

**ABSTRACT**

In recent years the phenomenon of using smart devices for studying anytime, anywhere, has grown rapidly. The objective of this study is to examine the scope of the academic use of smart devices in the Israeli academic environment. A Smart device refers to a portable device that is capable of connecting to the internet such as: Smartphones, Tablets, E-Readers and PDA.

The current study addressed two research questions:

RQ1: How do students use smart devices for academic purposes?

RQ 2: What are the barriers to using mobile smart devices and are smart devices easy to use for academic purposes?

The first objective is to explore the way students use smart devices for academic purposes. The second objective is to find barriers and ease of use of smart device academic. The findings indicate that students use smart devices for academic purposes, however academic use is not particularly high. The most common academic uses of smart devices are accessing the campus website, reading pdf files, using courses catalog, finding academic material by internet search and by online databases, finding new research tools and new services by internet search and by fellow students. According to the students the main barriers to using mobile devices with internet were: poor site format, small screen size and slow downloading time.

**KEYWORDS:** Academic mobile applications; Academic use; Higher education; M-learning; Mobile technology; Smart devices; Students technical limitations; U-learning.

**INTRODUCTION**

The global academic environment is preparing to adapt mobile technology into the academic environment so that the entire environment may be ubiquitous and reliable Wi-Fi connection will be available anywhere on campus. Apart from improving their technology infrastructure for better accessibility, the universities are acting for better integration of mobile technology into courses. Many institutions are adjusting their academic contents to small screen sizes and improving the network speed. Also the universities are preparing for the transition from heavy and expensive textbooks to digital textbooks and for the development of various mobile learning based courses. Keller,(2011) reported that in American campuses the number of students who used mobile devices daily to access the Internet significantly increased annually. According to the 2010ECAR research report, more than 40 percent of all college students, used mobile devices to access the Internet daily, compared to 10 percent in 2008.

**LITERATURE REVIEW**

According to Suki &Suki, (2011) one of the definitions of learning from a mobile is "the ability to study independently anytime anywhere". Over time the field expanded and a new level – called U-learning (Ubiquitous Learning) was added. According to Park, (2011) the learning environment has also changed and allows students access to various digital devices and services, including computers connected to the internet and smart devices anytime and anywhere.

According to Johnson et al (Johnson, Adams & Cummins, 2012) universities understand the potential concealed in cellular applications and every year new educational applications are added. Furthermore, they improve academic site accessibility by smart devices and finance programs which provide students with smart devices.

Among the universities which invest in applications we can find Berkley, Princeton, Stanford, Cleveland, Michigan, Virginia, Ohio and others. Smart devices prove their efficiency as an instruction tool in the academic environment by enriching and enhancing the learning experience and by significantly improving the students' success around the globe.

Wong,(2012) reported that Besides easy access to databases and college services, Robson College in North Carolina supplies the students with classes transmitted by video in real-time, thus allowing students who missed a lecture to listen to the taped lesson anytime. Furthermore, the college uses virtualization services for desktop computers. The aim is to allow students to access all applications using portable computers or any other smart device at all times. Kurtz & Chen,(2012) explain that learning via mobile devices can be applied in various ways as a means of sharing contexts such as texts, pictures, music, sites and various multimedia contents; as an environment for educational games; as an administrative tool for sending and receiving messages and updates and as a means for collecting information in real time. In their opinion, the integration of mobile devices invites a speedy, flexible and continuous location based personal-communal educational process which can occur any time teacher and student are connected to the internet.

In 2007 Apple came up with the slogan "study anytime anywhere, anyplace". Establishment of the learning environment iTunes U allowed thousands of universities and academic establishments around the world to share lesson contents and lectures among students and the general public using video and audio files. According to Germany (2011) over 500,000 lectures, movies, books and other information sources are distributed via the academic catalog. The iTunes U environment allows storage of academic contents of courses such as: syllabuses, audio and video files, PDF files, presentations, announcements and academic tasks. The platform is appropriate for all courses in any field, whether it be a language course or a course in micro biology or art. Apple has said that iTunes U content downloads have crossed the one billion mark. More than 1,200 universities and colleges, and 1,200 K-12 schools and districts host over 2,500 public courses and thousands of private courses encompassing the arts, sciences, health and medicine, education, business and more. Leading universities including Duke, Yale, Cambridge, MIT and Oxford continue to extend their reach by enrolling more than 100,000 students in single iTunes U courses, with Stanford University and The Open University each surpassing 60 million content downloads. The Ohio State University's Matthew general Chemistry course enrolled over 100,000 iTunes U students in the first year it was offered. (Telecom tiger, 2013)

According to the survey of Hu and Meier (Hu & Meier, 2010) students from California University use smartphones for academic purposes. Some watch presentations, while others listen to taped lectures. A portion check the course materials and some read academic content..

According to Dahlstrom et al. (Dahlstrom, De Boor, Grunwald&Vockley, 2011) in the United States since 2004 the ECAR Student Technology Study examines student use and perceptions of technology. The students are asked about the use they make of new technologies in their academic life. The research findings of 2011 reflected the importance of accessibility to information and efficiency. In other words, easy access to a variety of databases, Simplified administrative activities and tracking of academic progress. It was also reported that the students use smartphones in at least one course or academic activities in the past year for: sending emails to lecturers, checking grades, sending messages to fellow students, information seeking, visiting course sites/syllabus, timetable planning, collection of data for academic tasks, access social networks and library catalogs, course enrollment and research. The most popular learning applications are calculators, mathematical formulas, dictionaries and thesauruses, search tools and language translation.

Johnson and colleagues (Johnson Levine, Smith, Willis & Haywood, 2011) reported that hundreds of projects in universities around the world use local applications which were built specifically to meet students' needs and utilize social networks and other tools, which ease access to academic information at any time. Following are a number of examples for which smart device compatible academic applications were developed:

Chemistry - applications which include special calculators and applications which include chemistry formulas, in which the students can write notes while they are learning the formulas, illustrate processes in 3D, see results and reactions of processes and test their understanding.

History - Edinburgh University developed a location based application which helps students discover historical information about the places they are traveling in.

Business school - special calculators were developed, as well as applications which allow the presentation of research plans and products and an application for market research.

Medicine - Harvard University developed applications which allow learning about germ outbreaks and include maps which indicate the outbreak centers, check symptoms and gives tips on how to prevent contamination etc. Utah University developed applications for the study the human body, which enables viewing large amounts of data in 3D and analysis. The department of neonatology in Cork University, Ireland developed an application which allows interns access to medical information and to view medical procedures, calculators, medical equipment and more. Hawkes and his colleagues (Hawkes, Walsh, Ryan & Dempsey, 2013) claim that educational applications in the field of neonatology aid in the comprehension of processes and improve interns' skills.

Libraries – many universities developed applications which allow leafing through library catalogs, examination of library cards, extension of book loans, acceptance of notifications regarding books due and library activities. Valmestad (2011) found that the Library at Manitoba University photographed and tagged items from the art collection, including statues situated around the campus, using smart devices and barcode applications. They then edited the photographs and cataloged them by artists, dates and name of the work. The artwork was mapped and using a GPS application one may click on the map and receive details regarding any item.

Biology – Lee et al (Lee, Lee & Kwon, 2011) report that by using a barcode application (QR CODE) developed for biology students one may research and identify various types of creatures while on field trips.

Mathematics – Biahah & Dahar (2010) reported that Haifa University in Israel developed applications which support algebra and geometry studies. It may be downloaded to the mobile device and may be used at no cost without the need for an internet connection. Another application imitates a graphic calculator and presents graphs and formulas of popular functions. Yet another application boasts a linear model and a square model for the presentation of mathematical phenomenon.

Radiology- Szekely and his colleagues (Szekely, Talanow & Baygi, 2013) report tens of applications developed to help diagnostics, digital books and interactive encyclopedias in the radiology field.

### Research Questions

RQ1: How do students use smart devices for academic purposes?

RQ 2: What are the barriers to using mobile smart devices and are smart devices easy to use for academic purposes?

## METHODOLOGY

### Data collection

The study was conducted in Israel during the two semesters of 2012 using a quantitative method; data was collected via survey questionnaires and statistical analyses. The population of subjects included 146 Bachelor and Master Students from two academics institutions: Bar Ilan University situated in Ramat Gan and the Sami Shamoon College of engineering situated in Ashdod city, Israel. 78 of the participants were male and 68 women. The ages of the participants varied. Validation of the questionnaires was conducted on a sample population of 33 M.A. students in the Department of Information Science Bar Ilan University in the first semester of 2012. These students received iPads at the beginning of the semester and were requested to connect to the App store and iTunes U (an application through which thousands of universities from all over the world present academic content) and to download applications at will with a preference to academic applications

### Data analysis

Of the respondents 78 (53.4%) were male and 68 (46.6%) were female. Most (n=61, 41.8%) were 20–25 years old, 49 (33.6%) were 26-30 and 36 (24.7%) were 31+ years old. As for their enrollment by educational level, 100 (68.5%) were undergraduates, 46 (31.5%) were MA students.

### Measurements

The participants were requested to complete nine questionnaires:

- [1] Personal details questionnaire
- [2] Smart device experience questionnaire
- [3] reading academic content on smart device questionnaire

- [4] Finding academic contents questionnaire
- [5] Finding new research tools on smart device questionnaire
- [6] Barriers to use questionnaire
- [7] Ease of use questionnaire
- [8] Smart device preference for academic use questionnaire
- [9] The scope of academic use on smart device questionnaire

**Smart device experience questionnaire** included two questions; the first question refers to the time that students use the internet from their smart device daily. The second question refers to the time that students use their smart devices for reading. The measuring scale ranged from 1=1/2 hour to 5=5 hours. The internal consistency analysis of these two items according to Cronbach's Alpha value, indicated a good internal consistency of  $\alpha=.72$ . Scores were aggregated into one measure based on the mean of the item scores. Higher scores indicated higher *smart device experience*.

**Reading academic content on smart devices questionnaire** Characterization of academic reading on smart devices: The participants were requested to mark their answers on a scale of 1-3. 1= downloading PDF files, 2=reading via applications, 3=reading from sites. The score was calculated by counting the number of times each reading method was marked. A high score indicates frequent reading activity of the student on a smart device.

**Finding academic contents and new research tools on smart device questionnaires:** A high score indicates a high rate of activity by the student with regard to finding academic contents and new research tools.

**Barriers to use on smart device questionnaire:** The students were requested to mark their answers on a seven-point Likert scale. 1=no limitations, 4=very limiting. The internal consistency analysis according to Cronbach's Alpha indicated a good internal consistency of  $\alpha=.80$ . One measure was derived from the questionnaire by calculating the scores of nine items. Thus, the higher the score of limitation the more limited the smart device.

**The ease of use of smart device questionnaire** is based on Gu and his colleagues' questionnaires (Gu, Gu&Laffy, 2011), which were modified for this study and consisted of nineteen statements. Respondents were asked to mark their answers on a five-point Likert scale. 1=not at all, 5=very much. A principal components factor analysis using Varimax rotation with Kaiser Normalization was conducted. However four items (items 1, 2, 15, 19) were removed from the questionnaire because their factor loading was lower than 0.50. A principal components factor analysis was conducted again. The principal components factor analysis revealed two distinct factors, explaining 54 percent of the variance. The first factor related to technological ease of use of smart devices. (Items 11, 9, 10, 16, 14, 7, 13, 8, 12). The second factor related to academic ease of use of smart devices. (Items 5, 3, 4, 17, 6). The internal consistency of the two factors was tested according to Cronbach's Alpha. A high internal consistency was found. The Cronbach's  $\alpha$  values were 0.86, for the first factor and 0.82 for the second factor. Calculation was done based on the average of each factor. The higher the score the simpler the use.

**Smart device preference for academic use questionnaire** explored the preference of smart device for academic use and consisted of five statements. Respondents' scores were aggregated into one measure based on the mean of the item scores. Higher scores indicated higher *activity use*.

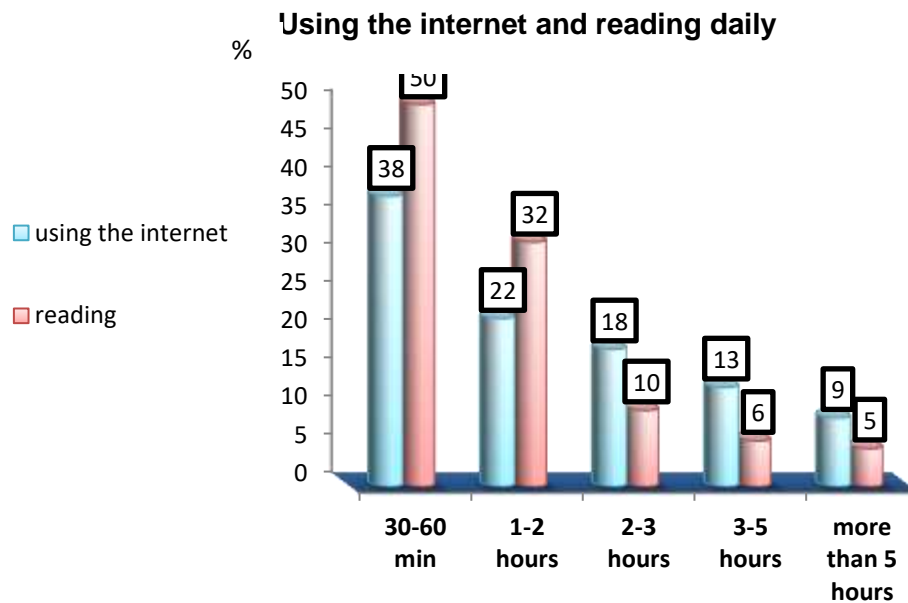
**The scope of academic use on smart device questionnaire** explored the frequency of the academic use on the smart devices and consisted of five statements rated on a 7-point Likert scale (1= never, 7=several times a day). Respondents' scores were aggregated into one measure based on the mean of the item scores. Higher scores indicated greater use. The value of Cronbach's  $\alpha$ , a measure of internal consistency, was high .89, indicating good internal reliability thus the higher the score the more frequent the use.

These questionnaires were based on Hu's questionnaires (2010) which were compiled for student and researcher use in the University of California.

## Findings

The first issue we dealt with is the experience students have with smart devices.

Experience was measured by two variables: the amount of time that students use the internet and reading. Scores were aggregated into one measure based on the mean of the item scores. Higher scores indicated greater *smart device experience*. Figure 1 presents how much time students use the internet and read content on smart devices.



*Figure 1: time (%) using the internet and reading from smart device*

The findings reveal that approximately 40% of the students use the internet between half an hour to one hour a day. 22% use between two and three hours and 13% use between three to five hours per day. A little less than 10% use over five hours a day. Regarding reading, almost half of the students read 30 minutes to one hour a day, a third read between an hour to two hours and about a fifth read more than two hours a day.

In order to examine for differences between genders, age groups and academic degrees, chi-square analyses were conducted. These analyses did not produce any significant differences. It seems that the general experience with smart devices is not particularly high. However, using the internet experience was found to be higher than the reading experience. Indeed, A paired comparison t-test revealed a significant difference between using the internet and reading,  $t=4.28, p<.001$ . However the correlation between the two variables is high  $r=.58$ , therefore, one measure was built according to the average of scores in two items. Thus, the higher the score, the greater the smart device experience is.

#### **Characterization of academic reading**

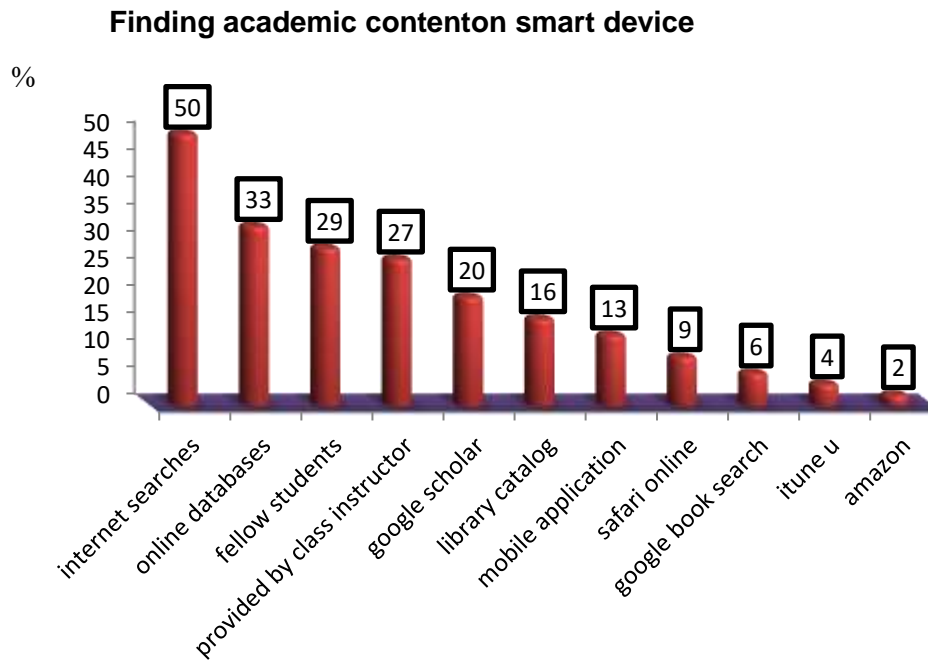
The second issue to be addressed were reading characteristics. Of the respondents who reported using a mobile device for academic reading, a majority (64%) reported reading from *downloaded PDFs*. 17% use *reading applications*. Only (7%) read academic content from *websites*.

In order to examine the relationship between personal characteristics (gender, level of education, age group) and characterization of academic reading, Chi square analyses were performed. A significant difference was found regarding gender,  $\chi^2 = 8.60, p<.01$ . Meaning, Men read more than women. Regarding level of education, significant differences were found between B.A. and M.A. students.  $\chi^2 = 7.82, p<.01$ . Meaning, B.A. students read more academic contents on their smart devices than M.A. students.

#### **Finding academic content and new research tools on smart device**

The next issue to be addressed includes two parts: first part is finding academic content and the second part is finding new academic tools and services on the smart device. A high score indicates a high rate of activity by the student for the purpose of finding academic contents and new research tools.

Figures 2 and 3 present the average frequency of finding academic content on smart devices, and finding new research tools on smart devices.



**Figure 2: frequency (%) of finding academic content on smart device**

Concerning the first part, finding new content on a smart device, the results show a majority(50%) of students who find academic content on smart devices by *Internet searches*. About a third use *Online databases* and *Fellow students* and a quarter use *Provided by class instructor*, 20% use *Google Scholar*, 16% use the *Library catalog* and 13% use *Mobile applications*. The other measures - Safari Online, Google Books, iTunes U and Amazon – are not significantly used.

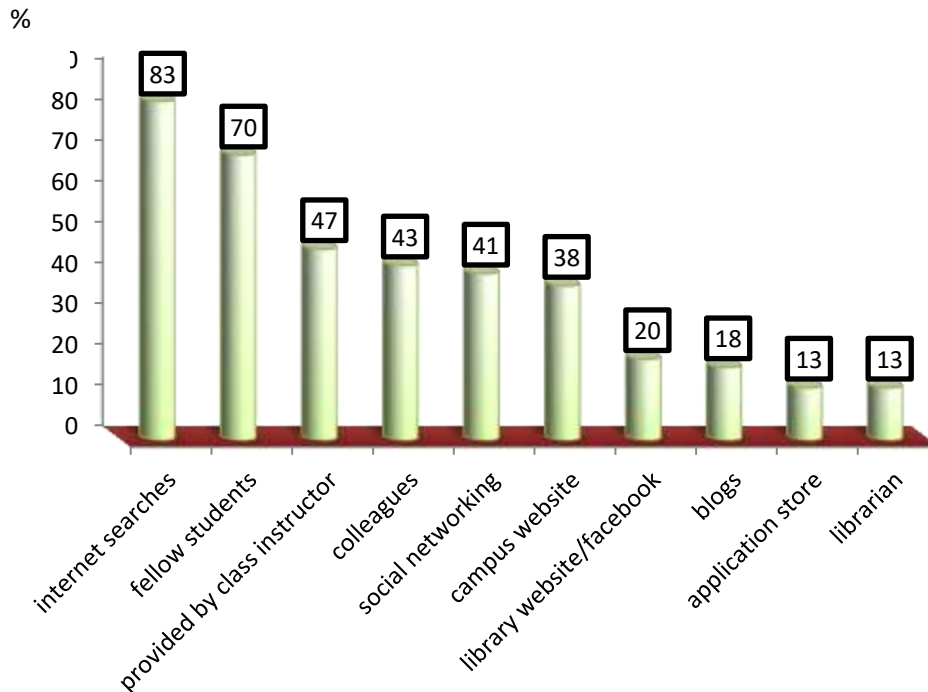
In order to find significant differences regarding personal characteristics (e.g. gender, level of education, age group) Chi square analyses were performed. The test did not reveal any significant difference regarding age group. However, a significant difference was found regarding gender in two academic uses: "provided by class instructor"-  $\chi^2 = 8.16$ ,  $p < .01$ , and "Google Scholar"-  $\chi^2 = 8.40$ ,  $p < .01$ . In other words, Women use these two sources more than men. 38% of the women use "provided by class instructor" on their smart device compared to only 17% of the males. 30% of the women used Google Scholar compared to only 10% of the men.

Regarding differences in level of education of the participants, significant differences were found regarding the use of "Google Scholar",  $\chi^2 = 16.99$ ,  $p < .001$ , "library catalog",  $\chi^2 = 8.97$ ,  $p < .01$ , "iTunes U",  $\chi^2 = 11.14$ ,  $p < .01$  and "internet search",  $\chi^2 = 4.83$ ,  $p < .05$ .

In other words, B.A. students use "internet searches" (57%) more than M.A. students. 40% of the M.A. students reported using Google Scholar compared to 11% of the B.A. students. 29% of the M.A. students use the library catalogue compared to only 10% of the B.A. students. We also see that most of the students do not use 'iTunes U' at all. Only 11% of the M.A. students reported using iTunes U while the B.A. students does not use iTunes U at all.

Concerning the second part finding new research tools and services on smart devices, figure 3 presents the findings.

**Finding new research tools and services on smart devices**



**Figure 3: Frequency (%) of finding new research tools and services on smart devices**

Results show that Majority of students(83%) use *internet searches* in order to find new tools and services. Below that,70% use *fellow students*. Far behind, only 47% use *provided by class instructor*. A bit less (43%) use *colleagues*. A similar frequency (41%, 38%) use *social networking* and *campus website* respectively. the rest of the sources are barely used.

In order to find significant differences regarding personal characteristics (gender, level of education, age group) Chi square analyses were performed. A significant difference was found regarding gender in two academic uses: *blogs*- $\chi^2 = 7.83$   $p < .005$ . and in *social networking*- $\chi^2 = 15.17$   $p < .01$ . Meaning, in order to find new research tools and services, women use *blogs* and *social networking* more than men.

A significant difference was found regarding the level of education in two academic uses, *blogs* and *fellow students*: *blogs*- $\chi^2 = 11.35$   $p < .01$ . Meaning, M.A. students use *blogs* more than B.A. students and *fellow students*  $\chi^2 = 5.05$   $p < .01$ . Meaning, B.A. students use *fellow students* more than M.A. students.

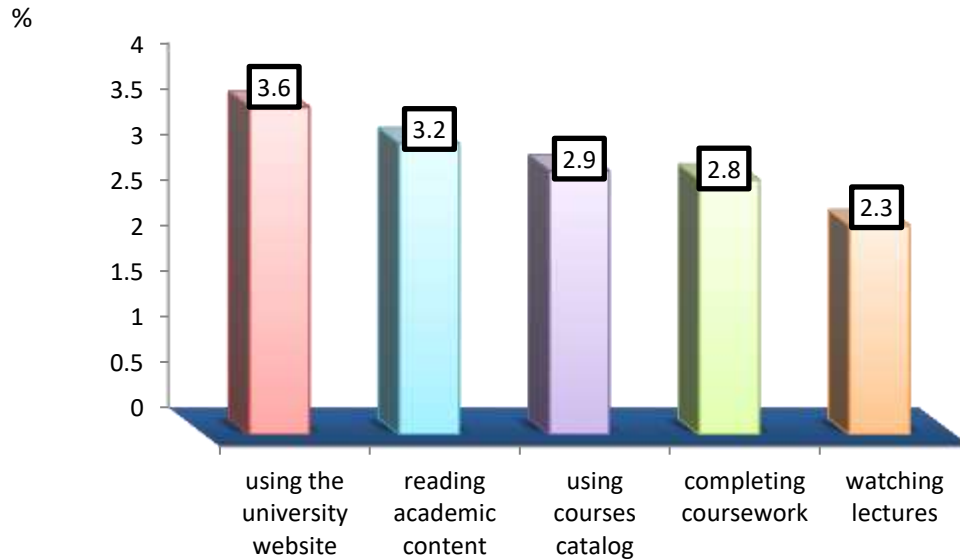
A significant difference was found regarding age group in two academic uses, *blogs* and *social networking*: *blogs*- $\chi^2 = 16.16$   $p < .01$ . Meaning, The third group (31+) uses *blogs* more than the first group (20-25) and more than the second group (26-30).

*Social networking*- $\chi^2 = 8.86$   $p < .01$ . Meaning, the first group (20-25) uses *social networking* more than the two older groups. However, the third age group (31+) uses the *social networking* more than the second group.

**Scope of academic use on smart device**

The Forth issue to be addressed is related to the scope of academic use on smart devices. Student scores were aggregated into one measurement based on the mean of the item scores. Higher scores indicated greater *activity* frequency. Figure 4 presents the average scope of academic use on smart device.

### The Scope of Academic Use on Smart Device



*Figure 4: average (%)scope of academic use on smart device*

The figure shows that the greatest use of the smart device among the five activities is *using the university website*, followed by *reading academic content*. A bit less is *using courses catalog* followed by *completing coursework* and *watching lectures*.

In order to examine whether there are differences concerning the scope of academic use between the activities, a variance analysis was conducted with repeated measures. A Significant difference was found among the activities:  $F(4,5222) = 19.34$   $p < .001$   $\text{Eta}^2 = .12$ .

In a paired comparison analysis a significant difference was found concerning the first activity- *using the university website* and the other activities. Meaning, this activity is performed more often than the other activities. Also, a significant difference was found concerning *reading academic content* and all the other activities except - *using courses catalog*. A significant difference was also found between *using courses catalog* and *watching lectures*.

In order to examine the relationship between personal characteristics (gender, level of education, age) and variables reflecting the scope of academic use a three way variance analysis was performed - Gender X age X activity and gender X degree X activity, with repeated measurements. This test did not reveal any significant differences regarding personal characteristics (gender, degree or age) Furthermore, the test did not reveal a significant interaction between the three variables.

#### Barriers to use on smart devices

Survey respondents felt that the highest barriers to using mobile devices for studying are: poor web page formatting, small screen size and slow loading time. Figure 5 presents the averages of barriers to use on smart device.

Average of **Barriers to use on smart device**  
Barriers to use



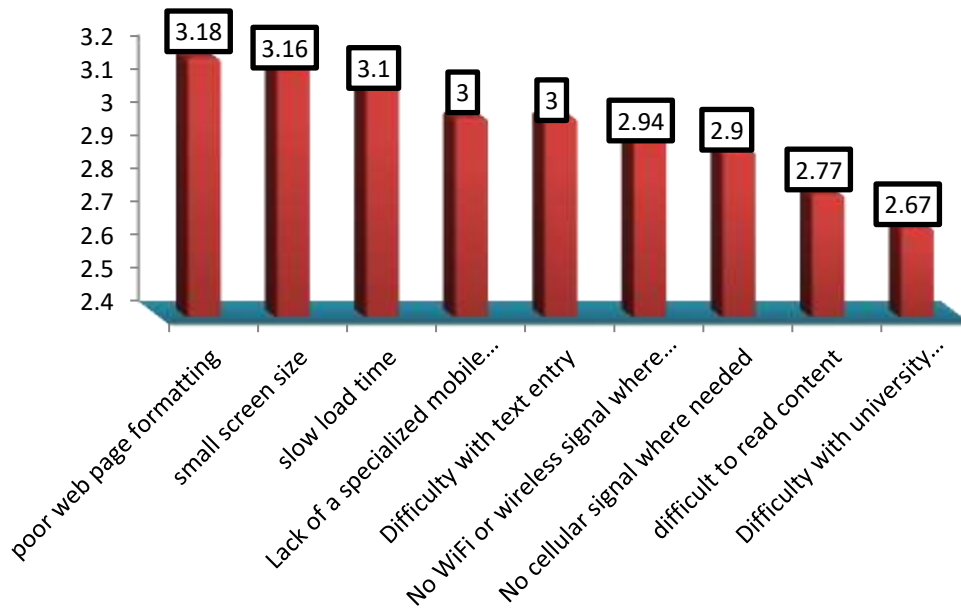


Figure 5: Averages (%) of barriers to use on smart device

In order to examine the relationship between personal characteristics (e.g. gender, level of education) and variables reflecting perceptions regarding smart device barriers to use, a MANOVA one way analysis was performed for each characteristic separately. A significant difference was found regarding the level of education:  $F(9,77)=2.13$   $p<.015$   $\text{Eta}^2=.20$ . Variance analysis, which was conducted for each measure separately revealed a significant difference relating to the screen size.  $F(1,85)=7.81$   $p<.01$   $\text{Eta}^2=.08$ . In other words, M.A. students perceive the limitation of *small screen size*  $M=3.43$ ,  $SD=.94$  more significant than B.A. students  $M=2.86$   $SD=.90$ . A significant difference was found regarding age groups  $F(10,152)=3.52$   $p<.0001$ . A variance analysis test was performed for each measure separately, revealing a significant difference relating to small screen size, difficulty with text entry and No Wi-Fi where needed. Table 1 presents the means and standard deviation of students' perception regarding to small screen size, difficulty with text entry, no Wi-Fi where needed, according to age group.

Table

measures	25-20		30-26		+31		F(2,84)	Eta2
	M	SD	M	SD	M	SD		
Small screen size	2.73	.73	3.23	1.01	3.35	.93	4.25	.09
Difficulty with text entry	3.14	.95	2.57	1.14	3.25	1.02	3.5	.08
No Wi-Fi where needed	3.49	.80	2.63	1.33	2.9	1.25	5.13	.11

\* $P<.05$     \*\* $P<.01$

Concerning the age group 20-25, the measure of *small screen size* is lower than the average of the two older age groups. Indeed, in Scheffe's comparative couple analysis a significant difference was found between the younger group and the others. Regarding the measure *Difficulty with text entry*, it seems that the average for the younger and the older groups is higher than that of the middle age group (26-30). In other words, the middle group evaluated this barrier lower than the other two groups. These differences correlate the findings of the comparative couple analysis. Regarding the measurement *No Wi-Fi where needed*, comparative couple analysis revealed a significant difference between the younger group and the two older groups, with the younger students rating this barrier more severely than the older students.

**Smart device ease of use for academic purposes**

Ease of use of smart device was examined by two factors: *academic ease of use* and *technological ease of use*. In order to find differences between gender and level of education and differences between *academic ease of use* and *technological ease of use*, a variance analysis was conducted 2X2X2 with repeated measures (Gender X level of education X academic ease of use and technology ease of use). This analysis revealed significant differences between the *academic ease of use* and the *technology ease of use*:  $F(1,121)=10.30$   $p<.01$   $\eta^2=.08$ . *Technology ease of use*  $M=3.39$   $SD=.88$  is higher than *academic ease of use*  $m=2.98$   $SD=.92$ . No significant interaction was found between genders or level of education and ease of use. However, the test revealed significant interaction between women and level of education  $F(1,121)=7.90$   $p<.01$   $\eta^2=.06$ . Meaning: Female B.A. students find smart devices easier to use for academic purposes than M.A. female students.

**DISCUSSION**

This study explored the scope of smart device academic use. The findings reveal that academic use is not particularly high. These findings are similar to previous studies. According to Woodcock and his colleagues (Woodcock, Moddleton & Nortcliffe, 2012) most of the students who own smartphones are not aware of the device's potential and its ability to support them in their studies and, in general, they do not download applications for academic use. Picek and Grcic (2013) reported that almost 40% of students who participated in their research never used their smart device for academic purposes despite their experience with the device and with online courses as well.

Concerning smart device experience, the findings showed that experience is not high. Most of the students spend between a half an hour to an hour a day using or reading on their smart device. The most common use is reading PDF files. These findings are similar to Hu and Meier's (2010) findings. They found that most students spend between a quarter of an hour to an hour a day surfing or reading on the smart device.

With regard to methods for finding academic contents, such as: searching a catalogue and online databases in the library website, free searching on the internet, digital books such as Amazon and Google Books, Google Scholar and also academic material passed on by the lecturer or students among themselves, it was found that half the students use free searching on the internet. The second most important use was found to be library online databases, while only a small number of students using the library catalogue. Apparently, students prefer online material to printed material. The databases allow access to full text articles while catalogues offer more printed academic content, such as books and journals.

An interesting finding relates to the personal characteristics. We found that almost 60% of the bachelor students find academic content by free internet searches, while only 40% of the master students do so. With regard to use of Google Scholar and the library catalogue we found that master students use these methods more than bachelor students. Moreover, bachelor students do not seek academic content through iTunes U at all. The reason for this may be that master students are more experienced than the bachelor students with finding academic content, therefore their search methods are more sophisticated and focus more on academic methods rather than on free searches.

With regard to finding tools and new services which may help organize academic and research materials, the study focused on finding tools and services by use of tools offered by Web 2.0, such as blogs and social networks, university websites, library or librarian, via information transferred by lecturer or among the students and also by free web searches and smart device applications. We found that over 80% find new research tools by free internet searches, a bit less through fellow students/friends and to a lesser degree from information passed on by the lecturer and colleagues. According to Shner (2012) the reason that the majority prefer free internet searches is because the internet is perceived by most as a great digital warehouse, which stores information practically in every field. Another interesting finding relates to the gender difference. Women seek new research tools on social networks on their smart devices more than men. A plausible explanation for this may be found in Aharony's study (2013) which found that women, in general, spend more time than men on social networks.

The study results also support Hu and Meier's study (2010) which found that the first four methods for finding new research tools are: colleagues, fellow students/friends, free internet search and via department or university Email. They think that the difficulty of finding new research tools derives from the difficulty of spreading the word about new research tools/services. They claim that most people learn about the existence of a research tool

or service from their immediate environment, i.e. friends and community. However, it is hard to reach many people by word of mouth.

As it seems from this study and previous studies, the academic potential hidden in the smart devices is not fully realized by the students. On the one hand, it may be assumed that lack of academic experience and lack of awareness to the capabilities of the smart devices are part of the reasons for the minimal use of the devices. On the other hand it is logical that the devices limitations are also a part of the reasons for the limited use.

The Second research question focused on the limitations of the smart device with regard to academic use. According to the research findings, the two main limitations were: site format which is not adapted to the smart device and smart device small screen size. To a lesser degree: slow downloading time and the lack of appropriate smart device Apps. It should be noted that master students evaluated the small screen size more severely than the bachelor students as well as the older age groups 26-30, (31+) who evaluated the small screen size more severely than the younger group (20-25).

According to this study and previously quoted studies the small screen size is one of the limitations which interferes the most with learning via the smart device. This study supports Hu and Meier's (2010) findings who found that the first two factors which limit the use of smart devices are small screens and slow downloading times and, to a lesser degree, difficulty reading the format of the contents and site formats that are not appropriate for smart devices. In their opinion, despite the lack of tools and systems developed specifically for these purposes, academics have no doubt integrated the smart devices into their academic work. They claim, that although screen size cannot be changed, study sites may be adapted to smart devices. Cheon and his colleagues (Cheonm Lee, crooks & song, 2012) reported that one of the reasons the small screens constitute a limitation on academic use is the fact that the academic contents are not yet adapted to the smart devices. The students in their study testified to the difficulty of reading articles in the PDF format and to the inability of direct notes and summary writing. Morris & Higgans (2011) reported that after reformatting web pages and after adapting them to smart devices the small screens did not present any difficulty and students often used the devices for academic purposes.

The small screen limitation has also been found in Canada. According to Watsi and McGreal (2013), who checked if university websites were adapted to smart devices (mobile websites), one of the hurdles keeping students from using their devices for academic purposes is the small screen size. They think this can be overcome by html elements which may be changed and adapted to the smart devices, so that the pages will be presented fully in a logical manner. Regarding the format – since not all devices support media files such as presentations, flash and the like, they recommend using formats supported by these devices.

The results of the study are also similar to Picek and Grcic's (2013) findings who state that some of the weaknesses of learning on a mobile device include: small screen, batteries that empty, price and usability. Abramitsky (2012) writes that students do not use their devices when they need to open a number of windows simultaneously. Although iPhone allows opening a number of internet pages simultaneously the transition between them is not as simple as on a computer and they cannot be viewed side by side because of the size of the screen.

Another difficulty that was discovered is the slow downloading time. Although most academic institutions have wireless networks, the number of users is great and the infrastructure does not support such a heavy load. The result – many disruptions while surfing the net. When a student is reading an article or studying and the net crashes his/her line of thought is disrupted and his/her learning quality is affected.

With regard to the ease of use from the both the technical aspect and the academic standpoint, the study found that the technical aspect is more convenient than the academic aspect. Picek and Grcic (2013) explain that ease is defined by both the hardware and the software. Gender differences were not found, nor was age find to have any influence. However, bachelor students gave the ease of use better evaluations than master students. These findings correspond to those of Gu and his colleagues (GU, GU & Laffy, 2011) who researched the ease of academic use of smart devices while on the go. They state that most of the students found the interface comfortable for studying while on the go from the design aspect, as well as the distribution, the division of contents into segments, the navigation and control. From the academic standpoint they reported that it is more convenient to listen to audio files rather than read while on the go. In order to make reading more convenient the researchers recommend adding multimedia files or audio files to the reading material, however, they noted that the small screen, the tiny keyboard and the slow downloading time create inconvenience when studying. The researcher's conclusion is that

the mobile learning experience should be in line with the online learning experience, In other words, the interface, the distribution and control need to live up to the standards of users who have previous experience with internet based information and learning sites.

The studies brought here point to a number of ways to overcome the limitations of the smart device. As mentioned, adaptation of the academic site pages had a positive effect on the assimilation of smart devices in the academic system. It can be assumed that in the future, as academic sites are adapted to smart devices and when academic content will be displayed in smart device appropriate formats, the limitations of the small screen size and the inappropriate site formats will disappear or become insignificant.

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