

A Study of Undergraduate Students' Use of Information and Communication Technology (ICT) and the Factors Affecting their Use: A Developing Country Perspective

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ABSTRACT

The purpose of this study was twofold: (1) to examine the extent of undergraduate students' use of Information and Communication Technologies (ICT) for personal and educational purposes, and (2) to examine differences in their use based on their gender, academic year, major, ICT access, and perceived ICT competencies. A descriptive method was followed in which 252 participants completed a questionnaire. The participants were students from a university in Jordan. The results showed that almost all the students owned smartphones and majority of them owned laptop computers. They had easy access to common types of technologies such as computers and the internet. They had moderate competencies in the general use of these common technologies, and high competencies in using smartphones. They were users of common digital tools and applications for personal purposes. Their ownership, access, competencies with, and use of ICT for personal purposes did not result in extensive use of ICT for educational purposes. However, students' use of ICT for informal learning had multifaceted relationships with their use of ICT for personal purposes, ICT access, and ICT perceived competencies. Students' ICT use for informal purposes is also influenced by their gender. However, the students' use ICT for formal learning was not directly influenced by their ICT access, ICT perceived competencies, gender, or major. But, students' use ICT for formal learning was related to their use of ICT for personal purposes and for informal learning. Nowadays university students surrounded by technology, some common types of these technologies include smartphones, Social Networking Service (SNS), computers, and the internet. They know how to use these types of technologies. Students' use of ICT in their learning is directly and indirectly influenced by several factors. University administrators and faculty members should take advantage of students' use and experience of specific types of ICT such as smartphones and SNS in their personal and social life by formally integrating such ICT in students' learning. However such integration needs careful planning in terms of considering the pedagogy related to technology integration and considering the factors that would influence students' acceptance and use of such technologies.

Keywords: use of ICT, undergraduate students, Jordan, technology integration in education, developing country

INTRODUCTION

Information and communication technologies (ICT) have reshaped the face of the era. Most aspects of our lives have been affected by these technologies. Modern society places higher demands on the higher education system.

Contribution of this paper to the literature

- There are several types of ICT that students can use in their personal and educational purposes; the current study provided up-to-date review of university students' extent and nature of ICT's use and the potential factors that might affect their use of these ICT.
- The study provided faculty members and administrators with useful information related to the appropriate ICT to be implemented for educational purposes and how integrate such technologies to support university students' learning.
- The study found that cultural constraints might affect students' extent and nature of use of ICT for personal and educational purposes and it provided recommendations to overcome such constraints.

The introduction and use of ICT in higher education has become a key issue in the development of the education system and they are commonly seen as the solution to the increasing demands on education systems.

The integration of ICT into educational systems varies from the simple use of technology to assist instruction (e.g., PowerPoint presentations) to the delivery of whole courses or programs using ICT (e.g., Massive Open Online Courses (MOOCs)). Students' ICT ownership, access, competencies, and extent and nature of use; play critical roles in the success of the integration of ICT in their education (Bingimlas, 2009; Margaryan, Littlejohn & Vojt, 2011; Pelgrum, 2001).

The use of ICT for educational purposes has several advantages for all higher education stakeholders. These advantages include, but are not limited to, facilitating distance and mobile education (Wang, 2008), enhancing learning outcomes (Valk, Rashid, & Elder, 2010), motivating students (Valentín et al., 2013), overcoming shortages of skilled and experienced instructors (Bass & Thapa, 2014), facilitating student-centered learning (Ertmer & Ottenbreit-Leftwich, 2013), facilitating constructivist learning environments (Howland, Jonassen, & Marra, 2012), promoting lifelong learning (Aspin, Chapman, Hatton, & Sawano (Eds.), 2012), promoting a knowledge-based economy (Dutta & Mia, 2010), increasing access to a wide range of educational resources (Khan, Hossain, Hasan, & Clement, 2012), enhancing and improving communication between students and instructors and among students (Khan et al., 2012), and taking account of individual differences (Graf, 2009). In addition to these general benefits, there are several more reasons for developing countries to integrate ICT into their educational systems. Some of reasons include the low quality of higher education outputs, the inability to cope with global development, imbalances in the geographical distribution of educational institutions due to a focus on areas with high population density, the need to learn from different cultures, the need to train skilled workers who can compete in the global world marketplace, and the need to reduce the cost of education (Sife, Lwoga, & Sanga, 2007; Abel & Deitz, 2011; Khan et al., 2012). In developing countries, students' use of ICT might differ from students' use of ICT in more developed countries, since students' ownership, access of some types of ICT might be limited and that might influence their extent and nature of the use of digital technologies for personal and educational purposes. Furthermore, the culture in some countries might affect students' use of ICT. For instance, gender-based digital divide might appear in some countries due to the culture of these countries that limit women use of ICT. There are several models that explain people adoption of innovations. For instance, Rogers, (2003) pointed to some factors that the person would consider adopting the innovation. These factors include the relative advantages, compatibility, observability, trialability, and complexity of an innovation. Davis, (1986) argued that perceived usefulness and perceived ease of use factors can predict a user's attitude toward using a technology. Furthermore, people demographic variables might directly or indirectly influence their adoption of technology (Venkatesh, Morris, Davis & Davis, 2003).

In Jordan there are increasing numbers of higher education practitioners who are seeking to integrate ICT into their education, since offering part of a course or a whole course online is becoming more appealing. One of the reasons for this is the characteristics of nowadays university students who are very attached to some types of technologies including smartphones, and SNS. Instructors are struggling to stop students using their mobile devices during classes because they cause distractions for students and their instructors. Some researchers suggest integrating the use of mobile devices in classrooms based on the philosophy of "if you can't beat them, join them" (Scornavacca, Huff, & Marshall, 2009). However, it is not clear whether students' interest in the use of some types of ICT for personal purposes will result in the widespread use of ICT for educational purposes. There is a need to examine students' use of ICT for personal purposes and educational purposes, as well as the factors that might influence their use. Students can use ICT to support their formal and informal learning. Formal learning occurs when a person enroll in courses, classrooms, and schools, whereas informal learning happens when a person choose to gain knowledge in specific topics (Dabbagh & Kitsantas, 2012)

Understanding students' ownership of, access to, perceived competencies in the use of, and use of ICT for personal and educational purposes would help higher education administrators and practitioners to select the right technologies to be implemented for educational purposes, and to plan and to design the use of such technologies.

Margaryan, Littlejohn, and Vojt (2011) pointed to the influence of students' access to and preferences for these ICT on policy and practice in relation to ICT integration in education.

The purpose of this study was twofold: (1) to examine the extent of undergraduate students' use of ICT for personal and educational purposes, and (2) to examine differences in their use based on their gender, academic year, major, ICT access, and perceived ICT competencies.

LITERATURE REVIEW

This literature review focuses on university students' use of ICT for personal and educational purposes. It also examines the factors that might affect students' use of ICT. The studies discussed first are from different parts of the world, and then the scope narrows down to Jordan.

University Students' Use of ICT

Different studies have examined university students' use of ICT in different parts of the world. In Australia, Kennedy, Judd, Churchward, Gray, and Krause (2008) examined university students' access to, use of, and preferences for a set of digital technologies. They used a cross-sectional survey design in which 2120 first year university students completed a questionnaire. The results showed that the students were diverse with regards to technology access, use, and preferences. Most of the students had access to mobile phones, desktop computers, and the internet. The most popular uses of computers were to create and edit text, play music, and create multimedia presentations. The most popular uses of mobile phones were to call people, text people, and to take digital photos or videos. The most popular uses of web-based technologies were to send or receive emails, browse for general information, and look up reference information for educational purposes. Several uses of computers and mobile phones were not very popular among participants. For instance, more than half of the students had not used a desktop computer for creating web pages, or audio and video material. In addition, about two-thirds of the participants had not used a mobile phone to access the web or to send or receive emails. Furthermore, several web services were not very popular among participants. For instance more than half of the participants had not used web services to play network games, to use instant messaging, to build and maintain a website, to participate in social networking sites, to participate in web conferencing, to read RSS feeds, to comment on other people's blogs, to create blogs, or to contribute to the development of a wiki. In another recent study in Australia, Gosper, et al. (2014) examined university students' use of technology in 2010 and 2013. The researchers used a cross-sectional survey design. In 2013 the number of participants was 2,849. The results showed that 96% of the participants had access to a laptop or desktop computer at home, 69% of the participants had access to a university-provided computer, and 82% of participants had access to a smartphone, whereas in 2010 only 53.6% had access to a smartphone. However, very low changes were observed in the percentage of students who had access to computers in 2010 and 2013. In addition, the results in 2013 showed that each of the following technologies was used by more than 30% of participants for educational purposes: internet search engines to find online resources, Wikipedia to find information, library tools to find online resources, and Facebook for group work. The results also showed that over 60% of the participants frequently used Learning Management System (LMS) tools for educational purposes. The most common electronic communication tools among students were Short Message Service (SMS), Facebook, and email. The timeline of the studies showed that extent and nature of university students' use of ICT had changed with time. For instance, the more recent study has shown that smartphones have become more popular among university students.

Some research focused on students' use of specific type of ICT, for instance in a study the United Kingdom, Selwyn (2008) examined undergraduate students' use of the internet for academic purposes and the factors that might influence their use. A survey was used and 1222 students completed a questionnaire. The results showed that over 50% of the participants extensively used the internet to send/read emails; to access newsgroups, chat rooms and instant messaging services; to maintain a blog/space on SNS; and to look for information about university studies/assignments. Furthermore, the results showed significant gender differences in students' use of the internet for academic purposes, where female students use the internet to look up academic information more than the male students. Furthermore, students' majors affected students' use of the internet for academic purposes. Students from medicine, social studies, law and business used the internet for academic purposes more than students in the creative arts, architecture/planning and the humanities. There were no differences in students' use of the internet for academic purposes due to academic year. Access to technology or perceived levels of expertise did not strongly relate to students' academic use of internet. In a large scale study that was carried out in the United State and Canada, Smith, Caruso, and Kim (2010) examined undergraduate students' use of information technology. A survey research design was used, and 36,950 students completed a questionnaire. The results showed that over 50% of participants reported owning laptop computers and internet-capable handheld devices. About one-third of participants used Web-based word processors, wikis, and SNS. However, about half of these

participants reported using word processors and SNS in their courses. About two-thirds of the participants reported using LMS for their courses. Furthermore, the results showed gender differences in students' adoption of technology, a higher percentage of male students perceived themselves as ICT early adopters compared to the female students.

In a study that followed qualitative approach Echenique, Molías, and Bullen (2015) examined university students' use of ICT for social and academic purposes in Spain. They conducted semi-structured interviews with twenty undergraduate students in a college of education in a university. The findings showed that the most popular ICTs among the participants were computers and mobile phones. Facebook and Twitter were the most frequently used internet tools. The technologies were used for social and academic purposes. For personal and social purposes, most of the participants reported using Facebook, Twitter, mobile texts, and WhatsApp. For academic purposes, most of the participants used computers to access educational materials. Most of the participants used mobile phones and social media for educational collaboration purposes such as arranging work groups. The participants appreciated their flexible access to the internet and social media via their mobile phones. In New Zealand, Lai and Hong (2015) examined university students' use of digital technologies for educational, personal and social activities. Eight hundred and eight undergraduate and postgraduate students completed a questionnaire. The results showed that over 50% used three electronic tools - laptop computers, mobile phones and MP3/iPods, and three applications -internet browsers, Google, and Facebook/MySpace on a daily basis. Furthermore, the results showed that the students were spending more time on personal and social activities than they were on university activities.

In an international study, Dahlstrom, Walker and Dziuban (2014) conducted a study in which 75,306 university students from five US states and 15 countries participated in a cross-sectional survey which examined their uses and expectations of information technology. The results showed that technology was embedded into students' personal and social lives, and students were technology users. However, students' use of technology in their lives had a moderate relationship with their use of technology in their courses and to communicate with other students and faculty members. More than half of the participants had used LMS, electronic collaboration tools, smartphones, laptops and electronic books. The technologies most commonly owned by the participants were: laptop (90%), smartphone (86%), and tablets (47%). The students used their hand-held devices for academic and administrative purposes. More than half of the students who owned hand-held devices reported using them to communicate with other students about class-related matters outside class sessions; to check grades; to look up information while in class; to access LMS; to access information about events, student activities, and clubs/organizations; to read e-texts; to capture static images of in-class activities or resources; to access library resources; to register for courses; to participate in interactive class activities; and as a digital passport for access or identification. However, more than half of the participants agreed that some of these technologies could be more effective if they had better knowledge and skills for using them. Examples of these technologies included LMS, electronic collaboration tools, and tablets. Students' use of technology was not significantly related to their age, gender, ethnicity, enrollment, or place of residence.

The studies discussed above examined university students' ownership of ICT, access to ICT, ICT competencies, use of ICT for personal purposes, and their use of ICT for educational purposes. Furthermore, these studies have shown that high levels of access, ownership, and use of specific types of digital tools and applications, did not necessarily transformed into extensive use of ICT in the academic environment. Although the findings showed significant growth in university students' access to and use of a range of ICT, their use of ICT was more for social and personal purposes than for learning (Selwyn, 2008, Dahlstrom et al., 2014; Lai & Hong, 2015).

The studies found that only a limited number of ICT were popular among university students. The most common digital tools among university students were mobile phones, desktop and laptop computers, and the internet (Kennedy et al., 2008; Selwyn, 2008; Smith et al., 2010; Gosper et al., 2014; Echenique et al., 2015; Dahlstrom et al., 2014; Lai & Hong, 2015). The common digital applications among university students were emails, phone calls, SNS, text editors, wikis, SMS, internet browsers, and Google (Kennedy et al., 2008; Selwyn, 2008; Smith & Caruso, 2010; Gosper et al., 2014; Echenique et al., 2015; Lai & Hong, 2015). Students made limited use of other types of technologies (Kennedy et al., 2008). The studies reported mixed results regarding variations among students' uses of ICT based on their gender, academic majors, years of study, and educational level (Selwyn, 2008; Smith & Caruso, 2010; Dahlstrom et al., 2014).

The previous studies showed that university students use similar ICT for their informal learning and for personal and social purposes. However, their uses of ICT for informal and formal learning were limited (Lai & Hong, 2015). Students used ICT that were required by their courses (e.g. LMS) to support their formal learning (Kennedy et al., 2008; Smith & Caruso, 2010; Gosper et al., 2014).

University Students' Use of ICT in Jordan

In Jordan, previous studies have shown that undergraduate students had experience in the use of some types of ICT. For instance, Alsoudi and Adaeleh (2005) examined undergraduate students' attitudes to and use of ICT for educational purposes at two universities. They used a survey in which 416 university students completed a questionnaire. The results showed that the most-used ICT was the computer, where about three-quarters of the participants reported using computers, although only half reported owning one. Less than 5% used a computer and ICTs in the classroom. There were no significant differences based on gender and place of residence. However, more recent studies showed that Smartphones have become more popular than computers among university students. For instance, Gasaymeh (2017) examined Jordanian university acceptance of the use of smartphones in their education. The author used a survey design in which 170 university students completed a questionnaire. The results showed that almost all the participants reported owning smartphones. In addition, the results showed that students' intention to use smartphones in their education was significantly influenced by their perceptions of smartphones' usefulness and enjoyment and social factors. In more comprehensive study, Al-Shboul, Al-Saideh, and Al-Labadi (2017) examined university students' perceptions of the current level of integration of ICT in their education. A survey design was used in which 724 students from four private and public universities in northern and north-central Jordan completed a web-based questionnaire. Slightly less than two-thirds of the participants either 'usually', 'most of the time' or 'always' used ICT for their learning. Regarding their perceived competencies in using ICT, about one-fifth of the participants were very confident in using ICT. The most common digital tools among students were laptop computers and smartphones. About one-third of the participants reported having access to laptop computers and smartphones. About half of the participants reported using a laptop computer for their learning. About one-quarter of the participants reported using smartphones for their learning. A little less than half of the participants reported having internet access. The most common educational digital applications were Moodle, specialized webpages, and Blackboard. About one-quarter of the participants reported using Moodle, about one-sixth reported using specialized webpages, and about one-sixth reported using Blackboard. These studies show that the most common digital tools among Jordanian students were computers and smartphones. However, there were variations in students' intensity of use of these tools.

Some studies have focused on students' use of specific types of computer/smartphone-mediated technologies such as SNS. For instance, Bsharah, Gasaymeh, and Abdelrahman, (2014) examined students' use of Facebook in a Jordanian university. For the purposes of the study, 286 undergraduate students completed a questionnaire. The great majority of participants (92.6%) were Facebook users. The most common reasons for using Facebook were for social and academic purposes. However, the research did not deeply investigate students' perceptions and use of Facebook for academic purposes. The results showed that there were no significant differences between students' use of Facebook based on gender but there were significant differences in the students' uses of Facebook based on their major. Engineering students and business administration and economics students used Facebook more than education students. In another study that focused on the educational use of Facebook among university students, Abu-Alruz (2014) used a questionnaire to measure students' use of Facebook for out-of-class educational activities. The participants were 189 students from a college of education. The participants reported high usage of Facebook for several purposes. The top uses included; to communicate with other students and with instructors about course requirements, to post announcements, to inquire about training workshops, and to discuss course-related ideas with other students and with instructors. In addition, the study showed that there were no significant differences between students' use of Facebook based on gender and educational level. In larger-scale study that focused on students' use of different types of SNS, Alimat and Altah (2014) examined the extent of the use of SNS among Jordanian university students. A survey design was used, and 1316 students completed a questionnaire. About two-thirds of the participants reported using SNS. The most popular SNS was Facebook. Furthermore, the results showed differences in students' use of social media based on some variables. SNS was more popular among male students, it was more popular among science majors than humanities majors, and it was more popular among students in their third and fourth academic years compared to students in their first and second academic years.

In Jordan, the studies discussed here reported different results regarding students' use of ICT. Similar to the international studies, the Jordanian studies showed mixed results regarding variations in students' use of ICT based on their gender, academic major, year of study, and educational level (Alsoudi & Adaeleh, 2005; Bsharah et al., 2014; Abu-Alruz, 2014; Alimat & Altah, 2014). None of these studies examined students' use of ICT for personal and academic purposes or the relationships between these uses. The field of ICT is very changeable due to the regular emergence of new tools and applications. Access to, and use of, ICT are not uniform between countries or within a country. University students' access to and use of ICT depends on factors that go beyond the availability of ICT. Therefore, university students' access to, ownership of, and use of ICT, as well as the variables that might affect their use of ICT, should be considered by higher education administrators and faculty members in the planning, design and integration of ICT in higher education.

PURPOSE OF THE STUDY

The purpose of this study was twofold: (1) to examine the extent of undergraduate students' use of ICT for personal and educational purposes, and (2) to examine differences in their use based on their gender, academic year, major, ICT access, and perceived ICT competencies.

The research questions of the current study were:

Research Question 1: What is the extent of students' use of ICT for the following purposes:

- personal purposes
- informal learning (student-selected)
- formal learning (required by courses work)?

Research Question 2: What are the relationships between students' use of ICT for educational purposes and:

- their use of ICT for personal purposes
- their ICT access
- their perceived ICT competencies?

Research Question 3: What are the relationships between students' use of ICT and their:

- gender
- major
- academic year?

RESEARCH METHODS

A non-experimental, cross-sectional, descriptive quantitative research method was followed in the current study. Data were collected using a questionnaire. Questionnaires are useful for collecting information from large groups of individuals. In this study, the questionnaire was used to examine participants' demographic characteristics, and ICT ownership, access to ICT, ICT perceived competencies, and use of ICT.

Participants

The questionnaire gathered demographic data on the participants including their gender, age, major, and academic year (**Table 1**).

Table 1. Descriptive Summary of Participants' Demographic data

| | Category | Frequency | Percent |
|---------------|----------------------------------|-----------|---------|
| Gender | Male | 87 | 34.5 |
| | Female | 165 | 65.5 |
| Age | 18-20 | 160 | 63.5 |
| | 20-25 | 78 | 31 |
| | 26-30 | 3 | 1.2 |
| Major | Education | 42 | 16.7 |
| | Arts and Literatures | 49 | 19.4 |
| | Science | 48 | 19.0 |
| | Engineering and Computer Science | 28 | 11.1 |
| | Nursing and Health Science | 37 | 14.7 |
| | Business Management | 22 | 8.7 |
| Academic year | 1 | 158 | 62.7 |
| | 2 | 12 | 4.8 |
| | 3 | 27 | 10.7 |
| | 4 | 48 | 19.0 |
| | 5 | 6 | 2.4 |

Table 1 shows variations in participants' gender, majors and academic years. Such variations enabled useful comparisons to be made among students with different majors and academic years in relation to their use of ICT.

Instrument

The questionnaire consisted from four parts. The first part collected demographic information about the participants and their ownership, access to, and perceived competencies with, ICTs. The second section addressed

students' use of ICTs for personal purposes. The third section addressed students' use of ICTs for informal learning. The fourth section addressed students' use of ICTs for formal learning. The second, third, and fourth sections of the questionnaire used a four-point scale in which the possible responses were: daily, weekly, monthly, and never. The questionnaire items were selected and developed based on different research studies that were discussed in the literature review section.

Setting and Procedure

The study took place in a Jordanian public university located in southern Jordan. The study took place in the second semester of the 2016/2017 academic year. To recruit participants, several professors from different disciplines were contacted to request their consent to hand out the questionnaires to the students during their lectures. Five faculty members agreed to have their students to participate in the study. These faculty members were teaching general courses that included students from different majors. Short presentations in relation to the study were given to the agreed classes. Paper-based questionnaires were handed out to the students who agreed to participate in the study. Completed questionnaires were returned during the same classes.

Data Analysis

Frequency distributions were computed for participants' demographic data, digital tools that students have, ICT access, and ICT perceived competencies. Frequency distributions were used to answer the first research question regarding participants' use of ICT. Spearman's correlation tests were used to answer the second research question regarding the relationship between students' use of ICT for personal and educational purposes. To answer the third research questions regarding the differences in students' use of ICT according to some variables, non-parametric Kruskal-Wallis tests and Mann-Whitney *U* tests were used to determine whether there were any overall or pair significant differences.

RESULTS

ICT Ownership, Access, and Perceived Competencies

The results regarding participants' ownership of ICT are presented **Table 2**. The majority of participants own smartphones (97.2%, $n=245$), and laptop computers (62.3%, $n=157$) and memory sticks (56.3%, $n=142$). However, less than one-third of the participants reported owning any another listed ICT.

Table 2. Frequency Distributions of Participants' Ownership of ICT

| ICT Type | Category | Frequency | Percent |
|------------------|----------|-----------|---------|
| Smartphone | Yes | 245 | 97.2 |
| | No | 7 | 2.8 |
| Laptop computer | Yes | 157 | 62.3 |
| | No | 95 | 37.7 |
| Memory stick | Yes | 142 | 56.3 |
| | No | 110 | 43.7 |
| Desktop computer | Yes | 72 | 28.6 |
| | No | 180 | 71.4 |
| Tablet | Yes | 65 | 25.8 |
| | No | 187 | 74.2 |
| Games console | Yes | 81 | 32.1 |
| | No | 171 | 67.9 |
| Digital camera | Yes | 44 | 17.5 |
| | No | 208 | 82.5 |

The results regarding participants' perceived ease of access to some ICTs are presented **Table 3**. Most of the participants (87.3%, $n=220$) reported having "easy" or "very easy" access to a computer. The great majority of participants had access to their own computers. A low percentage of participants used computers belonging to their relatives or friends. A very low percentage of the participants (6.3%, $n=16$) used the university computer lab. This might reflect the students' limited use of computers for educational purposes. Most of the participants (93.3%, $n=235$) reported having "easy" or "very easy" access to the internet. The main ways to access the internet were smartphone internet data, followed by the internet at home. A very low percentage of the participants (.8%, $n=2$) used the university computer lab to access internet. This might reflect the university's limited internet infrastructure or students might just prefer to use their own digital tools to access the internet.

Table 3. Frequency Distributions of Participants' Access of Computer and The internet

| | Category | Frequency | Percent |
|---------------------|-----------------------------|-----------|---------|
| Computer Access | Very easy | 145 | 57.5 |
| | easy | 75 | 29.8 |
| | medium | 18 | 7.1 |
| | Difficult | 12 | 4.8 |
| | Very difficult | 1 | .4 |
| Computer Access Way | My Own Computer | 187 | 74.2 |
| | Friend or Relative Computer | 33 | 13.1 |
| | University Computer lab | 16 | 6.3 |
| | Internet Cafe Computer | 3 | 1.2 |
| | Others | 12 | 4.8 |
| Internet Access | Very easy | 158 | 62.7 |
| | easy | 77 | 30.6 |
| | medium | 7 | 2.8 |
| | Difficult | 6 | 2.4 |
| | Very difficult | 1 | .4 |
| Internet Access Way | Internet at home | 33 | 13.1 |
| | Smartphone Internet Data | 213 | 84.5 |
| | University Internet | 2 | .8 |
| | Internet Cafe | 1 | .4 |
| | Others | 1 | .4 |

The results regarding participants' perceived ICT competencies are presented **Table 4**. The results show that the majority of participants (50.8%; $n=128$) believed that that their computer competencies was fair. A little more than one-third of the participants (37.7%; $n=95$) believed that the level of their computer competencies was either "good" or "excellent". The greatest percentage of participants (44.8%; $n=113$) believed that that their internet competencies was "good". A little less than one-third of the participants (37.7%; $n=95$) believed that the level of their internet competencies was "fair". The majority of participants (79.4%; $n=180$) believed that that their smartphone competencies was either "good" or "excellent".

Table 4. Frequency Distributions of Participant' Perceived ICT Competencies

| | Category | Frequency | Percent |
|---------------------|----------------|-----------|---------|
| Use of computer | Excellent | 20 | 7.9 |
| | Good | 75 | 29.8 |
| | Fair | 128 | 50.8 |
| | Low Capability | 18 | 7.1 |
| | No Capability | 10 | 4 |
| Use of the internet | Excellent | 46 | 18.3 |
| | Good | 113 | 44.8 |
| | Fair | 80 | 31.7 |
| | Low Capability | 9 | 3.6 |
| | No Capability | 2 | .8 |
| Use of Smartphone | Excellent | 91 | 36.1 |
| | Good | 109 | 43.3 |
| | Fair | 44 | 17.5 |
| | Low Capability | 5 | 2 |
| | No Capability | 2 | .8 |

ICT Use for Personal Purposes

Figure 1 shows the types of ICT students used for personal purposes on daily basis. The majority of participants (over 50%) used their phones to make phone calls, used SNS, used internet websites, played and downloaded music, used chat rooms, took and shared photos, and exchanged SMS. On a daily basis around one-third of participants shared files, captured and shared videos, accessed news websites, used wikis and blogs, exchanged emails, and used internet gaming. Most students reported that they never used virtual worlds and audio and video conferencing.

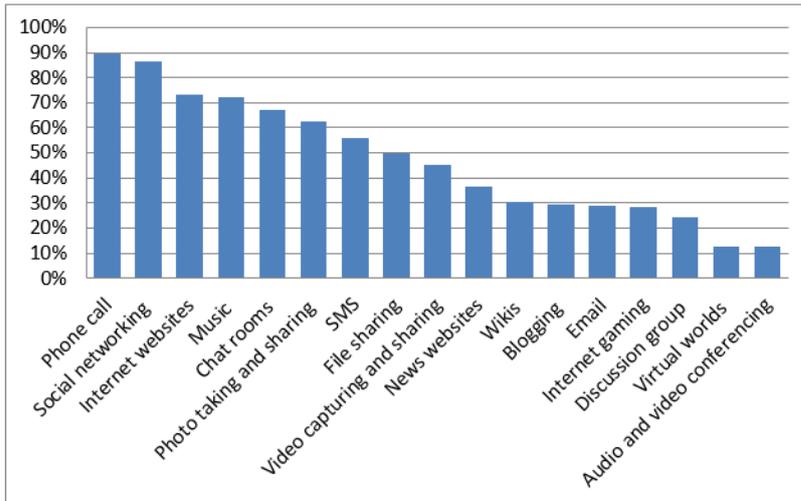


Figure 1. Students Use of ICT for Personal Purposes on Daily Basis

ICT Use for Informal and Formal Learning Purposes

Figure 2 outlines the types of ICT students used for informal learning. The use of ICT for informal learning was less extensive than the use of ICT for personal and social purposes. On a daily basis a high percentage of participants (over 40%) used SNS and search engines for their informal learning. Around one-third of participants used smartphones, visited a course websites, viewed YouTube videos, and visited internet websites daily for their informal learning. A high percentage (over 40%) reported that they never used audio and video conferencing, digital cameras, virtual worlds and simulations and games for their informal learning. For formal learning, Figure 2 outlines the types of ICT students used for formal learning purposes. The results showed that their use of ICT for formal learning was less popular and extensive than their use of ICT for informal learning. However, the types of ICT commonly used for informal learning were similar the types used for formal learning. Around one-quarter of the participants used SNS and search engines daily for their formal learning. A high percentage of participants (over 40%) reported that they never used digital cameras, audio and video conferencing, virtual worlds, blogs, simulations, games, SMS, word processing software, podcast or online discussion groups for their informal learning.

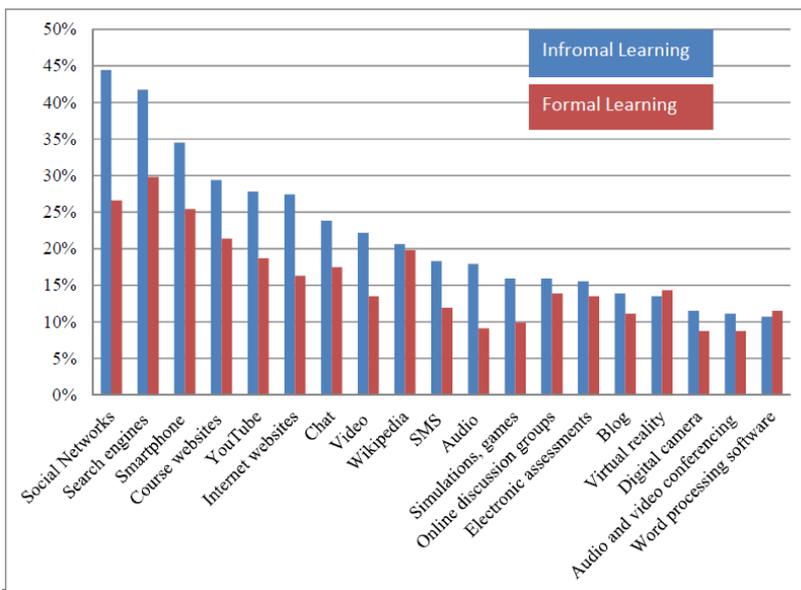


Figure 2. Students Use of ICT for Educational Purposes on Daily Basis

Relationship between Students' Use of ICT for Educational Purposes and their Use of ICT for Personal Purposes

The extent of students' use of ICT was gauged using the mean scores of their responses to the ICT use scales (Score: 4=daily, 3=weekly, 2=monthly, and 1= never). The relationships between students' use of ICT were measured through correlation tests. The results show that there was a positive relationship between the extent of students' use of ICT for informal learning and their personal use ($r=.57, p <.05$), there was a positive relationship between the extent of students' use of ICT for formal learning and personal use ($r=.29, p <.05$), and there was a positive relationship between the extent of students' use of ICT for formal learning and informal learning ($r=.58, p <.05$). The relationship between students' informal use and personal use was stronger than the relationship between their formal use and personal use of ICT.

Difference in ICT Use by ICT Access

Table 5 shows the results of the Kruskal-Wallis tests that examined the differences in students' use of ICT for educational purposes based on the level of their perceived ease of access to computers. There were significant differences in students' use of ICT for informal learning based on perceived ease of access ($X^2 (4) = 11.96, p < .05$). The results of a series of Mann-Whitney *U* tests for pair significant differences show that the use of ICT for informal learning was significantly greater for the students who perceived that the level of their access to computer was "very easy" ($M = 2.49, SD=.66$) than for students who perceived that the level of their access to computer was "easy" ($M = 2.21, SD=.63, U= 4139.5, p = .00$). In addition, the results showed that there were no significant differences in students' use of ICT for formal learning based on their perceived ease of access to a computer ($X^2 (4) = 3.63, p = .459$).

Table 5. The Results Kruskal-Wallis Tests for Difference in Students' use of ICT based on their Computer Access

| Outcome | χ^2 | Df | p |
|-------------------------------|----------|----|------|
| ICT use for informal learning | 11.96 | 4 | .018 |
| ICT use for formal learning | 3.63 | 4 | .459 |

Table 6 shows the results of Kruskal-Wallis tests that examined the differences in students' use of ICT for educational purposes based on the level of their perceived ease of access to the internet. The results showed that there were no significant differences in students' use of ICT for informal learning based on their perceived ease of access to internet ($X^2 (4) = 5.20, p = .267$). In addition, the results showed that there were no significant differences in students' use of ICT for formal learning based on their perceived ease of access to internet ($X^2 (4) = 1.46, p = .834$).

Table 6. The Results Kruskal-Wallis Tests for Difference in Students' Use of ICT based on their Internet Access

| Outcome | χ^2 | Df | p |
|-------------------------------|----------|----|------|
| ICT use for informal learning | 5.20 | 4 | .267 |
| ICT use for formal learning | 1.46 | 4 | .834 |

Differences in ICT Use by Perceived ICT Competencies

The results of the Kruskal-Wallis tests, that examined the differences in students' use of ICT for educational purposes based on their perceived computer competencies, showed that there were significant differences in students' use of ICT for informal learning based on their perceived computer competencies ($X^2 (4) = 18.28, p < .05$). The results of the Mann-Whitney *U* tests showed that the use of ICT for informal learning was greater for the students who perceived that the level of their computer competencies was "excellent" ($M = 2.63, SD=.70$) than for students who perceived that the level of their computer competencies was "low" ($M = 2.04, SD=.55, U= 91.5, p = .01$, and for students who perceived that the level of their computer competencies was "no capability" ($M = 1.94, SD=.57, U= 44, p = .014$). In addition, the use of ICT for informal learning was greater for students who perceived that their computer competencies was "good" ($M = 2.53, SD=.66$) than for students who perceived that their computer competencies was "fair" ($M = 2.31, SD=.62, U= 3766, p = .01$), students who perceived that their computer competencies was "low" ($M = 2.04, SD=.55, U= 3735, p = .003$, and students who perceived that they had "no capability" ($M = 1.94, SD=.57, U= 183.5, p = .009$). There were no significant differences in students' use of ICT for formal learning based on perceived computer competencies ($X^2 (4) = 3.43, p = .488$).

The results of Kruskal-Wallis tests, that examined differences in students' use of ICT for educational purposes based on their perceived internet competencies, showed that there were significant differences in students' use of ICT for informal learning based on perceived internet competencies ($X^2 (4) = 9.88, p < .05$). The results of series of

Mann-Whitney U tests for pair significant differences show that the use of ICT for informal learning was greater among the students whose perceived level of internet competencies was “good” ($M = 2.49, SD=.65$) than among students who perceived that their internet competencies was “low” ($M = 1.09, SD=.58, U= 255, p = .013$). There were no significant differences in students’ use of ICT for formal learning based on perceived internet competencies ($X^2 (4) = 4.1, p = .288$).

The results of Kruskal-Wallis tests, that examined the differences in students’ use of ICT for educational purposes based on their perceived smartphone competencies, showed that there were no significant differences in students’ use of ICT for informal learning based on perceived smartphone competencies ($X^2 (4) = 1.06, p = .9$). There were no significant differences in students’ use of ICT for formal learning based on perceived smartphone competencies ($X^2 (4) = 2.45, p = .65$).

Difference in ICT Use by Gender

Table 7 shows the results of Mann-Whitney U tests that examined the differences in students’ use of ICT based on their gender. The use of ICT for personal purposes was greater for the male students ($M = 3.1, SD=.46$) than for the female students ($M = 2.89, SD=.51, U= 5453, p = .002$). In addition, the use of ICT for informal purposes was greater for male students ($M = 2.57, SD=.67$) than for female students ($M = 2.27, SD=.62, U= 5344, p = .001$). Students’ use of ICT for formal learning did not significantly differ based on their gender.

Table 7. Results of Mann–Whitney U tests and Descriptive Statistics of Students’ Use of ICT by Gender

| Outcome | Group | | | | | | | | |
|-------------------------------|-------|-----|----|--------|-----|-----|-------|-------|------|
| | Male | | | Female | | | U | Z | p |
| M | SD | n | M | SD | n | | | | |
| ICT use for personal purposes | 3.1 | .46 | 87 | 2.89 | .51 | 165 | 5453* | -3.14 | .002 |
| ICT use for informal learning | 2.57 | .67 | 87 | 2.27 | .62 | 165 | 5344* | -3.33 | .001 |
| ICT use for formal learning | 2.96 | .50 | 87 | 2.09 | .66 | 165 | 6913 | -.481 | .631 |

Difference in ICT Use by Major

Table 8 shows the results of Kruskal-Wallis tests that examined the differences in students’ use of ICT based on their major. There were no significant differences in students’ use of ICT for personal purposes based on their major ($X^2 (5) = 7.58, p = .181$), there were no significant differences in students’ use of ICT for informal learning based on their major ($X^2 (5) = 8.87, p = .114$), and there were no significant differences in students’ use of ICT for formal learning based on their major ($X^2 (5) = 8.20, p = .145$).

Table 8. The Results Kruskal-Wallis Tests for Difference in Students’ use of ICT based on their Major

| Outcome | χ^2 | Df | p |
|-------------------------------|----------|----|------|
| ICT use for personal purposes | 7.58 | 5 | .181 |
| ICT use for Informal Learning | 8.87 | 5 | .114 |
| ICT use for formal Learning | 8.20 | 5 | .145 |

Difference in ICT Use by Academic Year

Table 9 shows the results of Kruskal-Wallis tests that examined the differences in students’ use of ICT based on their academic year. The results showed that there were no significant differences in students’ use of ICT for personal purposes based on their academic year ($X^2 (5) = 4.64, p = .33$), and there were no significant differences in students’ use of ICT for informal learning based on their academic year ($X^2 (5) = 4.21, p = .114$). There were significant differences in students’ use of ICT for formal learning based on their academic year ($X^2 (4) = 11.38, p < .05$). The results of Mann-Whitney U tests showed that the use of ICT for formal learning was greater among the students in their fifth academic year ($M = 2.65, SD=.50$) than among students in their first academic year ($M = 2.03, SD=.77, U= 230, p = .032$). However, the limited number of students in the fifth academic year may affect the results, where there was only 6 students in their fifth academic year while there was 158 students in their first academic year. The use of ICT for formal learning was greater for the students in their fourth academic year ($M = 2.21, SD=.54$) than for students in their first academic year ($M = 2.03, SD=.77, U= 3027, p = .034$). The use of ICT for formal learning was greater for the students in their third academic year ($M = 2.28, SD=.57$) than for students in their first academic year ($M = 2.03, SD=.77, U= 1612, p = .043$).

Table 9. The Results Kruskal-Wallis Tests for Difference in Students' use of ICT based on their Academic year

| Outcome | χ^2 | Df | p |
|-------------------------------|----------|----|-----|
| ICT use for personal purposes | 4.64 | 4 | .33 |
| ICT use for Informal Learning | 4.21 | 4 | .39 |
| ICT use for formal Learning | 11.38 | 4 | .02 |

DISCUSSION

While learner-centered teaching that involves effective use of technology has been advocated in higher education in recent years (Laurillard, 2013), traditional teaching methods still dominate university classrooms in many developing countries (Ssekakubo, Suleman, & Marsden, 2011; Al-Shboul et al., 2017). The change toward effective use of ICT in university teaching requires understanding students' ownership, access, competencies and use of ICT. Understanding university students' use of ICT is a significant determinant of the success or failure of the integration of ICT in higher education institutions (Venkatesh, Croteau, & Rabah, 2014).

The current study was conducted to gain a better understanding of university students' use of ICT for personal and educational purposes and whether their uses differed by gender, major, academic year, ICT ownership, ICT access, and ICT perceived competencies. The field of ICT is dynamic due to the constant emergence of new tools and applications. Access to and uses of ICT are not uniform between countries or within a country. University students' use of ICT depends on factors that go beyond the availability of ICT. Therefore, university students' ICT use of ICT, as well as the variables that might affect their use of ICT, should be considered by higher education administrators and faculty members in the planning, design and integration of ICT applications in higher education.

Students' ICT Ownership, Access, Perceived Competencies

The results showed that the most frequently owned electronic devices by students were smartphones and laptop computers. This result is consistent with outcomes of other studies (Kennedy et al., 2008; Smith & Caruso, 2010; Gosper et al., 2014; Lai & Hong 2015; Dahlstrom et al., 2014; Echenique et al., 2015; Al-Shboul et al., 2017). A possible explanation for the popularity of smartphones among university students in comparison with other electronic devices is that current versions of smartphones have software and hardware capabilities to replace tablets, memory sticks, MP3 players, game consoles, digital cameras, electronic organizers and other electronic devices. In addition, smartphones can be used like computers and can accomplish many personal, social, and academic tasks. Furthermore, smartphone brands vary in price from cheap to expensive. Therefore, most university students can afford one.

The university students had easier access to the internet than to computers. The smartphone was a common tool for accessing the internet among university students. In Jordan, most cell phone plans involve a certain amount of free internet data (Orange, 2017; Zain, 2017; Ummiah, 2017). Such data plans enable students to access the internet at anytime and anywhere. The participants considered themselves more competent in using their smartphones than in using computers and the internet. The growth in smartphone ownership among university students would explain their perceptions that they possessed high levels of competencies in using them. They did not rely on the university' facilities to access computers and the internet; they relied on their own devices. Students' access to university computers and internet was limited by time and place.

Extent of Students' Use of ICT

University students use ICT for personal purposes on a daily basis. University students are regular users of smartphones and the internet. The students use their smartphones to make phone calls, to listen to music, to take and share photos, and to exchange SMSs. The students used the internet to access SNS, to surf the World Wide Web, and to access chat rooms. Smartphone was the main tool the students used to access the internet. The results related to the popularity of smartphone services among university students are consistent with the outcomes of other studies (Kennedy et al., 2008; Gosper et al., 2014; Echenique et al., 2015). The result related to the popularity of the internet among university students is consistent with outcomes of other studies (Selwyn, 2008; Gosper et al., 2014). The result related to the popularity of SNS among university students is consistent with outcomes of other studies (Smith & Caruso, 2010; Bsharah et al., 2014; Gosper et al., 2014; Abu-Alruz, 2014; Alimat & Altah, 2014; Lai & Hong, 2015; Echenique et al., 2015).

Students' use of ICT for their learning was not as common and extensive as their use of ICT in their personal lives. Several of the ICT examined were used by the majority of participants (over 50%) for personal purposes on a daily basis. None of the ICT examined was used by more than 50% of the participants for educational purposes on

a daily basis. The findings suggest that students use more types of ICT, and use ICT more often, for personal purposes than for their learning. This result is consistent with outcomes of other studies that have found that university students' use ICT for personal purposes was greater than their use of ICT for educational purposes (Selwyn, 2008; Lai & Hong, 2015; Dahlstrom et al., 2014). University students know how to use ICT for personal purposes. However, there were reasons for the mismatch between their use of ICT for personal purposes and for learning. Possible reasons are a lack of knowledge about how to use ICT efficiently to support their learning, and a lack of incentives to transfer their use of ICT for personal reasons to support their learning.

However, the students' use of ICT for informal learning is more common than their use of ICT in their formal learning. The use of ICT for formal learning does not totally depend on the students themselves. The educational system plays an integral role in encouraging and requiring students to use ICT in their education. For instance, if the system relies on traditional teaching methods (e.g., transmitting knowledge and skills through lectures and textbooks) this will make the students more likely to rely less on ICT in their learning. Furthermore, the students might be influenced very little in relation to their use of ICT in formal setting.

The most common ICT that were used for informal learning among university students were mainly common technologies, in particular SNS (e.g., Facebook, search engines like Google, smartphones, course websites, YouTube, and internet websites). The most common ICT that were used for formal learning among university students were similar (e.g., SNS, search engines, smartphones, and course websites). The results related to the use of well-known technologies for learning among university students is consistent with the outcomes of other studies (Selwyn, 2008; Gosper et al., 2014; Echenique et al., 2015; Abu-Alruz, 2014; Lai & Hong, 2015).

Despite the clear differences in the extent of students' use of ICT for personal purposes and for educational purposes, their use of ICT for informal and formal learning was influenced by their use of ICT for personal purposes. The findings indicate that the most common ICTs that the students used for their learning were similar to the ones they used for personal purposes. Students who used specific types of ICT for personal purposes were more likely to employ these types of ICT in their learning. This finding indicates that the use of ICT for personal purposes is an important factor in shaping students' use of ICT in their learning. However, the relationship between students' use of ICT for informal learning and their use of ICT for personal purposes was stronger than the relationship between students' use of ICT for formal learning and their use of ICT for personal purposes. The results suggest that there are other potential factors that affect students' use of ICT for formal learning. For instance, Gasaymeh (2017) found that usefulness and enjoyment and social factors might affect students' acceptance of technology. In addition, the voluntariness might have affect students' use of technology in their formal learning (Venkatesh, Morris, Davis & Davis, 2003). The finding that there was a positive relationship between students' use of ICT for personal purposes and for educational purposes is consistent with outcomes of other studies (Lai & Hong, 2015; Dahlstrom et al., 2014).

Students' Use of ICT and ICT Access and Perceived Competencies

Students' use of ICT for their informal learning was significantly influenced by their ease of access to computers and the internet. Students who had easy access to computers and the internet were more likely to employ ICT in their informal learning. However, such a relationship was not true for the use of ICT for formal learning. In addition, students' use of ICT for formal learning was not significantly influenced by their perceived ICT competencies. A possible cause is that the educational system in terms of the instructors' roles and teaching methods represent the key factors that determine the formal use of ICT in students' learning rather than their access to ICT. The findings aligned with the results of Selwyn's (2008) study that found that technology access or perceived expertise did not strongly relate to students' academic internet use.

Only perceived computer competencies had a significant relationship with students' use of ICT for informal learning. A possible cause is that students have high smartphone and internet knowledge and skills, and they use these tools extensively for personal and social purposes. Another possible cause is that smartphone use is easier and more convenient than computer use (Smith, 2012; Yu & Conway, 2012) and students use computers mainly to accomplish educational tasks that cannot be accomplished using their smartphones, and therefore students' computer competencies are more likely to affect their use of computers for their learning. The findings regarding the significant relationship between students' computer competencies and their use of ICT aligned with adoption of innovations theories (Davis, 1986; Rogers, 2003).

Students' Use of ICT and Gender, Major and Academic Year

The results showed that for personal purposes and for informal learning, male students used ICT more frequently than female students. A possible cause is that the female students' use of and access to ICT might be limited by social norms, cultural constraints, and gender inequalities in the Arab world, where female students might not have the same freedom as the male students to use ICT. The Arab World is a firmly male-dominated

culture, where male domination is the standard. This finding is consistent with the results of other studies (Alsoudi & Adaeleleh, 2005; Smith & Caruso, 2010). For instance, Smith and Caruso (2010) reported that due to cyber stalking and cyber bullying, female students were more concerned about their privacy in relation to their use of ICT. This finding is inconsistent with the findings of some other similar research studies (Selwyn, 2008; Bsharah et al., 2014; Dahlstrom et al., 2014; Abu-Alruz, 2014).

The results show that students' majors had no significant effect on their use of ICT for either personal purposes and for educational purposes. This finding is consistent with the findings of some similar research studies (Bsharah et al., 2014). However, it is inconsistent with the results of other studies. For instance, Selwyn (2008) found that there were subject discipline differences in students' use of the internet for educational purposes, where students from medicine, social studies, law and business use the internet for educational purposes more than students in creative arts, architecture/planning and the humanities. Alimat and Altah (2014) found that the use of SNS was more popular among science majors students compared to humanities majors students

The results showed that students' academic year only had a significant influence on students' use of ICT for formal learning. A possible cause is that the courses offered for students in higher academic years would require them to use and access of ICT more than the courses offered for students in their first years. This finding is consistent with the results of other studies. For instance, Alimat and Altah (2014) found that the use of SNS was more popular among students in their third and fourth academic years than it was among students in their first and second academic years. However, the finding is inconsistent with the findings of Selwyn's (2008) study.

CONCLUSION AND RECOMMENDATIONS

Nowadays university students own smartphones and laptop computers. They are surrounded by some common type of technologies such as smartphones, computers and the internet. They have moderate competencies in the general use of these basic technologies, and high competencies in using smartphones. University students are users of common digital tools and applications such as smartphones and SNS for personal purposes. Their ICT ownership of, access, and competencies did not transform into extensive use of ICT for educational purposes. However, students' use of ICT for informal learning has a multifaceted relationship with their use of ICT for personal purposes, ICT access, and ICT perceived competencies. Furthermore, students' use of ICT for informal purposes is influenced by their gender and academic year. The students' use of ICT for formal learning was not influenced by ICT access, ICT perceived competencies, gender, or major. The students' use ICT for formal learning might be successfully encouraged by universities.

Margaryan et al. (2011) highlighted on the influence of students' access to and preferences for these ICT on policy and practice in relation to ICT integration in education. University administrators and faculty members should take advantage of students' extensive use and experience of specific types of ICT such as smartphones and SNS in their personal and social lives by formally integrating such ICTs in students' learning, particularly given the increasing evidence of the pedagogical value of these technologies and their positive influence on students' learning (Valk et al., 2010; Ertmer & Ottenbreit-Leftwich, 2013; Howland et al., 2012). The formal integration of ICT in students' learning should consider the social norms and the cultural constraints associated with the use of these ICT, particularly for female students. Furthermore, university administrators and faculty members should ensure the development of computer and internet skills amongst students and show them how different ICTs can fit into their learning. Increasing students' access to computers would increase their use of its tools and applications for their learning. University administrators should make sure that appropriate hardware and software are available in the university and students should be encouraged to access them.

The current study was exploratory, and the findings require further examination. In order to generalize the findings, more participants from more universities in Jordan should be invited to participate in future studies. Further studies could use qualitative or mixed methods to examine in depth students' use of ICT for personal, social and educational purposes, and the factors that might influence their use. The small correlation coefficients and the insignificant relationships between students' use of ICT and the examined factors indicates that there are other factors that might influence students' use of ICT. Future studies should re-examine the pedagogical values of common ICT in Jordanian higher education settings.

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