

Awareness, Usage and Usability Experience of E-Learning Tools among Saudi University Students

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Abstract: An investigation was conducted on the usage of e-learning tools among a sample of 350 Saudi university students, and their experience of usability. Data was collected from a nationwide survey using an instrument containing a self-constructed 12-item checklist. The results suggest a lack of awareness of e-learning tools persists, issues with usage, and common deficiencies in usability experiences. This may explain why some tools are under-utilised, and why learning management systems are inadequately exploited as technological aids in education. The study lends support to the need for improving software usability generally, and in the case of e-learning tools in particular if their usage is to be promoted.

Keywords: usability, software usage, e-learning software

INTRODUCTION

An investigation was conducted to ascertain the extent of awareness and usage of e-learning tools among university students in Saudi Arabia, and to get an indication of the usability experiences of these tools. Many of these e-learning tools are integrated in a single software package called a Learning Management System (LMS) which students in higher education institutions usually have access to. Since these tools play an important role in supporting students' learning, it is essential that they be aware of them and are able to make satisfactory and effective use of them. When an e-learning tool is easy to use and students perceive it to be useful, this bears a positive influence on students' intention to use the system effectively (Moreno et al., 2016).

For the purpose of this study, e-learning may be understood as defined by Sangra et al. (2012: 152): "E-learning is an approach to teaching and learning, representing all or part of the educational model applied, that is based on the use of electronic media and devices as tools for improving access to training, communication and interaction and that facilitates the adoption of new ways of understanding and developing learning". An 'e-learning tool' is as described in this definition, but is understood as referring particularly to a computer-based tool, which relies on the use of a computer to aid learning.

There are many kinds of e-learning tools. These may be classified, as done in this study, under hardware, content creation, delivery/distribution, user, and communication and collaboration tools. Moreover, e-learning tools may be used either standalone, in combination with others, or be made available as part of a more integrated arrangement within a Learning Management System (LMS). A computer and LMS may themselves be considered as e-learning tools, but other

common e-learning tools include presentation, messaging, discussion forum, and wiki tools. Twelve specific e-learning tools were selected, as listed further on in

In spite of the growing importance and promotion of e-learning tools in the Saudi higher education sector, their usage is impeded due to various issues with usability (Ssekakubo, 2011). If these usability problems are left unidentified and not addressed, they tend to lead to disappointment and frustration among learners, who then have a low perception of those e-learning tools (Ludivine et al., 2009; Althobaiti & Mayhew, 2016). Moreover, deficiencies in usability, and poor design, are often major factors behind the high rates of abandonment of e-learning programs (Bernerus & Zhang, 2010).

In Saudi Arabia, the Ministry of Higher Education has made available its own LMS named Jusur although other widely recognised LMS's, such as Blackboard and Moodle, are also used in Saudi universities. It is against this background situation in Saudi Arabia that this study was undertaken to gauge the extent of the problem so that measures may be taken to improve software usability, and thereby enhance the potential for e-learning tools to be utilised more and made more effective.

The research instrument used in this study was designed to firstly determine the extent of awareness and usage of e-learning tools, and secondly to identify the type and nature of any issues from a software usability perspective. The following two research questions guided the conduct of this research:

- What is the extent of awareness and usage of specific e-learning tools made available to university students in Saudi Arabia?

•What kind of usability issues are experienced by Saudi university students whilst using these e-learning tools?

Usability is understood in this study in terms of five aspects of learnability, reliability, efficiency, engagement and satisfaction. Learnability may be considered as a mainly conceptual aspect, reliability and efficiency as technical, and engagement and satisfaction as interactive/aesthetic aspects of software usability.

LITERATURE REVIEW

Usability Aspects

Usability is an important concept in software engineering for ensuring the software that is developed is highly usable by en-users as possible. This is usually understood in terms of more specific aspects, which to reiterate, in the case of this study are selected to be learnability, reliability, efficiency, engagement and satisfaction. Most of these selected usability aspects are encapsulated in Nielsen's (1994) identification of usability aspects of software being easy to learn (learnability), efficient to use (efficiency), easy to remember (rememberability), having few errors (reliability), and for the software to be subjectively pleasing (satisfaction and engagement). Gonzalez (2010) emphasised the aspect of engagement in particular, as distinct from general satisfaction, which may be described alternatively as a motivating factor, as in other identifications of usability aspects.

According to Manza (2010), learnability is both a conceptual and functional usability aspect. It describes the capability to learn how to use software for accomplishing tasks for which the software is designed. It is recognised as an important usability aspect, for instance, by Dubey et al. (2012) and Constantine (2011). Features such as logical flow, good navigation, clear instructions, use of metaphors, etc. help to make software easy to learn to use.

Reliability and efficiency both describe technical performance. They are viewed as important usability aspects due to their potential impact on user perception while using software (Constantine, 2011). Dubey et al. (2012) described reliability and efficiency together as “The degree to which the software facilitates the user in accomplishing the task for which it is intended with precision and completeness while avoiding most errors in varying contexts of use”. For the purpose of this study, this is taken to be descriptive of reliability. That is, software would be considered as reliable if it is capable of enabling users to accomplish the tasks expected from it, and experiences such as being productive and not encountering errors give the impression of reliability.

Efficiency is more widely recognised as a usability aspect on its own, for instance, by Constantine (2011), and Bachman (2004) among others, and is included in ISO/DIS 9241-11. The latter defines usability as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”. In short, this quality is indicated by

being able to accomplish tasks quickly, established standards, and consistency in design and workflow, make the software seem efficient.

Satisfaction is also recognised as a usability aspect in the same ISO/DIS 9241-11. Dubey et al. (2012) defined it as “The degree to which the software is likeable, comfortable, attractive and trustworthy for the users”, and it is noticeable as its absence causes dissatisfaction (Rubin & Chisnell, 2008). Although engagement is perceived as a relatively weaker usability aspect and is often used synonymously with satisfaction (Alotaibi, 2017), it may be argued that it is important for the learning context in its own right, and especially for e-learning software due to the distance between users.

Allen (2003) considers engagement as a fundamental requirement of an e-learning system, and Roffe (2002) emphasised the need specifically for ‘interactive engagement’ as an essential quality in order for e-learning software to be supportive of user needs. Al-Muaythir et al. (2014) investigated engagement capabilities as an indicator of the usability of e-learning systems. Since it is easier to engage interactively in face-to-face arrangements, the idea was to identify a minimum set of functionalities for e-learning systems for acceptable interactive engagement. The study evaluated 7 different LMS's, and found Moodle and Dokeos to offer the “best coverage of all possible interactive engagement-supporting capabilities available”. Engagement is characterised by such attributes as a positive affect, and aesthetic and sensory appeal; the software being challenging, enduring and interactive, and its ability to sustain attention, and provide feedback and perceived user control (O'Brien & Toms, 2008). Interactive engagement focuses specially on the interactive attribute.

For satisfaction in general, other important factors could be important to consider. For example, Alelaiwi & Hossain (2015) found evidence to distinguish between knowledgeable and non-knowledgeable users. A usability evaluation questionnaire was used to gather data relating to usage from end users. Those classed as having background knowledge of Human-Computer Interaction (HCI) were less satisfied than those classed as being without HCI knowledge. The researchers explained this by stating that end-users with HCI knowledge had greater expectations of the e-learning tool, which suggests they take greater notice of any deficiencies they come across. The factor of background knowledge pertains to awareness of the tools and knowledge of their potential, and a higher capacity for holding expectations. Another important and related dimension that complements knowledge is the actual usability experiences of users of e-learning tools, which is examined next.

Usability Experiences

Some usability studies have been conducted previously on non-educational software used in Saudi Arabia, such as Alturki & Gay (2017) on a fitness app, and websites used by Saudis (Miraz et al., 2014). However, in the education sector,

only limited attention has been given on usability, as in studies by Al-Said (2015) and Alali (2015) on mobile device based learning, and use of educational resources in electronic form by medical students (Ahmed & Al-Reyae, 2017). Studies on the usability experiences of university students in Saudi Arabia whilst using e-learning tools and LMS’s are scarce. The notable few include a study on usability of LMS’s by Althobaiti & Mayhew (2016) and Alturki et al. (2016).

Alturki et al. (2016) evaluated the usability and accessibility of the Blackboard LMS at King Saud university. Evaluation was made of the user interface, navigation/layout, functionality, interactivity, and ease-of-use, and the 400 participating male and female faculty members were asked to rate their experience with tasks, such as checking announcements, accessing course materials, information sharing, asking questions, doing assignments, taking real-time exams, etc. A 5-point Likert scale was used for participants to indicate their ratings.

Although the e-learning software served its purpose of delivering content and 73% of respondents were generally satisfied and 56% rated it positively in terms of design, ease of use, functionality and interactivity, the findings also revealed widespread dissatisfaction with its usability and accessibility. In particular, the interactive features were perceived to lack user-friendliness. Additionally, not all features were found to be useful, and navigational difficulties were experienced. With respect to usability, learnability was low because the software was viewed as being too complex, and the usability problems, experienced especially with the assessment and quiz components, resulted in coping difficulties, unnecessary time extra time required and workload due to design issues, and technical issues. The latter included connectivity and security issues, loss of emails, and system crashes, which may be considered as serious usability issues. The researchers recommended greater customisation of the tool according to the needs of the teachers, and to improve the overall usability and accessibility.

The usability of Saudi Arabia’s own Jusur LMS has also been insufficiently researched. An early usability study was conducted by Al-Khalifa (2010) on a small survey sample of 155 students, and a more recent one by Althobaiti & Mayhew (2016). The latter study involved a larger survey sample of 479 students, but faculty staff were not included as another important category of users, and the survey was not complemented by a qualitative method for more detailed insight.

Among the major problems experienced were difficulties logging in, slowness, and interruptions in connection, which are serious technical problems. In this respect, the findings of Althobaiti & Mayhew (2016) agree with the previously mentioned study of Alturki et al. (2016), which also identified technical problems plaguing e-learning tools among Saudi students. In addition, 15% of the students

traced some usability issues to instructors lacking adequate technical training.

METHODOLOGY

The methodology applied in this study was guided by a descriptive survey research design, and the sample was taken to represent the entire population of e-learning students in higher education institutions in Saudi Arabia. An online survey was administered to 350 university students throughout the Kingdom asking them to rate their usability experience on a range of e-learning tools. The self-constructed 12-item checklist had a Cronbach Alpha of 0.74 indicating an acceptable internal consistency.

Twelve e-learning tools (listed in) were selected to determine the extent of awareness and usage of them. Those tools were selected which e-learning students are likely to use frequently with a focus on those used for communication and collaboration to support learning. Six of them (1-6) relate to the hardware, system, content, and delivery, and six of them support communication and collaboration. The intent behind this variation is to provide a comprehensive set of e-learning tools.

• **Selected E-Learning Tools**

Tool	Description	Type
1	Computer based device	Hardware
2	Learning Management System (LMS)	System
3	E-book	Content
4	Online assessment	Content
5	Presentation	Delivery
6	Podcasting	Delivery
7	Email	Communication
8	Instant messaging	Communication
9	Web/Teleconferencing	Communication
10	Discussion forum	Communication
11	Interactive online whiteboard	Collaboration
12	Wiki	Collaboration

The extent of awareness and usage was determined by employing a four-point Likert scale, which is presented in The scale for awareness ranges from “Don’t know anything about it” (1 rating) to “Yes, I know it well” (4 rating), and the scale for usage ranges from “Never used it” (1 rating) to “I use it frequently” (4 rating). A low rating thus indicates a low extent of awareness or usage, and a high rating indicates a high extent of the same.

• **Likert Scale Devised**

Scale	Awareness	Usage
1	Don’t know anything about it.	Never used it.
2	Not sure if I know.	I rarely use it.
3	I know a little about it.	I use it sometimes.
4	Yes, I know it well.	I use it frequently.

“Awareness, Usage and Usability Experience of E-Learning Tools among Saudi University Students”

In order to get an indication of the quality of usability experience, the participants were asked to rate each tool in terms of the following five selected usability aspects:

- Ease of using the tool (L: learnability)
- Reliability to work as expected (R: reliability)
- Effectiveness in being applied (Ef: efficiency)
- User-engagement (En: engagement)
- General satisfaction in usage (S: satisfaction)

A similar sized 4-point scale was adopted, as follows: 1- poor, 2-moderate, 3-high, and 4-excellent. The mean value of all the responses was calculated for each type of usability, and then a sum of the five mean values for each item. A low total mean value indicates an overall low usability, and a high value indicates a high degree of usability.

RESULTS AND ANALYSIS

Awareness and Usage

Presents the results for the first part of the study showing the mean values for awareness and usage for each of the selected e-learning tools.

• Descriptive statistics

Tool	Statement	Mean (1-4)	
		Awareness	Usage
1	Computer based device	4.00	3.47
2	Learning Management System (LMS)	2.87	3.11
3	E-book	1.59	2.94
4	Online assessment	3.72	3.24
5	Presentation	3.51	3.33
6	Podcasting	2.93	3.27
7	Email	3.96	3.45
8	Instant messaging	3.87	3.85
9	Web/Teleconferencing	3.21	2.72
10	Discussion forum	3.40	3.23
11	Interactive online whiteboard	2.77	2.52
12	Wiki	2.83	2.79

Awareness is greatest for computer based devices (4.0), as would be expected, followed by email (3.96), instant messaging (3.87), and online assessment (3.72). It is lowest for e-books (1.59), followed by interactive online whiteboard (2.77), wikis (2.83), and LMS's (2.87). Rating for usage is highest for instant messaging (3.85), followed by computer based devices (3.47), and email (3.45). It is lowest for interactive online whiteboard (2.52), followed by web-conferencing (2.72).

Usability Experience

X below presents the mean values for the five usability aspects for each selected e-learning tool. These values were then summed for each tool to obtain an overall usability rating ranging between 5 and 20.

• Mean Values of the Usability Ratings

Tool	Mean Value (Range: 1-4 for each, 5-20 for overall)					
	L	En	R	Ef	S	Overall
1	3.24	3.73	2.84	3.16	3.41	16.38
2	2.94	3.28	3.06	3.14	3.20	15.62
3	3.61	2.92	3.44	3.60	3.44	17.01
4	2.77	2.18	2.52	2.63	2.35	12.45
5	2.58	3.04	2.98	2.75	3.12	14.47
6	3.24	3.32	3.51	3.72	3.74	17.53
7	3.38	2.91	3.53	3.60	3.71	17.13
8	3.73	3.50	3.86	3.72	3.70	18.51
9	2.67	3.75	2.87	2.81	3.23	15.33
10	3.09	3.44	3.75	3.55	3.29	17.12
11	2.88	3.68	2.72	2.91	3.65	15.84
12	3.16	2.95	3.20	3.64	3.72	16.67

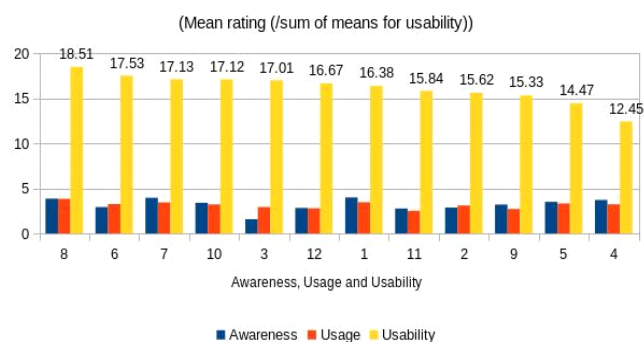
Summary

Presents a summary of the three sets of ratings (awareness, usage and usability) in order of the degree of usability from greatest to least (column 3). The usability ratings range from the greatest, 18.51 for the instant messaging tool, to the least, which is 12.45 for the online assessment tool. The average of these values is 16.17, which may suggest an overall high usability rating of e-learning tools. This ordering is illustrated as a chart in:

• Summary of Ratings

Tool (Number/Description)	Usability Rating (5-20)	Mean (1-4)	
		Awareness	Usage
8 Instant messaging	18.51	3.87	3.85
6 Podcasting	17.53	2.93	3.27
7 Email	17.13	3.96	3.45
10 Discussion forum	17.12	3.40	3.23
3 E-book	17.01	1.59	2.94
12 Wiki	16.67	2.83	2.79
1 Computer based device	16.38	4.00	3.47
11 Interactive online whiteboard	15.84	2.77	2.52
2 LMS	15.62	2.87	3.11
9 Web/Teleconferencing	15.33	3.21	2.72
5 Presentation	14.47	3.51	3.33
4 Online assessment	12.45	3.72	3.24

Ordered List of E-Learning Tools with Respect to Usability



• Ordered list of e-learning tools with respect to usability

DISCUSSION

As expected, the participants were well aware and were frequent users of computer based devices, email and instant messaging the most. However, LMS's, wikis, interactive whiteboards, and especially e-books are less well known, which suggests a need to promote greater awareness of them. In terms of usage, this also includes web-conferencing, which students may need greater practice with.

The overall usability ratings revealed a high average of 16.17 for e-learning tools within the range extending between 5 and 20. This may indicate a generally high degree of usability of e-learning tools as experienced by Saudi university students. However, the low ratings for the last five items in the ordered list (Table V), which are below this average, could indicate issues with their usability. These items in order are interactive online whiteboard, LMS, web/teleconferencing, presentation, and online assessment, of which the latter had the lowest usability rating.

The challenge identified with taking online assessment corroborates the finding in the study of Alturki et al. (2016) where the usability deficiencies led to unnecessary extra workload and wastage of time. From , it is evident that the low overall rating for online assessment is largely due to usability weaknesses in terms of its ability to engage, low reliability, and low satisfaction. All three of these individual ratings are the lowest of their types compared to all other e-learning tools examined. This again confirms the study of Alturki et al., as well as that of Althobaiti & Mayhew (2016), in which this usability weakness is attributed to technical problems. In a study on critical success factors for e-learning, it was noted that lack of usability can arise if there is a lack of suitable technologies (Alhabeeb, 2016). The study thus supports for this aspect to be given serious attention in order to improve software usability.

CONCLUSION AND RECOMMENDATIONS

In this investigation on awareness, usage and usability experiences of students studying in higher education institutions in Saudi Arabia, twelve e-learning tools were selected for which 350 students were asked to give ratings in a nationwide survey. The first part of the results led to ascertaining the extent of awareness and usage of the selected e-learning tools, which addressed the first research question, and the second part led to identifying usability issues experienced by Saudi university students, which addressed the second research question. Important actionable findings include the need for promoting awareness of e-learning tools such as wikis, interactive whiteboards and e-books, and providing more experience also with web conferencing. For improving the likelihood of satisfactory usability experiences, tool such as LMS's, web conferencing, presentation, and especially online assessment must be given software design reconsiderations with an emphasis on improving their reliability and ability to engage users.

As a limitation, this study relied on subjective ratings by students. In spite of the large sample size and diverse

geographical coverage, detailed insight into the nature of the deficiencies in usability experiences would need to be gained from interviews and observations. Furthermore, this study was focused on the software usability of e-learning tools, not on their did active effectiveness, which may arguably be more important, irrespective of technical effectiveness. Nonetheless, usability of the software may be seen as a necessary foundation for supporting effectiveness for educational purposes. Further research is being conducted on evaluating the didactic potential of e-learning tools from a pedagogical perspective in which conceptual, technical, and interactive or aesthetic aspects of usability from the perspective of a software engineer are treated as important but not exclusively. This reflects the need for integrating usability and learning. 'Learnability heuristics' for evaluating the usability of e-learning applications have been developed, for instance, by Karoulis & Pombortsis (2003), Vrasidas (2004), and Ssemugabi (2006). However, the learning context, culture and learning approach would also need to be taken into account, and an actual evaluation made of e-learning tools available in Saudi Arabia including as assessment of their pedagogical effectiveness.

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