding technology adoption in higher education in 2015: What will hold back the use of technology in higher education over the next five years? Times Higher Education. Retrieved 28 December, 2019 from https://www.timeshighereducation.com/news/6-significant-challenges-impeding-technology-adoption-in-higher-education-in-2015/2018820.article

Pinto, M. (2014). Knowledge management in higher education institutions: a framework to improve collaboration. In *Information Systems and Technologies (CISTI), 2014 9th Iberian Conference on* (pp. 1-4). IEEE. https://doi.org/10.1109/CISTI.2014.6876876

Ramachandran, S., Chong, S., & Wong, K. (2013). Knowledge management practices and enablers in public universities: A gap analysis. *Campus-Wide Information Systems, 30*(2), 76-94. https://doi.org/10.1108/10650741311306273

Ramakrishnan, K., & Yasin, N. M. (2012). Knowledge management system and higher education institutions. *International Proceedings of Computer Science and Information Technology, 37*(1), 67-71.

Rennie, F., & Morrison, T. (2013). *E-learning and social networking handbook: Resources for higher education* (2nd ed.). New York, NY: Routledge.

Sami, F. A. (2018). *Integration of learning management system with social networking sites* (unpublished Doctoral dissertation). University of Malaya

Santos, I. M. (2013). Integrating personal mobile devices in teaching: the impact on student learning and institutional support. *Learning and Teaching in Higher Education: Gulf Perspectives, 10*(2), 1-15.

Self, T. B., Matuszek, T., Self, D. R., & Schraeder, M. (2014). The weaver's loom: A conceptual framework for facilitating transformational human resource management through the strategic integration of knowledge management and continuous improvement. *Journal of Business and Management, 20*(1), 87-99.

Siadat, S. H., Matinvafa, A., Saeednia, A., & Moghadasi, F. (2015). Effective factors on successful implementation of knowledge management in higher education. *Management and Administrative Sciences Review, 4*(1), 166-181.

Siau, K., Ee-Peng, L., & Shen, Z. (2001). Mobile commerce: promises, challenges, and research agenda. *Journal of Database management, 12*(3), 4-13. http://doi.org/10.4018/jdm.2001070101

Stănescu, I. A., Ștefan, A., Roceanu, I., Ștefan, V., & Hamza-Lup, F. (2009). Mobile knowledge management toolkit. In *Proceedings of the 8 th European Conference on eLearning* (pp. 558-567).

Sunalai, S., & Beyerlein, M. (2015). Exploring Knowledge Management in Higher Education Institutions: Processes, Influences, and Outcomes. *Academy of Educational Leadership Journal, 19*(3), 289-299.

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education, 94*(1), 252-275. https://doi.org/10.1016/j.compedu.2015.11.008

Tsinakos, A., & Ally, M. (2013). *Global mobile learning implementation and trends*. Beijing, China: CRTVU Press.

Viberg, O., & Grönlund, Å. (2015). Understanding students' learning practices: challenges for design and integration of mobile technology into distance education. *Learning, Media and Technology, 42*(3), 1-21. https://doi.org/10.1080/17439884.2016.1088869

Wang, M., Shen, R., Novak, D., & Pan, X. (2009). The impact of mobile learning on students' learning behaviours and performance: Report from a large blended classroom. *British Journal of Educational Technology, 40*(4), 673-695. https://doi.org/10.1111/j.1467-8535.2008.00846.x

Wu, W. H., Wu, Y. C. J., Chen, C. Y., Kao, H. Y., Lin, C. H., & Huang, S. H. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education, 59*(2), 817-827. https://doi.org/10.1016/j.compedu.2012.03.016