

Mobile Discussion Boards: An Analysis on Mobile Collaboration

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Abstract—Mobile technology offers learning institutes the opportunity to extend e-learning opportunities and enable students the opportunity to have more control over their learning. Mobile technology truly enables learning to take place where and when the learner wants to learn. Discussion boards are typically used in teaching to enable students to collaborate and interact outside class time. These discussion boards seem particularly well suited to mobile enhancements given that their effectiveness depends heavily on active participation and timely posting/response cycles. This research assessed the effectiveness of discussion forums and how well these forums performed when viewed on four different mobile devices. The research focuses on how the device influences the interaction with the discussion board. The results of this analysis will help determine how different devices support users interacting with a discussion board.

Index Terms—Mobile Technology, Web Based Discussion Boards, Asynchronous discussion, Mobile Devices, Collaboration.

I. INTRODUCTION

The computing power of mobile devices has increased significantly in recent years. Mobile browsers have taken advantage of this capability to offer better rendering of Web content designed for personal computers. Mobile applications have better control of their environment and are able to compensate for the disadvantages of the mobile devices such as intermittent connections, bandwidth limitations, the limitations of storage and input capabilities to provide richer learner experiences. Mobile devices are increasingly looked at for enabling institutes to provide learning content to their students. Mobile-learning is emerging as a pedagogical revolution which will provide students with autonomy and mobility in their learning. The aim of this technology is to utilise the portability which mobile devices offer, combining it with rich interaction that enables students to learn at a level previously unattainable.

Tools used in learning that offer collaboration between students are of great interest to educators, as their effectiveness tends to be interaction-dependent and thus sensitive to limits of face-to-face accessibility among educators and students. Discussion boards can be utilised as a tool for asynchronous group collaboration among geographically dispersed participants as they offer many benefits to users. The main benefit that discussion boards offer is that they facilitate the construction of low-level learning up to and including high-level evaluative skills [1]. Discussion boards, characterised by long response lags, allow students to develop more articulate and critical

dialogues [2]. Conversely, these long response lags may also adversely affect the level of interactivity of the participants. Long delays between messages limit creativity and motivation of students to continue interacting. The speed and level of interaction within a collaborative group are therefore associated and often reliant on the technology used to facilitate the collaboration [3].

Online threaded discussions seem particularly well suited to mobile enhancements given that their effectiveness depends heavily on active participation and timely posting/response cycles [4]. Mobile technology provides a vehicle for involving threaded discussions that better emulate face-to-face discussions by enabling interaction, in device-scaled form, between the participants in real time wherever they are located [4]. Thus, discussions are not confined to the desktop, allowing dynamic and immediate communication that can take place anywhere, taking the paradigm from 'pull', beyond 'push', to a 'reach' orientation [5].

Mobile technology is continuously advancing and now an increased amount of mobile devices can support HTML websites. These devices support the interaction with the website all with varying success. The success of how well the device performs depends on various factors including the design and the hardware and software available on the device. Therefore it is crucial to determine how well different devices support the interaction with the discussion board so designers of discussion boards can determine how best to accommodate a wide variety of devices. The outcome of this work will help form the groundwork needed to help build an adaptive discussion board that will be viewable on a desktop computer and be supported on a wide variety of mobile devices.

II. STUDY BACKGROUND AND MOTIVATION

Discussion boards centre on the concept of allowing students to collaborate. The main focus behind the collaboration is that it builds students' learning. Students are busy and usually have a high study load as well as many other commitments, so for students to use a discussion board they first need to see it as a beneficial tool for the completion of their studies. It should also be easy to use and not take a significant amount of students' valuable time. Enabling students to interact with a mobile device allows them to communicate anytime and anywhere regardless of their schedule and where they happen to be located; students are no longer tied to the desktop computer but are able to get valuable, timely

information and interact with others when and where they need it.

Enabling students to interact with mobile devices allows them to access messages as they are posted; the messages do not get old and students are able to keep up-to-date with the current discussion. This, therefore, helps in maintaining momentum in the discussion [3]. Facilitating students with the ability to check messages easily and more frequently, a mobile device eliminates the accumulation of unread messages. Students no longer need to wade through large volumes of unread messages that are not valuable because they are not relevant any more.

Giving students the facility, which enables them to interact more conveniently, should increase participation. Increased participation should then directly influence the level of learning on the discussion board [6, 7, 8]. Since students will be able to access posts as they are posted, this should in turn decrease the time that they take to respond and increase interaction. Having said that, the discussion board will still offer an opportunity for students to take time preparing a well thought out response that traditional discussion boards offer [4].

Interaction between students can be instantaneous. Students can choose to interact immediately if they are available and willing to engage. If the timing is right, a critical mass can spark a lively synchronous debate [5]. Therefore mobile devices offer the advantages of allowing communication that can be both asynchronous and synchronous.

According to Chen et al. [9], enabling the discussion to have the flexibility to take place synchronously in addition to asynchronously offers students the benefits of immediate feedback and increased motivation. Immediate feedback allows students to strengthen their learning by being able to immediately correct wrong or ill thought out assumptions, which are needed in group decision-making, brainstorming, and analysis. In addition synchronous discussion motivates students to participate, as there is a compulsion to be present and participate, which in turn increases students' involvement in learning and activities, hence resulting in better learning experiences.

The responsiveness of participants in the discussion will impact on the overall success of the discussion board. Low response will lead to a decline in use as users develop a "responsive image" [10]. This means that

students develop an impression of the overall responsiveness of the discussion and mirror the level. A minimal level of activity eventually leads to minimal levels of postings. Students who post regularly may be discouraged by the slow rate of participation and may be less inclined to check posts regularly; then, even if a reply is posted quickly it may not be checked till later, further impacting the level of interaction. Interaction on mobile devices should eliminate this as students are notified of new posts to questions and they are able to access new posts immediately with the option of also replying immediately [3].

The use of mobile technology can also be used to help generate critical thinking. Intelligent agents can be used to prompt users to stimulate and enhance the discussion [3]. The higher activity of students, along with wider participation and decreased time between posts, should better allow for a more enhanced learning experience.

To achieve the above benefits it must be understood how different devices impact on the usability of the discussion board. Each device will support the user differently and an understanding is needed to customise the discussion board to support a wide range of users.

III. STUDY

The study focused on the assessment of four students, evaluating how well a Moodle discussion board performs when viewed by a four different mobile devices. The evaluation will be based around three scenarios of use and will guide the users in their interaction. Once the participant have completed the three scenarios they were asked to rate the devices based on how well they performed on each activity. In addition to rating the different devices the participants were interviewed to gain a deeper understanding what the participants thought of each device.

Table 1. sets out the specification of the different devices used in this study. Each devices have different capabilities, platforms and functionality. The diverse range of the devices selected, enables the researchers to gauge how well a number of different devices support the discussion. It is unreasonable to test all devices on the market but the devices used were aimed to represent a wide range of different devices currently available in the market.

The discussion board selected for this study was a

TABLE I
DEVICE SPECIFICATIONS

Device	Resolution and screen size	Operating System	Data entry	Browser	Wireless capabilities
Palm Tungsten T	320 x 380 resolution 2.5" display	Palm OS 5.0.	Touch-sensitive Graffiti writing area Soft on screen keyboard	Blazer	Bluetooth
HP iPaq hx4700	640 x 480 resolution 4" display	Windows Mobile 2003	Soft on screen keyboard, track pad	Pocket Internet Explorer	Wi-Fi, Bluetooth
I-mate PDA2k	240x320 resolution 3.5" display	Windows Mobile 2003	Full slide-out QWERTY keyboard	Mobile Opera	Wi-Fi, Bluetooth, GRPS
Sony Ericsson V630i	176x220 resolution 1.9" display	Sony Ericsson	Multi tap keyboard	Opera Mini	GPRS, Bluetooth

course management system (CMS) called Moodle. The discussion board is integrated within a Learning Management System (LMS) based on Open Source software. The motivation for selecting Moodle was that because it was Open Source it could be customised at a later date to better meet the need of mobile users. In addition to this discussion boards are often used in addition to LMS so therefore tend to be used to support each other. Currently Moodle has received a considerable amount of attention in regards to customising the design to allow mobile users to interact with the LMS. Most of this research has been conducted in Japan but at this stage no full module has been developed. This study will also contribute to the wide research done on Moodle to support mobile users.

IV. RESULTS AND DISCUSSION

Four scenarios have been developed which were used to guide the evaluation of the devices. Ratings were given to the devices based on how easy and how well they performed typical tasks associated with using a discussion board. Table 2. sets out the rating scale while Table 3. shows the average score given to each activity for each device.

A. Palm Tungsten T

The Palm performed as one of the worse out of all the devices tested in this study. One of the main reasons for this poor result could be possibly attributed to the fact that the Palm was the oldest device tested. The Palm was introduced in November 2002 and since then considerable advances have been made in mobile technology. The reason for selecting a relatively older device to test was that the researchers wanted to identify how well users with older devices will be supported.

The following goes into more detail about the rating given to the Palm. The first activity tested by the participants was connecting to the Internet. The device only offered Bluetooth wireless capabilities, thus limiting the methods of connecting the device. The participants were limited to connecting to the Internet either by sharing a connection with a Bluetooth capable phone or computer, or connecting directly to a Bluetooth capable modem. The participants found that connecting to the Internet, using either of these two methods, were cumbersome and affected the overall mobility of the device, as participants

TABLE II
DEVICE EVALUATION RATING SCALE

Scale	Description
0 = Not applicable	The device does not permit this task.
1 = Poor	The device permitted this task, but with errors or with difficulty.
2 = Sufficient	The device permitted this task without errors, but with some limitations.
3 = Very good	I was able to perform this task exactly as I had intended.
4 = Excellent	I was able to perform this task better than I had intended. The device exceeded my expectations.

needed an additional device to connect to the Internet.

Once the participants were connected to the Internet they found using the device fairly difficult. This was largely due to the input and output capabilities of this device. The Palm has considerably low resolution and offers a limited amount of colour which some of our more mature participants found hard to read. The discussion board did not display well on the device, the text was compacted together making it hard to determine where postings started or finished. Also many characters on the discussion board were not displayed correctly therefore a significant amount of "garbage text" was displayed. The input mechanisms offered by the device were also limited and difficult to use. The soft graffiti functionality offered by the Palm was hard to learn, considerable time was needed to learn how to input text and many errors were made. Those that did finally master this mechanism did find that they preferred it to the soft keyboard also offered on this device. The main complaint with the soft keyboard was that when entering text the soft keyboard and text entry area filled the screen co context of where the text was being entered into was lost.

The success of viewing downloads largely depended on the software being purchased first. In this study we installed Documents To Go (<http://www.dataviz.com>) which allowed the participants to view, edit and create Microsoft Word, Excel and PowerPoint files, view Adobe PDF files as well as unzip files. For users to view other types of attachments they will need to install other software, which can be frustrating.

B. Sony Ericsson V630i

The Sony Ericsson phone performed second equal to the Palm. The main drawback was that this device was primarily a mobile phone thus lacking many of the featured offered on a PDA or a Smartphone. The features included the limited connection methods, limited input, small screen size and software available on the device.

The device was limited to connecting to the Internet through the GPRS network, which is one of the more costly methods of connection. Overall the device rated well in terms of viewing the discussion board and posting a message. Some participants found that the discussion board was viewable but found that it was hard to navigate

TABLE III
AVERAGE RATING RECEIVED FOR EACH DEVICE

Tasks	Palm Tungsten T	Sony Ericsson V630i	HP iPaq hx4700	I-mate PDA2k
a. Connect to Internet to view DB	2	2	3	4
b. Reading discussion postings	2	3	4	3
b. Using input device to post a response to a discussion posting	2	3	3	3
c. Download an attachment from the discussion posting	2*	1	3*	3*
e. Print discussion	3*	1	3*	3*
Average mark	10	10	16	16

* Extra software was needed to support this activity

on the much smaller screen and found reading long posts difficult. Inputting messages into the discussion board was relatively easy for users used to writing SMS messages. It was highlighted by one participant that she found it faster than the other methods used by the other devices but found that there was a tendency to abbreviate words rather than using more formal languages usually found on an academic discussion board. One issue brought up in this study was the way that the browser on the mobile device supported entering passwords. Passwords are protected, when typing into the device, by replacing letters with asterisk characters this therefore makes it difficult when entering letters with the multi tap keyboard, as it is hard to gauge which letter was being entered.

Since the device did not support additional software such as Microsoft Word attachments were unable to be viewed nor was it able to print. To be able to print or view attachments they device needed to be connected to a PC so the attachment could be viewed or printed from the PC.

C. HP iPaq hx4700

The iPaq device was quite successful in this study and was rated top equal to the iMate. Connecting to the Internet was supported by either Wi-Fi or using Bluetooth to connect to a Bluetooth capable phone or computer. As mentioned when discussing the Tungsten device that the Bluetooth option was not very popular due to the need to have another device to support the Internet connection. The Wi-Fi connection was popular with the participants and all found it very easy to connect to the Wi-Fi network. Using Wi-Fi does limit the mobility of the device, as a wireless network is needed to be available for the device to connect, but advancement and rapid adoption of wireless networks in Universities and cafes have increased significantly over the years so this may not be an issue in the near future.

This device performed the best when viewing the discussion board. The browser coped well viewing the HTML webpage and the webpage was easy to read and interact with. Only one method of inputting text was supported by the device, this was via the on screen soft keyboard, but this method was relatively easy to use and did not take up too much space on the screen.

Once again the ability to view attached documents relied on the application software being installed on the device. The device had Microsoft Word and Excel already installed but to view PowerPoint's and PDF documents extra software was needed. The same was true when printing from the device, a third party software was installed (<http://www.fieldsoftware.com>) for webpage's to be capable to be printed. Once the software was installed these activities were performed without problems.

D. I-mate PDA2k

The iMate also performed very well in this study. When connecting to the Internet a wide variety of options were available, such as Wi-Fi, GPRS network and Bluetooth. The device did not display the discussion quiet as well as the iPaq, due to the automatic resizing of the page. This feature automatically restructures the page into a one-column display, making the text more spread out. This required the participant to scroll more than when testing with the iPaq. Similar to the iPaq additional software (<http://www.fieldsoftware.com>) was needed to support

viewing attachments and printing but once they were installed they too worked well.

V. DISCUSSION AND CONCLUSION

Overall from the above evaluation, it was established that it is feasible and certainly viable to interact with a discussion board on a mobile device. Though not all browsers gave the same results, we were able to conclude that the basic activities associated with interacting with a discussion board are supported on mobile devices. The devices that performed poorly were the devices that did not support the peripheral activities used when participating with discussion boards. Overall this study has shown that users with devices, that support HTML pages, work well to a certain extent. Therefore the main focus will be for the designers to develop a discussion board that will be easy to use and navigate, no matter the device. The more uncluttered and straightforward the discussion board is, the better it will be to interact with on a mobile device. This will need to be balanced so that users are not limited in what can be achieved or impact on the usability of the discussion board. By allowing users to interact with the discussion board on the mobile device we hope to be able to increase the participation of students by giving them more opportunities to interact and make it as easy as possible for them, thus ultimately facilitating students to collaborate and learn.

This research provides an investigation into some of the technical and organisational implications of implementing discussion boards for use on mobile devices. Four different mobile devices were used to view a discussion board. The study attempts to give a wide understanding how different devices support users of the discussion board, however it is possible that users using different devices might have different problems than those discussed in this study. It is therefore crucial when testing the new discussion board to test as many different devices as possible. The aim of this paper is to create an awareness of the perceived difficulties that are inherent when interacting with discussion boards on a mobile device. This paper should act as a springboard for further discussion in this area and help designers and developers understand what problems might affect the success of this project or similar projects.

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