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A Comparative Analysis of iPad and Other M-learning Technologies: Exploring Students' View of Adoption, Potentials, and Challenges

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Abstract

Mobile learning is currently trending toward rapid expansion within the classroom. This study employed survey methodology to specifically target students' perceptions of adoption potentials, and challenges. Potentials for the technology offered a number of mobile learning findings including a hierarchy of devices, educational work, and goals. Challenges included the symbolic view of devices, sustainability, and more accessible curriculum. Adoption interest revealed a fairly homogenous population in terms of gender, socioeconomic status, and innovativeness. iPads and eReaders shared the same penetration rates but differed greatly in initial adoption indicators, with the former being viewed much more favorably.

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The term M-learning or mobile learning refers to learning in specialized contexts. These contexts are entered into in a number of ways. One way is when the learner is not at a fixed or a predetermined location. Another is when the learner may access the content of class materials from a variety of locations. Still another is device dependent when the learner takes advantage of learning opportunities offered by mobile technologies (O'Malley & Vavoula, 2003). The communication process of mobile learning usually occurs via computer-mediated formats, including instant message, e-mail, and chat room etc. A great deal of the historical communication research exploring these conditions has been subsumed under the term computer-meditated communication or CMC (Wallace, 2008). CMC is defined as any communicative transaction that occurs through the use of two or more networked computers (McQuail, 2005). Clearly, smart phones, laptops, advanced personal digital assistants, PDAs, and tablet computers such as iPads would fit this definition.

Connections and M-Learning

Pownell and Bailey (2001) identify four major "technological trends" in the relationship between information, communication technologies, and educational environments. One of them occurred in the 1990s' was the large-scale diffusion of Internet and the World Wide Web, which led to a huge number of people who communicated through Computer-mediated communication.

Computer-mediated communication describes the human facilitated intercourse that is augmented by "computer like" hardware and applications. Examples include electronic mail, computer conferencing and electronic bulletin boards (Luminita, 2010). Electronic bulletin boards currently include a number of reifications such as Twitter and Facebook.

It is not surprising there is a "prevalence of computer-mediated communication (CMC) in education" (Sherblom, 2010. p. 479), while technology has been a part of education throughout

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history. CMC "plays an essential role of online collaboration for educational purposes" (Liu, Tao,& Nee, 2008, p. 127). The applying of CMC in education also adds the relatively new concept of portability. Universities and schools use to localize around libraries so that information, resources and research were easily obtainable. Now the nature of computers has made many of those same resources more easily accessible from a variety of locations because of the way that we access them. Milks and Bloxham (2010) describe M-learning devices as lighter, less bulky, easier to carry around and having lower requirements for the working environment than laptops.

This new dynamic in communicating with people and accessing information shifts many educational dynamics of the past. Community, connections, and communication are being reexamined in educational venues. Some of the proponents offer a number of ways that mobile learning may be advantageous to education.

First, by constructing flexible learning environments mobile technologies may be able to bridge the gap between the classroom and traditional community members (Luminita, 2010). Mobile technology (m-technology) can effectively bring communities instructional resources and activities from the outside into the classroom (Liu, et al., 2008). Beyond that, the social interactions that are provided by handheld computing devices offer a simple and straightforward learning environment. Furthermore, M-learning provides more open access. Rappa & Baey (2009) argued that with M-learning capabilities, all learners should have access to information that can improve their own quality of life regardless of location, status, and culture. Luminita (2010) echos the point indicating that mobile technologies may indeed provide educational access to learners normally excluded from education based on location, social status, or technology infrastructure.

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However, a number of impacts and effects of applying mobile learning in classroom have yet to be determined. Some scholars express concerns. One is that the M-learning environment built to support collaborative learning should not only enable learners to carry out activities, but also need to facilitate favorable collaborations. Clearly this is not always the case. Luminita (2010) argued that CMC learning decreases the direct interaction and immediate feedback between students and professors, and increases the rate of failures and drop-outs. CMC has also been reported to create a time-place displacement that decrease communication, erodes social connections, and increases feelings of personal loneliness and depression (Breen, Lindsay, & Smith, 2001). Additionally, there is a concern that the quality of the learning may be reduced by encouraging plagiarism because some students might take materials from web without thought (Banyard, et al., 2006). Moreover, identity construction within these CMC interactions might be more complex than daily face-to-face interactions. Individuals can easily maintain relative anonymity in CMC environment. According to Rumbough's (2001) research, this anonymity can prolong decision-making processes, increase the potential for interpersonal deception and boost antisocial communication. According to Anderson and Emmers-Sommer (2006), in face-to-face contexts, communicators use active, passive, and interactive strategies, but these are not equally available in CMC. Similarly, Sherblom (2010) also contends that in CMC, uncertainty reduction strategies are altered, both restricted and expanded, in ways that affect interpersonal impressions, communication, and relationships.

Beyond these psychosocial concerns, there are restrictions and challenges placed on M-learning devices themselves. A number of these have to do with current uses, size and price. M-learning devices are currently perceived as "expensive toys,"that will be out of date quickly in a fast moving market (Veerasamy, 2010). The M-learning devices also have high requirement for

the system, and access speeds that may reduce effectiveness (Mahnoud, 2008). Chen-Chung et al. (2009) express concern that "the screen on handheld devices are designed for individual-user mobile applications and may constrain interaction among group learners" (p. 127). Chen-Chung et al. (2009) also summarize a recent review on mobile learning stating, "whether handheld devices facilitate or impede face-to-face social interaction is an important research issue" (p. 128).

With the fast development of new technologies applied in mobile learning, a technological proficiency barrier may have an impact on the ability to learn. Banyard et al. (2006) mention that particularly entry-level skills for some enhanced technologies can be a barrier to effective learning in CMC environments. Previous research is also clear that there are some serious concerns regarding the potential for these tools to inhibit or distract from learning (Luminita, 2010). So while there are a great many potentials and challenges surrounding the application of mobile learning, further study is appropriate and necessary. This paper intends to extend this discussion by applying how students perceive many of these potentials and challenges.

Theoretical Heuristics for M-Learning and Communication

Much of the research concerning mobile learning is data driven without any theoretical guidelines. However there are decades of technological applied theories that may provide heuristics that will help contextualize data findings. Additionally, data concerning previous technological innovations may also provide some lenses to examine current technologies. Sherblom (2010) identifies five of the more dominant streams of scholarly thought that have had historical resonance within the communication discipline. These include media richness, social presence theory, social information processing (SIP), social identity, and the hyperpersonal

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perspective. Following are historical foundations of each of these with the addition of Sherblom's summary of more recent literature.

Original conceptualization of media richness theory defines richness as:

> "Based upon a blend of four criteria: (1) the availability of instant feedback, making it possible for communicators to converge quickly upon a common interpretation or understanding; (2) the capacity of the medium to transmit multiple cues such as body language, voice tone, and inflection, to convey interpretations; (3) the use of natural language, rather than numbers, to convey subtleties; and (4) the personal focus of the medium" (Trevino, Daft, & Lengel, 1990, p. 75).

Social presence theory strongly asserts that, in the organizational environment, the characteristics of the media and the equivocality of the message need to be considered for communication effectiveness (Conger, 1992; Trevino, et al., 1990). Sherblom (2010) likewise summarizes current thinking regarding the theory. Briefly stated, a leaner medium, like CMC conveys more limited information, cues, feedback, and language is more efficient for unequivocal communication, but less suited for equivocal ones.

Similarly social presence theory has a long historical resonance within the discipline. Seminal conceptualizations contend that social presence is the degree to which other communication participants are believed to be jointly involved in the communication process (Short, William, & Christie, 1976). They state that media vary "in their capacity to transmit information about facial expressions, direction of looking, posture, dress and non-verbal, vocal cues" (p. 65).

Olaniran (1993) elaborates on this theory in terms of CMC and points out that,

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> The proponent of this theory subscribes to the notion that CMC systems are low in capacity to convey information about facial expression, posture and nonverbal cues. The lower availability of such cues is believed to influence users' views if the communication medium, contexts, performance, and message interpretation. Specifically, CMC, with its few nonverbal cues, is said to be lower in comparison to FTF communication. (p. 1)

Russo et al. (1999) took these thoughts a step further. They apply them to the online class and make the claim that social presence was the key objective to the development of early online classes.

> Specifically course developers sought to incorporate four key elements in this trial course: (1) to present pertinent and engaging content in a way that would support learning and sustain learning (2) to evoke reflection by students about the material (3) to support the establishment of social presence for each participant, and (4) to foster connection among participants. (p. 3)

Having students engaged in the course, engaging the material, and establishing social presence seem to point to characteristics that could have an impact on how to achieve immediacy in online environments. Sherblom (2010) summarizes subsequent findings contending that the reduction in cues restricts the communication of social information about the person and can generate a vaguer impression reducing social presence. This is important because it is also suggests that a loss of social presence may reduce learning.

Walther's (1992) award winning article lays out many of the propositions regarding social information processing theory (or SIP theory). Particularly of note is the proposition that

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social interactions in the CMC environment may be impacted by temporal barriers because "the functions accomplished through a variety of face-to-face cues are undertaken via fewer codes in CMC, and any single message exchange may not carry as much social information as would the exchange of the same qualities in a nonmediated setting" (p. 71). Sherblom (2010) further contends that training, development, and practice are keys to effective interactions.

Early research regarding social identity predates the modern Internet by decades (Tajfel, 1975). However later literature has embraced the theory and its intuitive application to computer accessed environments. One article contends:

> As applied to CMC, the relative anonymity associated with this medium provides a context in which individual differences between group members are sometimes less visible. As a result, the salience of group memberships is likely to be accentuated in depersonalized settings as found on the Internet, which has consequences for how people perceive in-group members, out-group members, and themselves. (Postmes, Spears, & Lea, 2002, p. 4)

While all of these theoretical positions are interwoven, social identity and social presence may be more so. One particular example related by Sherblom (2010), is that students who have difficulty using technology early in a course experience a frustration level, a tendency toward social withdrawal, and a general dissatisfaction with the course. Specifically, computer anxiety, social anxiety, and communication apprehension are suggested to affect a CMC participant's experience of social presence (Sherblom, 2010).

Lastly, the hyperpersonal nature of technology has been a characteristic of interest. Simply put, technology impacts communication in a way that surpasses the capabilities and characteristics of face-to-face interpersonal communication (Walther, 1996). To be sure, there

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are negatives to this effect. For example, the anonymity in CMC environments may allow students to engage in negative behavior that would not be typical in a face-to-face setting (Postmes, et al., 2002). However the flip side of this, as related above, may be that people with high levels of communication apprehension may be able to perform better. Other characteristics that are included in the hyperpersonal category include its ability to connect across time and space in a way that are difficult to do face to face (Sherblom, 2010; Walther, 1996).

So clearly the nature of mobile learning's pedagogical and technological characteristics provide a warrant to study learner technology interaction. Even without regard to the device being used, the nature of the Internet provides a very unique communication medium, allowing communication to be interactive, visual, and elastic (Zurita, et al., 2004). Furthermore, some of the differentiations between various devices need to be examined for their communication and adoption characteristics to help determine levels of impact. For these reasons, this study posits the following three research questions in regard to students' perception of mobile learning technologies:

RQ1: What are potentials for M-learning?

RQ2: What are challenges for M-learning?

RQ3: What characteristics are impacting the adoption of M-learning?

Methodology

This study was conducted by a team of three researchers who were involved in an in depth study of mobile learning. The survey instrument was designed by a focus group of five graduate students, two of which were contributing researchers. This was considered key since it focused on the student perspective to examine the potentials and challenges of using M-learning. Some of the content was modified from a previous study conducted by Ball State University in

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their preliminary analysis of iPad characteristics (Milks &Bloxham, 2010). The survey was then reviewed for prima fascia validity by a CMC subject matter expert who was also a part of the research team. Adjustments were made and the survey was distributed electronically using a snowball sample technique through e-mail (Reinard, 2007).

Participants were informed that the survey was both voluntary and anonymous aside from holistic demographic categories. The majority of questions used Likert type categories. These kinds of questions were noted for their ease in construction and interval level data return (Shurville & Browne, 2006). There was one ranking question used on the survey. Rankings have been viewed as a more robust estimator of survey values even though they may produce some analytical difficulties (Krosnick & Alwin, 1989).

This was part of a larger study that included faculty from a number of institutions. Students were solicited from a medium size private university in the southwest of the United States. A total sample size of 76 was obtained. The overwhelming majority of students and half of the faculty participants were from the southwestern university. The completion rate was roughly 90% with 67 completing the entire survey. Out of all respondents, 57 were students, of which 6 had high school degrees, 36 had finished some college, 4 had associated degrees, 6 had bachelor degrees, and 4 had graduate degrees. Gender distribution of the students was 44.6% male to 55.4% female. The majority of the students aged between 18-24 (94.7%), with three aged above 24 (5.3%). Twenty-eight of the surveyed students reported a household income below $35,000, while 26 reported a household income above $35,000. While differences between devices are often blurred, survey takers were allowed to self-define based on their own definitions. So while it is arguable that an iPad can also be an e-reader at the time of this survey the descriptions were fairly distinct.

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Results

The research questions were addressed in several ways. The students were examined for the level of experience with various mobile learning devices in regard to classwork. Respondents were also asked about their likelihood to use digital technology in the classroom weekly as well as their likelihood of engage in certain behaviors and attitudes. Perceived challenges of M-learning were examined included overpricing, ease of use, distraction while learning, and having the devices be more for entertainment than for education. Responseware devices were included for both comparative and complimentary reasons. While they can be used for a number of purposes, most often they are used for anonymous polling and temperature type questions given in class. Students have the devices distributed and then the percentage of agreement is generally projected to spawn discussion. The university researched has an almost immersive environment regarding these and the other devises, so most students have a high degree of familiarity.

Perceived potentials of M-learning that were examined included providing a motivating learning experience, reducing gender biases in the classroom, delivering curriculum to remote or nontraditional sites, and better delivery of classwork etc.

Table 1 reflects a list of items where participants had a class learning experience. Data ranged with the majority having experience with laptops (66%), smartphones (56.6%), and iPod Touch's (37.7%) to five items close to single digit responses. These included Tablet Computers, eReader, Responseware device, iPod Family (except touch), and others etc.

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Table 1: Learning Experience in Classwork

	Percent	N
Smart Phone	56.6%	30
iPod Touch	37.7%	20
iPad	18.9%	10
iPod Family (Except Touch)	5.7%	3
Laptop	66.0%	35
Tablet Computer	5.7%	3
eReader (e.g. Kindle)	3.8%	2
Responseware devices	3.8%	2
Other (please specify)		1
Total		53

Table 2 reflects the likelihood of weekly M-learning devices usage by students for classwork. The answers ranged from 1 meaning “extremely often” to 5 meaning “never.” Laptops were perceived as having the highest usage frequency with a mean of 1.81. eReaders were perceived to be used the least with a mean of 4.09.

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Table 2: Likelihood of Weekly Usage

	N	Mean	Std. Deviation
Smart Phone	49	2.84	1.559
iPod Touch	50	3.36	1.411
iPad	52	3.19	1.633
iPod Family (Except Touch)	46	3.85	1.299
Laptop	53	1.81	1.057
Tablet Computer	46	3.70	1.314
eReader (e.g. Kindle)	47	4.09	1.158
Responseware devices	48	4.06	.932

Table 3 reflects respondents forced rankings for various devices that they preferred to use in the classroom. The top and bottom mean rankings were fairly consistent with some general trends in between. In terms of which technology the respondents prefer to use in the classroom environment, the laptop was the most preferred technology, with iPad and Smartphone in the second and third place respectively. These were followed by the iPod family (touch and others). Tablet computers and eReader came next with Responseware and other devices trailing in the technology list.

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Table 3: Most Preferred Technology

	First	Second	Third	Fourth	Fifth	Sixth	Sev.	Last	Mean
Smart Phone	20.4%	18.4%	24.5%	14.3%	10.2%	4.1%	4.1%	4.1%	3.24
	(10)	(9)	(12)	(7)	(5)	(2)	(2)	(2)	
iPod Touch	3.8%	19.2%	17.3%	26.9%	17.3%	11.5%	3.8%	0.0%	3.85
	(2)	(10)	(9)	(14)	(9)	(6)	(2)	(0)	
iPad	17.0%	35.8%	24.5%	7.5%	3.8%	1.9%	5.7%	3.8%	2.92
	(9)	(19)	(13)	(4)	(2)	(1)	(3)	(2)	
iPod Family	0.0%	2.3%	9.3%	27.9%	23.3%	9.3%	14.0%	14.0%	5.26
(Except Touch)	(0)	(1)	(4)	(12)	(10)	(4)	(6)	(6)	
Laptop	62.3%	17.0%	7.5%	3.8%	9.4%	0.0%	0.0%	0.0%	1.81
	(33)	(9)	(4)	(2)	(5)	(0)	(0)	(0)	
Tablet Computer	0.0%	8.3%	14.6%	14.6%	16.7%	29.2%	10.4%	6.3%	5
	(0)	(4)	(7)	(7)	(8)	(14)	(5)	(3)	
eReader (e.g.	0.0%	0.0%	6.3%	4.2%	10.4%	37.5%	33.3%	8.3%	6.13
Kindle)	(0)	(0)	(3)	(2)	(5)	(18)	(16)	(4)	
Responseware	0.0%	0.0%	0.0%	4.3%	10.6%	8.5%	27.7%	48.9%	7.06
Devices	(0)	(0)	(0)	(2)	(5)	(4)	(13)	(23)	
Other	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0	8
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	% (7)	

The respondents were also asked to indicate what kind of technology that they would prefer to learn more about. These included Smartphone, iPod Touch, iPad, iPod, Laptop, Tablet Computer, eReader, and Responseware devices. The respondents were allowed to choose multiple options that applied for them. The result showed iPad as the leading technology among

others, because 73.1% of the respondents indicated they would like to learn more about it. This was followed by the Smartphone (28.8%), Laptop (23.1%) and eReader (23.1%).

Table 4 reflects the likelihood of a list of engaging in technology behaviors or attitudes by respondents. The answers ranged from "1" meaning "extremely likely" to "5" meaning "extremely unlikely." The answer reflects an extremely positive trend. Since laptops were the only device that was significantly used on a weekly basis, it is reasonable to extrapolate that in the majority of cases this is most likely the technology that is being considered. Engaging in individual projects was perceived to be the most frequent technology behavior followed by engaging in group projects.

Table 4: Likelihood of Engaging in Technology Behaviors or Attitudes

	N	Mean	Std. Deviation
Carry Laptop to Class	53	1.91	1.061
Group Project	53	1.70	.799
Individual Project	53	1.60	.689
More Technology Driven Curriculum	53	2.15	1.026

Table 5 reflects a list of students' attitudes towards mobile learning technology. They were asked about their general impression. The answers ranged from "1" meaning "strongly agree" to "5" meaning "strongly disagree." Almost all items had a positive valance including "outdated too quickly", "more for entertainment than for education," and distraction questions. The only items that were negatively valenced items were related to the devices being difficult to use and plagiarism.

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Table 5: Attitudes towards Mobile Learning Technology

	N	Mean	Std. Deviation
Provide a motivating learning experience	53	1.94	.864
Reduce gender biases in the classroom	53	2.64	.901
Deliver curriculum to remote or nontraditional sites	53	2.15	.744
Better deliver classwork	53	2.34	.939
Are supported by instructors	53	2.42	.969
Hard to use	52	3.77	.831
Outdated too quickly	52	2.60	1.159
Encourage teamwork	51	2.82	.888
Encourage plagiarism	52	3.33	.964
Enable more convenient studying	52	2.06	.998
Encourage communication with the professor	52	2.06	.895
Simplify communication	52	2.00	.950
More for entertainment than for education	52	2.46	1.075
Distraction	52	2.81	1.155

Additionally, several significance tests were conducted to determine if there were differences in perceived users regarding challenges and potentials. iPad experience was used as indicator of early adoption. It also was used as an indicator to see if there were some initial differences between how iPad experienced students related to mobile learning as compared with other students who had not had this experience. All items in table 5 were compared. Because of

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the expected deluge of iPad adoption, this is considered a critical comparison while these groups can be clearly identified without cross contamination. Nine iPad experienced subjects were compared to the other 43 subjects using a t-test for unequal variances.

There was no significant difference between iPads regarding mobile learning technology in general, comparing with smart phones laptops, iPods, and eReaders. Additionally the individual technologies were examined for being overpriced, ease of use, distracting while learning, and being more for entertainment than for education. Again there was no significant difference between early adopters with iPad experience and those without.

The subjects were also examined for gender differences in the above areas. There was no significant difference in terms of likelihood of using a particular technology (Table 2). Males' N size ranged from 21 to 24. Females' N size ranged from 25 to 29. There was no significant difference for likely hood to engage in certain technology behaviors (Table 4). Attitudes toward the respected technologies yielded similar results (Table 5). However, because of sample size, it is worth noting that the category "encourages communication with the professor approached significance (t= 1.745, df 38.991, p< .09). Females (N=29, M=1.86, sd= .743) agreed more strongly than males (N=23, M=2.30, sd. 1.043) that the technology encouraged communication with the professor.

The subjects perceived socioeconomic status was also examined. There were 24 subjects reported their annual household income below 35 thousand dollars and 28 that reported that it was above. Once again there was no significant difference in any of the above categories regarding income.

Overall adoption characteristics concerning M-learning were examined with overall means tables being used as indicators. T-tests were used to compare differences among various

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demographic characteristics regarding early adoption, gender and socioeconomic status. No significant differences were found in this range of categories. As such the subjects appear to be fairly homogenous regarding their perception, making means fairly robust indicators across the above demographic profiles.

Discussion

The above results suggest a number of findings that may help users of M-learning contextualize their audience. Also, potentials for the technology offered a number of findings. Laptops appear to be the dominant technology with a great deal of interest expressed toward other mobile technologies, most notably the iPad. Various kinds of student work and educational goals were positively viewed. Also a number of challenges were examined. Most notable among these is that over half the respondents considered the devices as more for entertainment than for education. Also, students indicated that their desire for technology friendly curriculums was not being met. Lastly, the sustainable value of the devices was an area of concern. Regarding adoption different technologies had different levels of penetration. iPads and eReaders shared the same penetration rates but differed greatly in initial adoption indicators, with the former being viewed favorably and the latter not. While speculative, this may be due to the iPad's better fit for both higher social information processing and social presence (Sherblom, 2010).

RQ1: What are potentials for M-learning?

The results of this study show that laptops, among other M-learning technologies, are perceived as the most prevalent technology accepted by students and the most preferred technology chosen by students to be used in the classroom. However, the results also indicate that large majority of students (73.1 %) prefer to learn more about iPad technology. This may suggest a degree of demand that has the potential to drive adoption for the technology in a fairly

abbreviated time frame. This survey was conducted in November of 2010, and the expansion of support for iPad and Apple products seems to be positioning for greater demand. For instance, Verizon Wireless, a venture of Verizon Communications and Vodafone just started selling Apple's iPhone in February 2011, which ended AT&T's more than three-year monopolized holding on U.S. iPhone sales (Gamet, Mar 10, 2011). Also, Apple has expanded their product distribution network to include retailers like Walmart, Target, Best Buy, and the aforementioned phone carriers. These expansions are expected to better meet demand that has been historically substantial for Apple's new technology roll outs (Staff, Mar 14, 2011).

The survey also indicated several kinds of class work that were viewed favorably. At this point the reflexive nature of the various technologies and its relationship to student work makes it difficult to determine which, if either, is more contributive. Regardless, engaging in individual projects and group projects are perceived to be the top two frequent behaviors by the respondents.

There were also a number of potentials regarding educational goals. First among these was the perception that it would enhance communication with the instructor. Other goals included simplifying communication, providing a motivating learning experience, enabling more convenient studying, and delivering curriculums to remote or nontraditional sites.

Theoretically these results are not surprising. Both from a hyperpersonal and media richness perspective one would expect that the richer and more interactive technologies should be the ones that would be preferred in the classroom (Trevino, et al., 1990; Walther, 1996). Additionally, M-learning appears to be on the verge of transcending or at least providing greater porosity to barriers of social presence (Russo, 1999; Sherblom, 2010).

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The perceptual nature of this data links it to the symbolic nature of the technology. Trevino, et al (1990) include symbolic value as one thing that contributes to media richness. Specifically:

> "In organizations the choice of a particular media carries with it symbolic meaning beyond the explicit message being transmitted. Organizational and subgroup norms for media usage create pressure to choose or not to choose a particular medium. These norms can have a powerful choice on media choice behavior (p. 88)

Certainly, this provides a reasonable frame to view the 71% of the students who want to know more about iPads, surpassing all other mobile learning technologies examined. It also, may help explain why 53.4% of the subjects thought that iPads were easy to use despite that only 17.3% of the subjects had actually used them. Similarly, 52.8% ranked the iPad as their technology of choice in the classroom, only being surpassed by laptop computers. Whatever one might think about a particular technology symbolic attributions this study appears to suggest it is a contributing factor in terms of future potential.

RQ2: What are challenges for M-learning?

There are a number of perceived deficiencies that emerged from our data. Realize that these results came from a population that viewed M-learning positively. Perhaps, one of the biggest challenges of M-learning is what the devices have come to symbolize. More than half of the respondents (53.9%) considered mobile learning devices to be more for entertainment than for education.

For students who had a preference, two areas represented the largest valence of opinion (positive, neutral, negative). The largest group (42.3%) contended the devices were a distraction to learning, while only 28.9% contended that they did not and 28.8% were neutral. Similarly,

46.1% stated that M-learning technologies encouraged plagiarism. This is contrasted with only 21.1% of students that did not and 32.8% were neutral. The percentages indicate that both distraction and plagiarism continue to be challenges regarding M-learning.

Perhaps some of the less apparent by equally important deficits were derived in students more tacit feedback. One of these areas was the desire for more technology driven curriculum. Sixty-two percent of students expressed a desire for more technologically driven curriculum. This point may also be embedded in some similar findings where roughly, 49% of students were either neutral or in disagreement that M-learning technologies were supported by instructors. Even though it is not a majority, this indicates that instructor support is seen by students as an area of concern.

Lastly sustainable value of the technology itself continues to be challenging. The results of this research supported speculations on the negative impact of price point and outdatedness (Veerasamy, 2010). Roughly, 80% of students in this survey thought mobile learning technologies were overpriced. Multi-generation products do help students in terms of being able to acquire previous generation products at reduced prices but at a substantial cost in terms of student satisfaction. Most of the students (53.8%) stated that mobile learning technologies were outdated two quickly.

RQ3: What characteristics are impacting the adoption of M-learning?

Many of the adoptions issues are somewhat embedded in RQ1 and RQ2. The sustainable value of various technologies tends to suggest that iPads are poised for initial adoption behaviors while eReaders are not. Cell phones, iPod products, and laptops already enjoy a high degree of penetration, while iPads and eReaders are in single digits. One large scale survey had percentages of ownership for those between the ages of 18-34 at 95% for cell phone, 74% for

iPod products, 70% for laptop computers, while tablet computers like iPads and eReaders only had 5% (Zickuhr, 2011). Certainly the high number of students that wanted to learn about iPads is an opportunity to initiate the first stages of the technology diffusion process (Rogers, 2003, 2004). Low numbers for other technologies might reflect various combinations of three dynamics. These are relevancy, symbolic value, and experience.

Since the majority of the students did not have experience with the iPad, it seems that either relevancy or symbolic value of the iPad is driving the initial knowledge acquisition stage of the adoption process. Contrast this with the eReader. Almost identical numbers were reported in terms of ownership and yet only 23% of students wanted to learn more about this technology.

Future research

This research did not differentiate between perceptions and actual use. While this helped provide a frame amplifying symbolic associations, linkages to actual behaviors needs to be more strongly established. Future research should expand the granularity of this examination in terms of actual behaviors.

Findings were consistent with a growing number of studies that are concerned about the non-learning dynamics of M-learning devices (Milks, & Bloxham, 2010, Turkle, 2011). Reasoned research should continue to focus on the potentials but also find out challenges such as devices distraction and also at what level devices are they being used for personal entertainment during instructional time. Also, plagiarism concerns are a constant struggle and should be monitored for longitudinal trends. Lastly, M-learning experiences were considered positive. Larger samples and more longitudinal analyses need to be conducted in the future to establish

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trends. Particularly of interest would be to establish whether this is a general trend or merely an artifact of early adopters as M-learning is maturing as an instructional environment.

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