An implementation of an mLearning scenario using short text messaging: an analysis and evaluation

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Abstract: This paper describes the results of a research study conducted in conjunction with an experiment in using a short text messaging service (SMS) scenario for test revision. The learning environment was developed in a specific class context and was supported by a commercial mobile data service. This study aimed to identify the factors students perceived as drivers of the mLearning scenario and inhibitors to the success of the mLearning scenario, and to investigate the implementation of a mobile learning requirements framework in evaluating the experiment outcomes. An activity theory (AT) framework was developed to represent the dynamic relationships between participants and technology within the context of the experiment. The results of the qualitative data analysis show that mobility support, information density and information relevance are the main success factors, while service cost is likely to be the major detractor, and allow to draw recommendations for increasing the value of the mLearning service.

Keywords: activity theory; SMS; short text messaging; mLearning; mobile learning; test revision scenario; success factors; service value; mobility support; information relevance; information density; service cost; drivers; inhibitors; New Zealand.


Biographical notes: Krassie Petrova is working as a Senior Lecturer in Computer and Information Systems at Auckland University of Technology and Programme Leader of the Master of Computer and Information Sciences Programme within the School of Computing and Mathematical Sciences. She lectures in the areas of networking, data communications, information security and information technology, and has professional experience as a manager and a consultant in information systems development and information management. Her current research focuses on mobile business applications, mobile payment systems, mobile and online learning and student capability development in industry supported learning.
1 Introduction and background

Mobile learning (mLearning) can be categorised as technology supported learning, or as an extension of electronic learning (eLearning) (Kinshuk, 2003; Leung and Chan, 2003; Seng and Lin, 2004; Vavoula and Sharples, 2002). However, mLearning addresses a specific characteristic which eLearning is not concerned with, namely learner mobility. In mLearning, the learner can be in touch with the mLearning service they want to use anytime and anywhere within the coverage of the network they subscribe to, and in a way which fits in with their life style and learning preferences. Developed to utilise the characteristics of the supporting mobile technology, mLearning models also belong to the paradigm of flexible learning as they allow the learner to tailor and personalise the time, the place and the pace dimensions of the mLearning environment. Additionally, mLearning allows the development of blended learning models where different types of supporting technologies are involved (Bielawski and Matcalf, 2005; Divitini et al., 2005; Hall, 1999; Song and Fox, 2005; Wuthrich et al., 2003).

Some socioeconomic aspects of mobile technology and its deployment may prove to be a challenge to the success of mLearning models. For example, while small enough to be easily portable, a mobile phone may not be best suited for typing in a significant amount of text; second, mLearning may become too costly to be affordable by a student on a limited budget. Another issue is that of the possible intrusiveness of a public service which uses the learner’s personal communication device. Therefore, it can be argued that a successful mLearning application should not only offer a clear learning value but it should also be accessible while the learner is ‘on the go’, compatible with the learner’s daily routine, available on demand and financially affordable.

Short text messaging service (SMS) has emerged as arguably the most accessible and affordable mobile data service. A text message normally costs less than a minute of air time, and all current generations of mobile data technologies (2G and above) support it. Therefore, SMS may represent a viable platform for mLearning capable of supporting high quality, flexible and cost-efficient learning (Sharples, 2005; Taylor et al., 2006).

SMS-based learning scenarios are especially suitable for just-in-time (JIT) learning. JIT requirements were formulated in Elia et al. (2006, p.1067) as “…the right knowledge delivered to the right people, at just the right time, in the right way, and just enough…”. Therefore, a JIT SMS-based learning scenario will need to be goal-oriented and will guide learners through a series of specific tasks, within a specific context – for example, vocabulary learning in foreign language studies.

Other contextualised SMS-based learning scenarios include tests/quizzes, playing games or role plays in a simulated context, collaborative problem solving (Petrova, 2007a). These and similar scenarios allow participants to control the learning process and to transform the information they receive into functional knowledge (Riel, 2000). A limitation to consider in the design of such implementations is the limited maximum size of a text message (160 characters).

To investigate the extent to which potential mobile learners were both technologically prepared to participate in mLearning, and interested in engaging with JIT activities, a study of 117 university undergraduates was undertaken in 2004. Using a four type classification of learner styles adapted from Kolb (namely ‘concrete experimenter’,
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‘observer/reflectionist’, ‘theory builder’ and ‘problem solver/active experimenter’), the study also looked into the learner types which would be most attracted to JIT mLearning activities (Petrova and Sutedjo, 2004). Data collected during the study about ownership and usage of mobile devices indicated that all students except one owned a mobile phone, that all mobile phone owners were interested in mLearning, and that their preferred supporting data technology was SMS. It was also found that students who identified themselves as either a ‘concrete experimenter’ or a ‘problem solver/active experimenter’ (88% of the sample), also showed a high interest in participating in JIT mLearning activities.

Following up on these results, a general framework for the development and implementation of SMS-based learning scenarios was proposed (Petrova, 2007b). A specific scenario (participants studying and revising for a test) was implemented in class conditions in 2005–2006, as a grant-supported research project. This paper describes the project and presents the results of the analysis of the qualitative data gathered during the project.

The rest of this paper is organised as follows: The next section reviews the literature and discusses the requirements and possible success factors of an SMS-based mLearning scenario. The section following formulates the objectives of the research study and describes its approach. The remaining sections present the findings, discuss their implications and identify the study limitations.

2 mLearning requirements and success factors

As mLearning belongs to the category of technology supported learning, it naturally occurs within an organisational and pedagogical context, and involves interactions between participants and technology (Valentine, 2004). A framework comprising constructs representing the context and the interactions is shown in Figure 1, where the pedagogical and the organisational contexts are referred to as ‘strategy’ and ‘policy’, respectively. The framework can be used to study the issues related to these constructs to identify the requirements of mLearning and the success factors critical to the acceptance and adoption of mLearning applications.

Figure 1 Requirements framework for mLearning
Table 1  mLearning success factors

<table>
<thead>
<tr>
<th>Infrastructural</th>
<th>Informational</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Access to a communication network:</strong> the network must be reliable (normally a commercial subscriber network)</td>
<td><strong>Information density:</strong> users typically prefer specific, concise (but precise) information, avoiding unnecessary details</td>
</tr>
<tr>
<td><strong>Connection type:</strong> must be private, available on demand. 2.5G and above network technologies are also secure</td>
<td><strong>Information relevance:</strong> information provided must be needed and/or expected in a specific context</td>
</tr>
<tr>
<td><strong>Location and time independence:</strong> the network and the network access device must support user mobility 24/7</td>
<td><strong>Ease of use:</strong> information access must be unobtrusive and suitable for the user context</td>
</tr>
</tbody>
</table>

In the requirements framework, the construct labelled ‘technology’ relates to the infrastructure used to deliver an mLearning service. Issues related to technology are: mobile device limitations (such as limited screen or text size), mobile network interoperability and universal coverage, network connectivity, network access and network security. Therefore, the resulting technology requirements are to support user mobility and to provide an adequate and ubiquitous communications channel, by deploying a reliable and secure communication network, available to all participants on demand, and with 24/7 access (Petrova, 2007b). The success factors related to the technological infrastructure (‘access to a communication network’, ‘connection type’ and ‘location and time independence’) are summarised in the first column of Table 1.

‘People’ relates to the human participants. Participants would expect to obtain certain benefits from using mobile technology for learning, with technology required to impact positively on all its users (e.g. students and lecturers). To deliver the expected value to participants, the mLearning service is required to operate through a personalised user-friendly interface, and to provide information which is needed, useful and non-noisy (Hino et al., 2002; Sharples et al., 2002; Uther, 2002; Wuthrich et al., 2003). Accordingly, the success factors related to the type of information provided and to the interface can be identified as ‘information density’, ‘information relevance’ and ‘ease of use’ (Petrova, 2007b). Table 1 provides summary of the informational success factors.

The pedagogy-related construct ‘strategy’ (Figure 1) signifies the requirement to create an overarching teaching and learning model within which mLearning activities seamlessly coexist with other learning activities. The pedagogical approach needs to ensure that significant ‘mLearning value’ is generated and offered to participants through a suitable pedagogical model meeting mobility requirements (Seng and Lin, 2004; Vavoula and Sharples, 2002).

It is important to note that at present all public mobile networks do meet the technology requirements listed in Table 1. Therefore, it may be expected that the informational characteristics of any particular SMS learning scenario will be the main mLearning value contributors. Thus, the strategy adopted to create a pedagogical model addressing the mLearning informational critical success factors will play a critical role in determining the success or failure of a particular scenario (Petrova, 2007b).
Finally, the construct ‘policy’ refers to the requirement to establish a regulatory framework supporting mLearning activities in the educational organisation. The regulatory environment within which mLearning occurs may play a supportive or an inhibitive role.

The framework introduced above was used to formulate the objectives of a qualitative study investigating how mLearning adds value to the learning process. The study was based on the experimental implementation of an mLearning scenario as a JIT learning mLearning service, and involved collecting evaluative feedback from student participants. The study aimed to:

1. identify the factors students perceived as success drivers or inhibitors in their use of the mLearning service
2. investigate how applying the mLearning requirements framework to evaluate the success of the mLearning service may help to provide recommendations for improvement.

3 Methodology

In an SMS-based learning, both ‘push’ and ‘pull’ mode can be implemented, depending on the pedagogical approach and the learning context (Evans and Taylor, 2004). In push mode, the learner cannot control the timing of the service, while in pull mode, the information can be delivered to the learner on demand. Most of the scenarios described in the literature (including the use of SMS for tests, quizzes, question and answer sessions) are not tied to a particular event timeframe and are driven not by the learner but by the provider, in a typical push mode (Capuano et al., 2004; Iliescu and Hines, 2005; Riordan and Traxler, 2003; Silander and Rytkonen, 2005; Tretiakov and Kinshuk, 2005).

3.1 The experiment

The scenario implemented and used in the study was learner-driven (i.e. it worked in pull mode). Its pedagogical context was that of SMS-based test revision, which is a JIT learning feature. The JIT ‘mLearners’ were expected first to construct their own knowledge through independent study and work with resources and then use the mLearning ‘test revision’ service to check whether they had understood the concepts correctly and were able to apply them in problem solving situations.

This particular mLearning application was run as a cost incurring mobile data service. However, to help the students financially and encourage participation a policy was adopted to reimburse participants up to a fixed limit.

The experiment was piloted first in 2005, with second year undergraduate students. With some valuable lessons about recruiting participants and about the timing of the experiment learned, the final run was conducted in the second half of 2006, involving again undergraduate students.
Both the Internet and mobile networks were deployed as supporting technology. The independently developed mLearning platform StudyTXT (Mellow, 2005) used allowed to set up a pull type SMS study service. StudyTXT does not require enrolment or registration; the SMS server works in the background and is totally ‘transparent’ to the students.

The revision material (i.e. the answers to the revision questions) was packed in the form of short messages (up to 150 characters) hosted on the dedicated SMS server. Users were able to request the answer to a specific question or to a group of questions by texting a unique code to the server. The server would respond by sending back the response(s) to the student’s mobile phone. As messages can be stored, the answers to the questions, once received, could also be shared with others; this feature of the service was seen as a potential learning community development facilitator (Riel, 2000).

It was envisaged at the start that lecturers would prepare the questions, and then use an administrative interface to upload them to the StudyTXT website and to store the answers to the SMS server. However, it was found during the pilot run that a centralised approach would work better as it would be easier to check the text for completeness, spelling, length of answers, etc. Consequently, lecturers were provided with a spreadsheet template to record the questions and the answers which were then loaded to the respective servers by the StudyTXT administrator.

In class, students were given a printed copy of the questions and their codes, along with instructions about how to use the revision service. Additionally, students could view or download the text of the revision questions from the StudyTXT website (http://www.studytxt.com), which is suitable for viewing on both computer- and handheld device screens. It was not compulsory for students to use the web component of the technological blend, rather the website provided a useful backup and ensured that participants would be able to obtain the instructions and the questions/codes even if they did not have the printed copies available when they needed them. The StudyTXT website was chosen in preference to the institutional BlackBoard® based managed learning environment as the latter is not easily accessible via a mobile Internet connection.

Students were charged a fee for every message received (or for a group of messages), using either subscriber account billing or pre-pay payment as appropriate. The commercial mobile data service provider who hosted the SMS server had made suitable arrangements with the different mobile network operators to ensure full interoperability. Finally, in this experiment the service content (test revision questions and answers) was developed free of charge by lecturers who volunteered to take part in it. In principle, it is possible to make profit sharing arrangements between the commercial service provider and the content provider (e.g. a university or another entity). The conceptual design of the service is shown in Figure 2. The arrows represent the interactions of the people involved (lecturers, students) with the technology (the servers).

Figure 2  Conceptual design of the SMS test revision service (see online version for colours)
3.2 Data collection method

Prior to running the experiment, all students attending the classes where the mLearning service was going to be offered were surveyed using a questionnaire similar to the one deployed in Petrova and Sutedjo (2004), in order to ensure that the device ownership and technology preference patterns had not changed significantly, and that the current student population had similar learning preferences. A total of 95 undergraduate students responded to the survey. All participants were enrolled in one of the two courses in the area of information technology and information systems chosen to trial the mLearning service.

Qualitative data from the student participants were gathered at the end of the semester through an anonymous course evaluation form which asked participants to comment on how they felt SMS revision might have helped them, how and when they used the service, what problems had occurred and what they thought needed to be changed in order to increase the perceived value of the service. A completed course evaluation form was returned by 50 students.

3.3 Data analysis method

A discussion of the issues related to the use of technology and its integration with educational systems can be found in Lim and Hang (2003) who suggested that activity theory (AT) could be used to inform research in the area. A detailed analysis of the secondary education sector in Singapore provides an example of their approach. According to the authors, the AT-based investigation may help identify the contradictions both within an activity system and across related activity systems, and understand how resolving the contradictions may lead to the effective integration of technology in the teaching and learning process.

Activity theory is seen as a suitable framework for studying technology enabled learning, including mLearning. Its advantages include capturing the dynamics of the process, a focus on the role of the activity context and an emphasis of the tool used by participants (Scanlon et al., 2005; Sharples et al., 2007; Uden, 2007).

Building on the results above, an AT framework was developed and used to analyse the data collected from the students, and to investigate the guiding research questions of the study formulated at the end of Section 2. It was assumed that:

1. by identifying the contradictions in the activity system, the factors driving and/or inhibiting the success of the mLearning service may be revealed
2. by understanding how contradictions may be resolved, recommendations for improvement may be derived.

According to AT an activity can be represented as a set of interactive components (Engeström, 1987; Koszalka and Wu, 2004) as shown in Figure 3 of labour’. The ‘subject’ of the activity aims to reach a ‘goal’ through achieving a concrete ‘object’ motivated to use the provided ‘tool’ in a specific context, formed by ‘rules’, ‘community factors’ and the ‘division of labour’ (Figure 3).
Figure 3  The AT framework (see online version for colours)


Table 2  AT applied to the SMS-based earning scenario

<table>
<thead>
<tr>
<th>Component</th>
<th>Experiment context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tool</td>
<td>The SMS-based test revision mLearning activity as set up by the lecturer</td>
</tr>
<tr>
<td>Subject</td>
<td>The student participants; the lecturer</td>
</tr>
<tr>
<td>Object and goal</td>
<td><em>Object</em>: facilitate revision. <em>Intended goal</em>: success in the test. Negative experiences during the experiment (a possible barrier to learning) are 'unintended' goals</td>
</tr>
<tr>
<td>Rules</td>
<td>Paid service, available anytime anywhere. Funded, up to a set limit</td>
</tr>
<tr>
<td>Community</td>
<td>Answers can be shared among student participants</td>
</tr>
<tr>
<td>Division of labour</td>
<td>Learning content is prepared by the lecturer; students assume that it is relevant to the test</td>
</tr>
</tbody>
</table>

Considering the mLearning scenario and service described in Section 3.1 as an activity, the corresponding AT components can be identified and described in the context of the experiment as shown in Table 2.

The AT framework suggested above provides a means to represent and study the dynamics of mLearning as implemented in the concrete case. It can be seen that its components relate to the evaluative framework introduced earlier (refer Figure 1): the upper part of the activity triangle (tool and subject) matches the technology-people layer while rules, division of labour and community refer to the strategy-policy layer. The value generated by the mLearning service is embodied in the object as the object serves to facilitate achieving the ultimate goal of the activity. This makes it possible to interpret the findings of the AT-based data analysis within the context of the mLearning requirements framework introduced in Section 2.
4 Findings

The preexperiment survey results showed that the mobile device ownership was very high (95.8%). SMS was the preferred mLearning data technology of choice (69% compared to 44% for using multimedia message service – MMS and 49.55% for using a phone camera). About 67% of the students were interested in participating in an SMS supported revision for a test. About 71% of the potential participants identified themselves as problem solver/active experimenters or concrete experimenters.

The recurring themes identified in the textual data were found to relate strongly to four of the components of the AT framework (namely, tool, object, rules and community), as follows.

4.1 Tool

With regard to using SMS as a technology, student participants particularly appreciated its ‘anytime and anywhere’ aspect. Comments included “I found it most useful when I was on the bus and in bed”, “this feature is useful when you are not at your computer or in your study area”, “convenient to have answers in the mobile and have a look at it at anytime”, “mobile phone is natural”, “actually having the answers on your phone is handy”, “I could keep the answers on my phone, allowed for revision on the bus etc. So it was great I could study in places I usually could not”.

Some negative experiences were related to interruptions in the connection (“facing technical problems not helpful when you have exams close”, “the service seemed to be inaccessible … when I wanted to use most”), to the need to store large amounts of data (“message box exceeds capacity”, “I receive a lot of txt in very short time and my phone is out of memory”), and also to the need to access the Web server to retrieve the questions (“it seems funny to get the … list off the Web and then text”).

However, there were also comments positively evaluating the combined use of the web and SMS (“I think a combination of SMS and web revision would work the best”, “it could be developed to be used together with Internet to provide longer answers and explanations”).

4.2 Object

Students felt that the object (to facilitate revision in preparation for a test) helped them achieve the goal (to pass the test). Most students understood the object well (“I think it must be stressed though that it provides a foundation for studying more rather than covering the entire line of topic”). The format was found appealing (“particularly useful in obtaining short definite answers”, “I loved SMS. I especially liked the definite, to the point answers”, “It was good how it stated the question in the answer”, “saves time”, “if you do not know the answer, quickly to find – for just in time, reasonable”, “responses covered a good selection of material and were of a good length, and clearly explained the question without over elaboration”). Negative experiences included dissatisfaction with the perceived level of difficulty in some answers (“some questions – their answers were not simple to remember”), and their relative brevity (“useful, however answers need to be explained in depth”, “could expand questions and add supplemental sources”).
4.3 Rules

The timeframe and the mode of the service (students needed to be proactive in the week preceding the test in order to use it) were perceived as appropriate (“Good way to study for revision”, “Goes through the topic, given the opportunity to try to answer for yourself, or if you do not have the time – to do it quickly”). Most of the critical reflections referred to the cost of the service. Typical comments included: “Good idea, would definitely use if it were cheaper”, “I would only use it if it was free or near free”, “50 cents per question is too expensive”, “I would not pay 20 cents per message”, “I think it should be around the 2–5 cents mark”.

4.4 Community

In this experiment, the positive effect of community related factors was evidenced by a favourable evaluation of the opportunity to share question answers with others (“it is very good because it is very easy to exchange with others”). However, most participants did not value this option too highly, for different reasons: Some did not perceive themselves as a part of a learning community (e.g. “did not share as though were not friends”). Others were prevented from sharing by the cost barrier (e.g. “I doubt students would collaborate together to exchange txt-s, as most people are on different networks so it would still cost 20 cents”).

5 Discussion

The study aimed to investigate how mLearning might add value to the learning process. Two research questions were formulated. The next two sections address each of the questions in the light of the findings presented in the previous section.

5.1 Success drivers and inhibitors

As mentioned earlier it is as critical for mLearning, as it is for any other mobile business application, to provide support for the mobile user: a seamless and uninterrupted, ‘always on’ service. Other service features which may play a critical role as factors enabling mLearning adoption are information density (characterised by specificity, precision and conciseness), information relevance (the property of information to be expected and anticipated by the recipient of the service, as the information is needed to support a concrete activity) and ease of use (information needs to be delivered in an obtrusive way).

The findings of the study confirm that support for user mobility using the ubiquitous texting was most highly valued by students. This is consistent with the reviewed prior work where the importance of enabling the mobile user to learn anywhere anytime is underlined. The service was perceived by students as useful because it provided specific information in a condensed format (an information density aspect) and was available when expected (an information relevance aspect). As the mLearning scenario operated in pull mode, the service was unobtrusive by definition (however, none of
the participants commented on this aspect). Based on the findings, mobility support, information relevance and information density can be construed as the most important success factors emerging.

The analysis of the data using the AT framework revealed some contradictions within the components: With respect to the object, there were participants who had not understood well the stated goal of the experiment (which was not so much knowledge acquisition but checking one’s knowledge to gain confidence before the test). With respect to the tool, network problems may have interfered with supporting the user anywhere, anytime and consequently, the information may have not been available when expected.

Further contradictions were identified within the context: First the usefulness of the service was offset by what was perceived to be unreasonable cost. Second, information sharing did not occur on a large scale although it was technically feasible and would have saved some of the cost. Reasons provided by participants included cost and a possible lack of a pre-established social network. Finally, device limitations (memory) may have prevented downloading groups of responses which would have been cheaper compared to receiving individual answers.

The findings indicate that high service cost and inadequate understanding of the service purpose may have been detrimental to the success of the SMS revision scenario. The finding that students did not avail themselves of the cost-reducing sharing of information also needs to be considered carefully if a similar service is to be offered to a class where students had not had a chance to form a community or establish personal networks. If information sharing is not a feasible option, it will not help lower the cost barrier.

As stated in Uden (2007, p.86): “Activity theory sees contradictions not as problems but as sources of development. Activities are virtually always in the process of working through contradictions that subsequently facilitate change”. Therefore, identifying the barriers to mLearning in a specific context may help develop more successful, and pedagogically sound mLearning scenarios and models, and provide a productive direction for further research and practical work.

Based on the success drivers and barriers identified and discussed, it can be concluded that the value of the mLearning service increases with better mobility support, higher information density and strong information relevance, and diminishes with the growth in cost. The mLearning service value could be positively affected if participants were better informed about its purpose and about the additional ways to decrease its cost.

5.2 Overall evaluation

To assess the extent to which the scenario design and its implementation as a service met the mLearning requirements derived from the literature and discussed in Section 2, the requirements framework constructs and the corresponding components of the AT framework were aligned as shown in Table 3. The analysis of the findings of the primary qualitative data presented in the previous section allowed to identify the issues related to AT components and to the relevant construct of the requirements framework. The issues were further classified into ‘addressed’ and ‘not resolved’ and formulated as evaluative statements in Table 3 (last two columns).
Table 3 mLearning requirements and activity theory

<table>
<thead>
<tr>
<th>mLearning requirements framework constructs</th>
<th>AT framework components</th>
<th>(+) Issues addressed</th>
<th>(−) Issues Unresolved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology Tool</td>
<td>Immediate response</td>
<td>Connectivity interruptions. Answers need to be less than 150 characters</td>
<td></td>
</tr>
<tr>
<td>People Subject and community</td>
<td>Students: Use of a familiar ‘fun’ technology, ‘anytime any place access’, support for students with English as second language</td>
<td>Students: a danger of missing out if cost is prohibitive. Need to understand better the object</td>
<td></td>
</tr>
<tr>
<td>Strategy Div. of Labour and Community</td>
<td>A blended learning model is created</td>
<td>Depends on financial support as the service is commercial.</td>
<td></td>
</tr>
<tr>
<td>Policy Rules</td>
<td>Using a commercial service was acceptable</td>
<td>Not clear whether financial support will be available on a regular basis</td>
<td></td>
</tr>
</tbody>
</table>

Based on the analysis, it can be concluded that the three key success factors identified in the AT-directed data analysis (mobility support, information density and information relevance) are underpinning the positively addressed issues and satisfy requirements related to ‘people’ and ‘technology’ while the most significant barrier to success (cost) (unresolved issue) related to an unresolved issue arising from not meeting ‘strategy’/‘policy’ requirements.

This finding is consistent with Valentine (2004) where it is pointed out that a strategy and policy development effort at organisation and institutional levels will be needed to complement scholarly work and development. It may be concluded that the success factors in the case considered were mostly related to technology, people and strategy, while the barriers were mostly related to policy but also to strategy. The strategy (i.e. the pedagogical approach underpinning the service) may need to be improved to meet the value expectations. With respect to policy, the value of the mLearning service may increase if the service were made less costly through a suitable cost- and revenue-sharing model.

6 Conclusion

This paper describes an experiment involving mLearning using SMS. The experiment was designed after a study of the readiness of the participants in terms of mobile device ownership, mobile technology preferences and learning styles. The SMS scenario developed for the experiment worked in pull mode and was provided as a commercial service in a specific context. Qualitative data were gathered and analysed using an activity theory framework.

The study identified mobility support, information density and information relevance as the factors which contribute most to creating mLearning value and are therefore likely to be the key success factors in the adoption of mLearning in a similar setting. Service cost was identified as a major detractor for participants therefore it is likely to be an
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inhibitor to the adoption of mobile services in mLearning. In addition, it was established that even the sporadic lack of network reliability may play a critical role in a time-critical context.

The experiment successfully satisfied a number of mLearning requirements derived from prior research. However, it could have been even more beneficial to participants if they had already formed an active social group prior to engaging in mLearning, and if all participants had achieved a better understanding of the intended goal of the mLearning revision activity.

The study has a number of limitations: despite the efforts it was not possible to conduct a sufficient number of in-depth interviews. Secondly, as participants were studying information technology related subjects, the results may have been biased towards a certain type of student. Only one lecturer was involved (the author) and data from other academics were not collected.

The limitations stated can be addressed through further research including a wider base of research participants, the application of both qualitative and quantitative methods of data analysis and a deeper study of the role of the success factors and barriers to mLearning. It is hoped that the results presented here will be useful both in future research and in practical endeavours.

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