Comparison of Websites and Mobile Applications for E-Learning

Foziah Gazzawe

Department of Computer Science, Loughborough University

f.gazzawe@lboro.ac.uk

Abstract

Information and communication technology (ICT) applied in the field of education is diverse in nature, and it is progressing continually. Advances in the development of smart phones in terms of both software and hardware capabilities have been considerable, and have provided new opportunities for e-learning. It can be argued that a key goal of companies is to produce applications that are productive, and more importantly, user friendly in nature so that they can deliver the best user experience to their customers. This paper reports on an investigation of user preferences when using an e-learning application designed to meet the needs of e-learners. Data was collected to gather evidence of their preferences with respect to both web and mobile applications. This study is part of a large research project, which aim to investigate the potential of e-learning within higher education using multiple e-learning applications. This paper undertakes the first phase of this research project. In the first phase, two user groups with a relatively similar age group (21-30 years) were asked to experiment the use of two different interfaces: one of a mobile application and the second of a web application. Both applications include information that aim to support international students. The information provided was based on one of the universities located in the USA. The information was obtained from the international office, which included facilities available, directions, events and workshops, important contacts, etc. Feedback on the use of both mobile and web applications was gathered using semi-structured interviews. Four interviews were conducted with two participants from each of the user groups within this study. The results indicate that both background and experience of using ICT applications highly influenced how both (web and mobile) applications were perceived. The analysis show that type of information and its representation play an important role in determining its efficiency and usefulness for the user. This study draws an important insight into the future of both web and mobile applications within the higher education environment. The next phase following this study aims to examine the results gathered in this study on a wider audience. This study provides an important foundation towards support understanding potentials and limitations for both web and mobile applications.

1. Introduction

Technological evolution has enabled the advancement of the education industry with production of websites and applications that contribute to e-Learning. E-Learning is learning through the use of internet and technology. As the trend of mobile applications emerged, e-Learning mobile applications have become quite common now. There are mobile applications that help students with their learning activities. Though e-Learning websites and mobile applications both are equally useful, still there exists differences that set them apart. This research paper compares websites with mobile applications specifically in the context of e-Learning platforms.

A mobile application is a smart phone application that may or may not require an internet connection. It is often downloaded from the internet and installed to run on the mobile device. The possible downloaded marketplaces include Google play store and the Apple application store (Counte, 2012). On the other hand, websites are designed to be browsed from laptops and computers. These websites are easily accessed using the web browsers that are installed on the computing devices. Links and URLs are widely used to access the sites using the web browsers.

2. Literature Review

2.1. E-learning: an overview

E-learning has become the new trend in the education system, people have become busier and technology has fitted in to compensate their busy schedules and comfort zones in education (Lonita and Asan, 2016). With many people resorting to E-learning due to its convenience and flexibility, there is a challenge in demystifying which of the two, mobile applications and websites, is easier to use for learners in the field (Hird, 2011). The usage of smart-phones, tablets, computers and even desktops is all a part of technical and technological advancements in e-learning.

It is thus not easy to say which one is preferable among the two as we have an almost equal range of consumers using mobile applications and websites at different levels. According to Hird (2011), the argument is that mobile applications are better than websites as they have a most have zero rated cost after they are installed. In the end, the two systems are aimed at giving the learner a convenient and efficient learning experience (Kapp et al., 2016). Since consumers are using the two, the solution to the mystification is an integrated approach whereby the advantages and disadvantages of each get outlined.

2.2. E-learning through web and mobile applications

One advantage that has facilitated the use of mobile applications and websites is that people own mobile phones, laptops and desktops to assist them in their studies. Looking into mobile applications that learners or consumers use, we have two types namely; native applications and web applications (Rowles, 2010). Therefore, it would be ideal for the user if the application does not require internet, and that is the advantage that native applications give. However, there are two ways to look at applications in terms of advantages and disadvantages. Some applications are specifically designed for mobile handset; meaning that they can only be run by a certain type of mobile handset that has specific features to support them (Pappas, 2016). Thus, it can be stated that deciding which approach is the best is itself difficult; the reason being that these two channels are not being used mutually exclusively with consumers tending to use both and they have proven a good experience for them. However, depending on personal experience, the advantages and disadvantages of each can be compared to outline which is preferable (Lonita and Asan, 2016).

Consumers find it advantageous that mobile applications are found in multiple sites such as Ovi stores, Apple stores and Google stores, creating some flexibility for their market and the ease to buy or order. Users have also come to find web applications quite advantageous in terms of flexibility as they can work across all devices thus creating a cross-platform compatibility (Hird, 2011). Amidst these advantages for websites, in reference to Pappas (2016), they tend to have some disadvantages in that they do not commonly access all the mobile phone features, such as the camera or geolocation and their deployment in the marketplace has become challenging.

2.3. Web applications vs. mobile applications: performance indicators

Over the past decade, mobile technologies have been growing rapidly and receiving much attention in educational institutions and by other e-learning content providers. The competition created by the introduction and features of various mobile devices has encouraged small businesses tremendously to compete and enter the education market with established firms. However, the point of interest in this competition is often neglected by many people, and they rely instead on the service provided by mobile phones (Rowles, 2010). In the 21st century, the level of education and the available modes of learning have been revolutionised in such a way that learning has now been made easier and cheaper via the use of mobile applications and websites.

In comparison, mobile applications tend to have better functionality due to the existence of the supportive features in the mobile phones. Some of the features include the user's address books, geolocation and even cameras. Secondly, they have proven to be cost effective as most do not need an internet connection. However, Papas (2016) explains that built-in expenses are created for mobile application users since they have to be downloaded and installed in the mobile handsets before use. Reverting to websites, they have low technical barriers to entry as they tend to utilize existing technologies.

Moreover, websites are ideal for e-learning since they tend to be compatible to all devices and platforms making their reach more flexible for users irrespective of the device that they are using. The updates made on websites do not need a third-party approval and it can be made in real time unlike the mobile applications which must undergo a series of approvals. Apparently, the use of the two approaches tends to go hand in hand and users cannot rely on just one of them exclusively. Simonson (2012), is of the view that as more mobile applications get programmed, website applications also get upgraded to ensure compatibility. In the end, e-learning has become much faster, convenient, cost effective and manageable. The preference on which is better could rely on multiple factors such as costs, flexibility, user friendliness and the type of learning content to be covered. Both mobile applications and websites seem to efficiency and ease of accessibility.

However, difference tends to linger in simplicity in use and flexibility in utilization of the two E-learning approaches (Hird, 2011). Technology has been designed to make E-learning not only effective but also flexible. Websites and Mobile applications have been designed to fetch user satisfaction while ensuring that the owner fetches maximum profitability. However, the approach that provides the most cost effective and quality usability by learners is the most preferred (Ionita and Asan, 2016).

2.4. E-learning applications in higher education

Counte (2012) explains that there is a massive gap between the choices learners make in terms of learning content and corporate learning. Traditional courses tend to rely heavily on face-to-face learning, a mode of learning that has historically dominated the education industry, but if given a choice, due to the complex and busy schedules that modern social and economic settings present, learners desire self-paced learning contents that are personalised and relevant via the use of mobile phones or computers. According to reference (Leyden, 2015) the chances of accessing and sharing academic content have been heightened by the digital revolution, and by the availability of smartphones in particular. Many learners nowadays prefer to study at their own convenience as opposed to attending scheduled classes with face to face settings, which now prove to be difficult due to their busy schedules. E-learning has thus come to bridge this gap.

When it comes to convenience, students are likely to prefer an e-learning system that can deliver learning content, as and when, and when they require, which are not conditions that can be provided under traditional classroom learning. As a result, e-learning cuts down the time for both delivering and accessing learning content, which is to the benefit of tutors and students alike. The travel time that would be required from home to class and vice versa is shortened drastically, and learning time is thus maximized through using an e-learning platform (Simonso, 2012). Moreover, learners have the privilege of focusing on exactly what they want to learn while skipping those topics in the program that they feel they are conversant with. This is unlike a classroom setting where all learners have to go through the program together in pace with the rest of the group instead of at their own pace (Pappas, 2016).

Learning has a cost, and each e-learner would naturally prefer the most cost-efficient option for learning. E-learning tends to have lower costs in comparison to classroom learning, as such costs as travel expenses, accommodation fee, course materials and even trainer's fees are mitigated through the system. It also supports andragogy more easily, as mature workers can also enjoy its convenience without any reservations of being in a mixed aged class. Most importantly, e-learning has been known to foster a positive attitude and impact learning positively. The retention of learned content gets potentially stronger, score tests improve, and even the ability to apply learned knowledge in their jobs is enhanced, as they get a chance to practice what they learn (Cantoni et al., 2004).

It can be claimed that the future of e-learning education is influenced by flexibility and affordability of the mobile applications and websites technology. Classroom learning has become a secondary choice for most students as e-learning has brought a whole new experience (Kapp et al., 2016). However, amidst all the flexibility and user experience, it is also ideal to focus on the outcomes of the learning which apparently is linked to the efficiency that either the websites or the mobile applications offer. It is good to identify which of these two current trends in e-learning has the most effective impact in getting the desired results (Simonson, 2012).

Papas (2016), argues that one major future trend of e-learning is the automation of course authoring leading to a significant drop in the cost of online courses and the time used to develop them. The level of responsiveness to design courses and their accessibility will be enhanced and managed better in future. Students have also trended towards the use of cloud-based systems as learning seems to be much better in the cloud providing security and privacy to research works. According to Ionita and Asan, (2016), the storage and gathering of big data will also become much easier through e-learning systems. However, all these trends will depend on the upgrades and reliability made on the mobile applications and websites technology (Simonson, 2012).

Therefore, irrespective of the preferences made by learners on which of the approaches is better in e-learning, either the use of mobile applications or websites, as they have their unique user experience and flexibility, data security, cost effectiveness, simplicity of use and quality of the end-result for students. However, the two have different flaws and strengths that vary based on personal experiences leasing to differing preferences. Hence, this paper investigates user experiences for both web and mobile applications, in order to gain richer insight into the complexity of pre-determined performance indicators acknowledge in the literature. It is anticipated that findings in this paper can support a better utilisation of e-learning applications within the higher education environment.

3. Methodology

This study aims to investigate user preferences when using web and mobile applications for e-learning in higher education. The participants who took part in the research, their age ranged from 21-30 years, and all were international students in higher education. The location where the data was collected at one of the universities located in the USA. The procedure included participants being assigned to either a website or mobile application specifically made for this research. Data was attained using semi-structured interviews, which were conducted after the participants finished using the web/mobile applications. The questions that were asked:

1) According to you, how was your experience of using mobile/web application?
2) Based on the application you used, how clear was the information content?
3) What is your understanding of e-learning applications? Have you used any before, if yes, how was your experience?
4) Based on the mobile/web application you used, how do you think this should be improved?

3.1. Development of the web and mobile application

The website made involved dynamic HTML pages with a responsive design, and the mobile application was used on the Android platform. The content for both the web and the mobile application were prepared within a period of two weeks. The process of recruiting participants involved sending out email invitation to international students, as the content was primarily designed to provide support and information of various facilities on the university campus.

3.2. Information content

The information was obtained from the international office, which included text, images and videos. The content included information on various facilities, guidance maps, important notices on immigration rules and contact information when needed. It is important to indicate that both the HTML pages (web application) and Android platform (mobile application) used in this study have limited the type (textual or visual) of information being presented. Hence other web platforms (e.g. .NET, Python, etc.) and mobile platforms (e.g. iOS) may have better capability in terms of hosting different types of information.

4. Results and findings

As indicated previously, data was gathered using interviews with individuals who participated in the use of web/mobile applications. For the purpose of clarity, the results gathered are tabulated (Table 1), which represents the questions asked and responses received. Four participants were interviewed, as this paper forms a stepping foundation as part of a larger study, which aims to draw richer insights into the future of different applications of e-learning within the higher education.

Table 1: Research Interview

Questions	Participant1 (web)	Participant2 (web)	Participant3 (mobile)	Participant4 (mobile)
What is your background (Nationality, ethnicity, educational, etc.?	A Ph.D. student from China	Undergraduate international student from Africa	A master's student from USA	A Ph.D. student from Saudi Arabia.
According to you, how was your experience of using mobile/web application?	I usually web on a daily basis, as my job involves the active use of internet. The application I used was easy to view content, differentiate between different contents and simple to navigate.	This was my first time of using web application, which I thought was very similar to websites. I found that different type of content was useful, but I faced some difficulty in browsing some of the content. For example, I couldn't allocate where I can do search within the web application.	I normally use mobile for communication purposes, and rarely deploy the use of any applications for other purposes. I found that the mobile application was not very simple or flexible to use. Also, I faced difficulty in setting up the app as well as navigating within it.	I have been using mobile applications for 6 years. At first they were hard to manage but once I got used to it and had some practice, I prefer them.
Based on the application you used, how clear was the information content?	I found that information was very extensive and detailed with the support of visual aids.	I gained so much information that I didn't know about the campus I reside within. I also was able to find interesting events, which are difficult to access from the university's website.	Like I indicated, I couldn't access all of the information provided. For example, many of the photos/videos didn't open when I clicked on them. I also found that most of the information provided were very brief.	The information was very brief and there was not much detail.
What is your understanding of e-learning applications? Have you used any before, if yes, how was your experience?	I am aware of various e-learning applications, but have not utilised the use of any during my previous studies. I found that the web application is simple and looks familiar to use even for someone who is not having any experience.	I never used an e-learning application before this. However, after trying the use of web application, I found that it does not require advanced skills to be able to view and navigate the content.	I have some experience of using e-learning courses where some of my modules require the use of e-learning based applications. I normally get inducted about any mobile application before its used, which acts as a good guideline and makes me aware of its features.	I have experience in using mobile applications, in particularly I use Udemy. It's an application provides online courses about different topics. It has different formats for presenting information and is overall very helpful.
Based on the mobile/web application you used, how do you think this should be improved?	I think that the web application should allow the user to insert/add comments on the content available, as this can support highlighting many issues with the international students within the university.	I would like the flexibility of having multiple languages as many students might face difficulty of understanding content that is only stated in English. I also think that a quick tour before using the web application can make it easier to understand and find the information by many people who might not be familiar with such applications.	I would suggest that the mobile application must highlight the important information, and point out the main contents within the application, so that it gives the user a guideline, which makes it more beneficial.	To improve the mobile application, I would say give the option of downloading the information instead of browsing them.

5. Discussion of Results

5.1. Perspectives on e-learning: a reflection on user experiences

The findings show that different users have perceived the use of mobile and web applications differently. This has mainly been influenced by the background, previous experience of using any mobile and/or web application. For example, participant 2 stated "I faced some difficulty in browsing some of the content. For example, I couldn't allocate where I can do search within the web application". Another participant claimed that "I have been using mobile applications for 6 years. At first, they were hard to manage but once I got used to it and had some practice, I prefer them". From the previous quotations, it can be stated that both 'background' and 'user experience' play an important role in determining the ease or difficulty of using a web or mobile application. Studies on usability have gained interest since the 1980s (Shacekl, 1991), which involve more complex characteristics than 'background' and 'experience'. In fact, Lallemand et al. (2015) highlighted that user experience (UX) is holistic to be confined within certain parameters. In addition, both social and cultural contexts play a major role in impacting UX within a specific context (Roto et al., 2011). It can perhaps be claimed that results from this study align with Lallemand et al., (2015) findings, which point out the need to do further research into both the socio-demographic and educational background dimensions. More importantly, the findings also promote the need to further expand on user centred design (UCD) that incorporate the perspectives of end-users rather than focusing on satisfying requirements of the technology (Law et al., 2014). This vital especially for the mobile technology, which relatively can be considered more recent than web technology.

As part of achieving the primary aim of this paper, knowledge on e-learning applications was explored. The responses gathered will support understanding a richer insight into intangible aspects that affect perspectives on usability. In this respect, the participants were expected to be in one of three categories: those who never heard of e-learning applications, those who know but never used any e-learning application, and those used one or more e-learning application. The findings showed that two participants fit within the first two categories whereas the other two have some experience of using e-learning application prior to the experiment conducted. By referring to some of the responses, it can be stated that those did not have previous skills of e-learning applications have adapted to the use of it. For instance, one of the participants highlighted "I found that the web application is simple and looks familiar to use even for someone who is not having any experience". The other participant pointed out similar opinion, which indicates that the web application can be adaptable as an e-learning application. In fact, this has been indicated in previous studies (Liao and Lu, 2008; May et al., 2005) where it was claimed that prior experience can impact adoption and intention when using an innovation. For example, Liao and Lu (2008) have investigated what influences web-based e-learning. Their study concluded that both user's intention of adoption has a direct impact on how e-learning application is perceived, and indicated that previous experience will have an impact over the information perceived within these applications. However, it is important to indicate that both participants with no experience of using e-learning application did not try the use of mobile application, which could have possibly led towards different output, hence, further investigation is taking place in future studies. Perhaps, age group can have an impact on the use of mobile applications for e-learning. For example, a study conducted by Skiada et al., (2014) showed that e- learning using mobile applications can support children with a disability such as dyslexia, as the pace of their learning ability is quick.

5.2. Information and content representation in e-learning applications

As part of the investigation undertaken in this paper, responses on both the clarity of information and future improvements were gathered from the participants. Perhaps, the primary purpose for this is to emphasize the significance of the capabilities and limitations of both web and mobile applications, and how they can be improved for a better use. Reflecting on the information content using web application, participant 1 stated "I found that information was very extensive and detailed with the support of visual aids". However, on the use of mobile application, participant 3 pointed out that "I couldn't access all of the information provided. For example, many of the photos/videos didn't open when clicked on them". Based on the previous quotations, visuals and capability of the application played an important role in representing the value of information provided web/mobile applications. It was shown that information was more explicit and accessible on a web application when compared to the mobile application. According to EDPS (2016), in a mobile application, it is important to ensure that 'layered notice'

and ‘contextual real-time information’ are featured. This is because they support highlighting essential information and provide the user with symbolic icons/images that raise awareness towards a particular matter. This has been stated by one of the participants as part of the future improvements “I would suggest that the mobile application must highlight the important information, and point out the main contents within the application”. Indeed, the information itself as a ‘context’ has its influence over the level of interaction by the user when used in a particular application. This has been acknowledged by Hakkila and Mantyjarvi (2006) who highlighted the importance of ‘context-awareness’ within an application. This is because it indicates whether an ‘information’ is a push/pull type. In this paper, the information provided to the users in web/mobile applications can be categorised as push, because the content was pre-determined, and not based on what the user may/may not use in the future. This has been picked up as part of the future improvements when participants were asked to provide a suggestion for the future. For example, participant 1 stated “I think that the web application should allow the user to insert/add comments on the content available”. Another participant added “I would like the flexibility of having multiple languages as many students might face difficulty of understanding content that is only stated in English”. Thus, it can be concluded that visual connectivity, information content and awareness as well as communication are important factors that influence the value of information, but capability of the application is a major key player, which requires further investigation in future studies.

6. Conclusion and future work

To sum up, this paper has provided a wide insight into the complexities associated with e-learning within web and mobile applications. The literature showed that both the web and the mobile applications are useful and have been utilised for various purposes. The use of e-learning in higher education is increasing as the current era is being dominated by the digitisation, which unleashed many potentials and opportunities to provide better learning experience. The findings from primary evidence, on the one hand, showed that mobile application for e-learning is useful, but it seems more restricted and lacks the flexibility of use. On the other hand, websites always serve the same purpose as mobile applications but with more flexibility and accessibility. The discussion showed that user experience and information representation are major key players that influence various performance indicators within the web/mobile applications such as flexibility, functionality, simplicity, and capability. Although it might be argued that the level of subjectivity might be high in such hard-engineered environments (web/mobile applications), their future development drawing a holist insight, hence interviews were used rather than questionnaire surveys. A future study investigates a wider audience, in order to establish a more solidified positioning of both web and mobile applications for e-learning within the higher education.

REFERENCES

Cantoni, V., Cellario, M. and Porta, M. (2004). Perspectives and challenges in e-learning: towards natural interaction paradigms. *Journal of Visual Languages & Computing,* 15(5), pp.333-345.

Counte, S. (2012) Going mobile developing applications for your library using basic HTML programming. Chicago: American Library Association.

EUROPEAN DATA PROTECTION SUPERVISOR. (2016). *Guidelines on the protection of personal data processed by mobile applications provided by European Union institutions*. Retrieved from https://edps.europa.eu/sites/edp/files/publication/16-11-07_guidelines_mobile_apps_en.pdf

Häkkilä, J. and Mäntyjärvi, J. (2006), October. Developing design guidelines for context-aware mobile applications. In *Proceedings of the 3rd international conference on Mobile technology, applications & systems* (p. 24). ACM.

Hird, J. (2011). The fight gets technical: mobile apps vs. mobile sites | Econsultancy. Retrieved from https://econsultancy.com/blog/7832-the-fight-gets-technical-mobile-apps-vs-mobile-sites/

Ionita, M. and Asan, D. (2016), April. LEARNING FOREIGN LANGUAGES BY USING MOBILE APPS WITHIN INTEGRATED EDUCATIONAL PLATFORMS. In *the International Scientific Conference eLearning and Software for Education* (Vol. 2, p. 115). " Carol I" National Defence University.

Kapp, K.M., Latham, W.F. and Ford-Latham, H. (2016). *Integrated learning for ERP success: A learning requirements planning approach*. CRC press.

La Counte, S. (2012). *Going mobile: developing apps for your library using basic HTML programming*. American Library Association.

Lallemand, C., Gronier, G. and Koenig, V. (2015). User experience: A concept without consensus? Exploring practitioners' perspectives through an international survey. Computers in Human Behavior, 43, pp.35-48.

Law, E., van Schaik, P., & Roto, V. (2014). Attitudes towards user experience (UX) measurement. International Journal of Human–Computer Studies, 72(6), 526–541. http://dx.doi.org/10.1016/j.ijhcs.2013.09.006i

Leyden, A. (2015). Why Mobile Learning Apps Are the Future of Education, ExamTime. Retrieved March 2017from https://www.goconqr.com/en/examtime/blog/mobile-learning-apps-future-of-education/

Liao, H.L. and Lu, H.P., 2008. The role of experience and innovation characteristics in the adoption and continued use of e-learning websites. *Computers & Education*, 51(4), pp.1405-1416.

May So, W. C., Danny Wong, T. N., & Sculli, D. (2005). Factors affecting intentions to purchase via the internet. Industrial Management & Data Systems, 105(9), 1225–1234.

Pappas, C. (2016). Top 6 eLearning Trends For 2016 - eLearning Industry. Retrieved from https://elearningindustry.com/6-top-elearning-trends-2016

Roto, V., Law, E., Vermeeren, A., & Hoonhout, J. (2011). User experience white paper: Bringing clarity to the concept of user experience. Result from Dagstuhl Seminar on Demarcating User Experience, Finland. <http://www.allaboutux. org/uxwhitepaper>.

Rowles, D. (2013). *Mobile marketing: how mobile technology is revolutionizing marketing, communications and advertising*. Kogan Page Publishers.

Shackel, B. (1991). Usability—Context, framework, definition, design and evaluation. In B. Shackel & S. Richardson (Eds.), Human factors for informatics usability (pp. 21–38). Cambridge: Cambridge University Press.

Simonson, M.R. (2012). Teaching and Learning at a Distance: Distance Education Foundations, 5th.

Skiada, R., Soroniati, E., Gardeli, A. and Zissis, D. (2014). EasyLexia: A mobile application for children with learning difficulties. *Procedia Computer Science, 27, pp.218-228.*