Tailoring SMS-Based M-Learning System to Malaysian Students' Preferences

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Abstract: -Adopting SMS (Short Message Service)-based learning system in educational institutions needs clear understanding of the students' preferences. As students increasingly accept mobile technologies to support and bridge the digital gap of teaching and learning environment, developing such systems that are not only effective, but also elicits their needs accurately has become more and more challenging due to incomplete initial analysis of users requirement. This paper presented students' perceptions on their needs in an SMS-based learning system. A quantitative survey was administered to undergraduate students from Science University of Malaysia (USM). Respondents' needs in SMS-based learning system were modelled according to components of system design as an attempt to design an effective SMS-based system to assist their learning process. Findings reported will serve as a platform to enable researchers to make recommendations and outline requirements in designing an effective SMS-based system for the case of Malaysian universities.

Key-Words: - user preferences, m-learning, system design, SMS, mobile technology.

1 Introduction

In developing a learning support system, analysis of users' requirement comes in the first place. Since the goal of the system is to assist users in learning, it is very important for the system to be designed in such a way that it can accurately model users' preferences. Identifying users' preferences is a crucial step in outlining users' requirement of a system [1]. A successful system begins with an understanding of users' needs and requirements [2]. In other words, a system which is most likely effective from users' perspectives is the one designed to know them in the first place.

However, transferring users' preferences into specific system design specification is not without a challenge. Incomplete initial analysis of users' requirement may cause a support system to appear less user-friendly, not flexible and ineffective from the perspective of users. [3] Modelling users' preferences in a learning system is one of the most challenging tasks nowadays. Most systems limit their users' modelling process to only students' knowledge and do not pay much attention to their needs [3]. As a matter of facts, even a successful e-learning system still requires a clear understanding on the learners' needs, which is accomplished by focusing on the principles of learner-centred criteria [4].

Specifically, for the case of designing a mobile learning or m-learning system via SMS, there is also a need to grasp the environment in which the system will function from the perspective of users themselves. Studies by other researchers also have shown that, in designing a mobile learning system, identifying and understanding users' needs in using such system is one of the crucial factors [5][6]. For instance, users may be surveyed on how they think mobile system should work for the learning activities [6]. [7] A few key technologies such as learner model and intelligent adaptation can also be utilized to establish an m-learning system which can truly understand the learners. Either way, any m-learning system should be able to meet users' demands due to the fact that users' preferences are key roles determining a successful learning system. Furthermore, it was reported that many m-learning systems which were unable to support a mobile learning course in a seamless manner had also failed to meet the users' expectations [8].

Amid the growing needs for effective m-learning systems in developing countries, learners' demand for such systems is also increasing. Thus, it is incumbent on education researchers to identify how can an m-learning system be designed and tailored to meet the users' needs and preferences. Accordingly, this paper proposes a quantitative

survey approach from Malaysian students' perspective to explore which factors of users' preferences are crucial in determining the design requirement of an SMS-based m-learning system. With this approach, findings identified will be beneficial for those researches involve in designing an SMS-based m-learning system that could fit users' needs and requirements, specifically for the case of Malaysian higher learning institutions.

2 Problem Domain

Literature has been rich with studies regarding m-learning potentials in higher learning institutions. There are also clear views on how m-learning can be adopted in developing countries. Nevertheless, without proper consideration on users' preferences, adopting such system in teaching and learning is not without a challenge.

2.1 Users' Preferences

[1] User's preference is the degree to which the user likes a product, by which the psychological dimensions of a user's preferences may include the perceptive, affective and behavioural dimensions. From the perceptual dimension, the design elements of the product are key roles that influence the user's preferences [1]. The preferences can quantitatively be measured by studying how people feel about the product. Then, these users' perception inputs are translated into the specification of the product design. Conclusively, the same study also implied that the characteristics of users' preferences may act as a reference model for a product design and development.

[2] Understanding user requirements is a necessary portion in the design of a successful system. The benefits gained from a clear user-centred design include increased productivity, cost reduction and improved user satisfaction [2]. However, the tasks to analyze and specify these requirements are not easy. For instance, problems may arise along the process in outlining users' needs in advance and representing the requirements in an appropriate form [2]. The same study also proposed four elements in analyzing users' requirements, which includes information gathering, user needs identification, envisioning and evaluation, and requirements specification. Then, the information gained still needs to be reflected back via simulation because survey and interview alone are not enough to prototype these requirements [2].

2.2 SMS-based M-Learning

With the rise of explosive development in the information age nowadays, the utilization of technology in education throughout the world is continuously growing. In this climate of change, mobile assistant devices are also being increasingly adopted as a tool for developing the teaching and learning programs. As a matter of fact, mobile-based learning was believed by several researchers to be the next generation of e-learning [9][10][11].

The utilization of mobile devices for teaching and learning tool is known as mobile learning or m-learning. Among several mobile technologies being used for learning, SMS appeared to be the most ubiquitous and stable one, which makes it a great potential in education [12]. SMS messaging was also found to be the most useful and convenient way of communication technology [13]. Not only that, it is the simplest technology available in the mobile environment which also supports various interactive learning activities [13]. Most of all, with the increasing cell phone penetration especially in developing countries, the use of SMS is beneficial for learners in both formal and non-formal education at minimal costs [14].

There have been a few applications in the literature on the utilization of SMS as a teaching and learning tool, such as for question-answering application [13], learning vocabulary [15] [16] learning supports for technical courses [17] [18] and as communication supports between students and tutors [Jo19nes et al., 2011]. Even more interesting, SMS also has the potential to be manipulated so that users not only can access information, but also have the ability to contribute information as well [20]. By this, the concept of mobile audio-wikipedia was developed with the combination of SMS and text-to-speech technologies [20].

It can be inferred from findings from studies above that SMS-based m-learning has a great potential in facilitating teaching and learning process in educational institutions throughout the world.

2.3 Design Requirement for an SMS-based M-Learning System

It is apparent that designing an SMS-based m-learning system needs a clear understanding of several factors and design requirements, which vary by purposes and objectives of the system being designed. Fardoun et al. [21] proposed an m-learning system, MPrinceTool that aims to improve the deficiencies identified in the current education practices. Iterative and learner-centred design and evaluation were used to by the researchers to gain

valuable information in designing the m-learning system. The system was seen as an interaction improvement to other m-learning systems [21]. Abdullah and Siraj[22] focused their studies on the curriculum design of m-learning system. The study consisted of three phases, whereby the first phase was needs analysis. In the needs analysis, the elements drawn from the survey method include curriculum objectives, electronic tools and services, curriculum content, teaching and learning strategies, and form of assessment [22]. In studying the learners' expectations of an SMS-based m-learning system, Ryu et al. [23] interviewed the participants to identify types of work contexts, tasks, information and design features that would suit them. The framework proposed by the study was to identify the design requirements of m-learning from four aspects, including design issues, learning contexts, learning experience and learning objectives. Likewise, other studies proposed some design characteristics of SMS-based m-learning system. The elements suggested include concise and short content [24], and modified mobile interface for convenient usage [25]. Conceptually, an SMS-based m-learning system designed for learners need to consider several aspects such as phone limitation, effectiveness of contents and learning objectives.

Designing a learning system in essence requires a clear understanding of the learners' preferences. While the design requirements of an SMS-based m-learning system as proposed by others can be many, there are few literatures that concern on users' preferences on the aspect of system design as a whole. Despite the clear need for such studies, some other literature seems to focus more on technical aspects. Studies that outline users' preferences to set the initial tailoring of the system design are yet to be further discovered. Thus, this study proposes that the design of SMS-based m-learning environment in concerns of users' preferences from the following perspectives: learning methodologies, content design, learning application, learning delivery and learning supports.

3 Research Questions

This study was conducted to answer the following research questions:-
- What are the respondents' preferences in using mobile phones?

- What are the respondents' preferences in learning methodologies of an SMS-based m-learning system?
- What are the respondents' preferences in the system design (content, application, delivery, and support)?

4 Methods

The reported study was an exploratory one to study users' preferences of an SMS-based learning system from Malaysian students' perspectives. It was a part of a larger study to design an SMS-based learning system which will complement the current teaching and learning modes practiced by most higher education institutions in Malaysia.

A quantitative approach through survey method was used to survey the respondents' preferences in an SMS-based m-learning system. The questionnaires were administered to undergraduate students from a university in Malaysia.

4.1 Sample

Fifty undergraduate students undertook fulltime course on Structure and Grammar in English in the School of Humanity Science, USM during the first semester of 2011/2012 academic year. The students were purposely selected such that they never had any experience with an SMS-based learning system before. Moreover, they had been chosen to participate in the SMS-based learning project during the semester. Since the students did not have any experience with such system, a brief guideline introducing the SMS-based learning system was given to them during the class. Afterwards, a survey was administered to each of the students in the class to gather data on respondents' perceptions on what they need in an SMS-based learning system. 46 of those questionnaires were returned, providing a 92 percent return rate.

Table 1 summarized the demographic profiles of the respondents. Of these subjects, 39 (84.8%) were female and 7 (15.2%) were male. Almost all (97.8%) respondents were between 20 to 30 years old. In terms of academic performance, majority of respondents (67.4%) scored at least 3.00 for their CGPA. More than half respondents were in their second year of their studies (52.2%).

Table 1 Demographic Profiles

	Frequency	Percentage (%)
Gender		
Male	7	15.2
Female	39	84.8
Age (year)		
20 to 30	45	97.8
31 to 40	1	2.2
Ethnic		
Malay	26	56.5
Chinese	12	26.1
Indian	6	13.0
Others	2	4.3
Marital		
Single	45	2.2
Married	1	97.8
Year of Study		
Year 2	24	52.2
Year 3	15	32.6
Year 4	5	10.9
More than 4	2	4.3
Current CGPA		
2.00 to 2.49	4	8.7
2.50 to 2.99	11	23.9
3.00 to 3.49	23	50.0
3.50 to 4.00	8	17.4

Table 2 Reliability and Normality Report of Learning Methodologies

	Mean	SD	Alpha	Skewness	Kurtosis
Learning activities	3.598	0.559	0.634	0.081	0.410
Assessment	3.913	0.558	0.752	-0.317	-0.468
Resources	4.228	0.555	0.822	-0.026	-0.821
Interaction	4.015	0.656	0.815	-0.107	-0.654
Personalization and individualization	3.837	0.635	0.808	-0.299	-0.352

Table 3 Reliability Report of Preferences in SMS-Based Learning System

	Mean	SD	Alpha	Skewness	Kurtosis
Learning methodologies	3.919	0.454	0.899	-0.414	-0.290
Content design	3.711	0.549	0.758	-0.410	1.438
Learning application	3.750	0.738	0.919	-0.243	-0.101
Learning delivery	3.734	0.690	0.892	0.098	-0.614
Learning supports	3.715	0.610	0.865	0.325	-0.043

4.2 Instrument

Data were gathered by using a quantitative survey method. The survey entitled "Survey of Users' Preferences in SMS-Based M-Learning System" was developed, whereby it combined items from Zawacki-Richter [26], Al-Fahad [27], and own items based on researchers experienced in using SMS-based system. Before the commencement of the survey, the respondents were given a briefing on the purpose of the survey. Out of 50 questionnaires being distributed, 46 were returned, providing a 92 percent return rate.

The instrument consisted of six sections with 90 questions. The sections were on demographics, mobile phone usages, knowledge in SMS-based learning, preferences in system, users' perceptions and recommendations. The section on mobile usage surveyed on amount of mobile phone owned, brand of mobile phone, service provider, types of service, most frequent application, language being used, and average SMS sent daily. Section on knowledge in SMS-based learning adapted Zawacki-Richter [26] while section on users' perceptions adapted Al-Fahad [27].

On the learning methodologies, the items were constructed based on the strategies and methodologies in m-learning as proposed by Zawacki-Richter [26]. There were five variables with four items each that measure the learning methodologies [26]. The variables include learning activities (active learning and question-answer session), assessment (testing and evaluation), resources (information and sharing), interaction (collaboration and experts consultation), and personalization and individualization (learners behaviour and learning pattern)[26]. Other measurements on users' preferences that were self-developed by researchers were on content design, learning application, learning delivery, and learning supports.

All questions were closed-ended type. Except for sections on demographic, mobile phone usage and recommendation, all measurements utilized five-point Likert-type scale ('1' – Strongly disagree, '2' – Disagree, '3' – Partially agree, '4' – Agree, and '5' – Strongly agree). The instrument was validated by two field experts. Pilot test was performed on 30 undergraduate students to verify the reliability of the instruments. As described in Table 2 and Table 3, it can be seen that all variables of students' preferences in SMS-based learning system were deemed to be reliable, since all alpha values exceeded the conventional minimum value of 0.7 [28].

4.3 Data Analysis

Data were analyzed using statistical software, PASW 17.0 descriptively by using mean, standard deviation, frequency and percentage.

5 Findings

As discussed in the methods section, findings of the study are the results of preferences analysis to identify what are the students' needs in designing an SMS-based learning system. Through the survey technique, the respondents were asked on five areas of users' preferences in using SMS-based learning system. The areas of students' preferences in using the system include preferences in using mobile phone, content design, learning application, learning delivery and learning supports. Details of respondents' preferences in each area were discussed as follow:
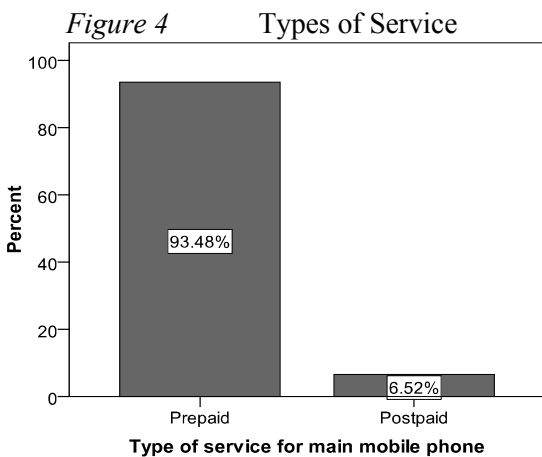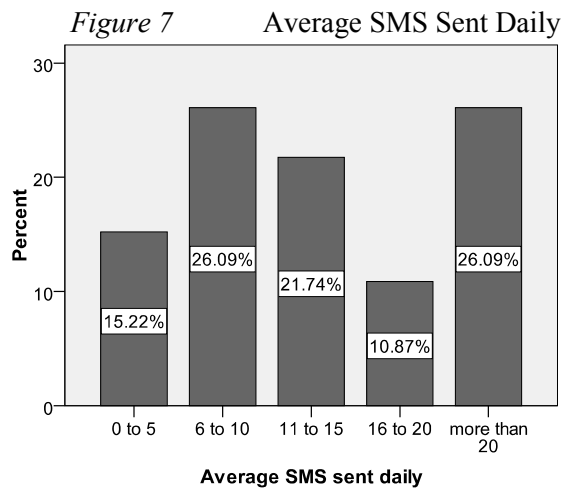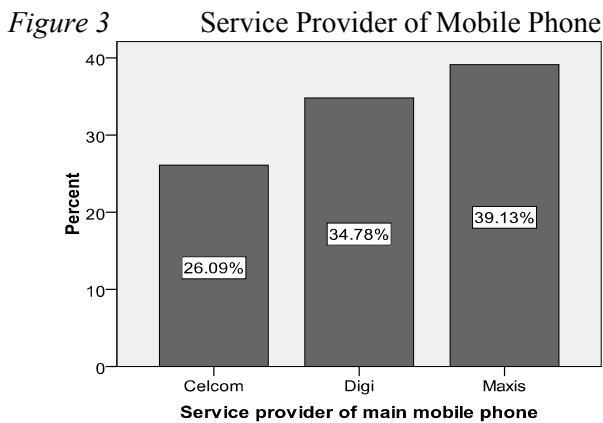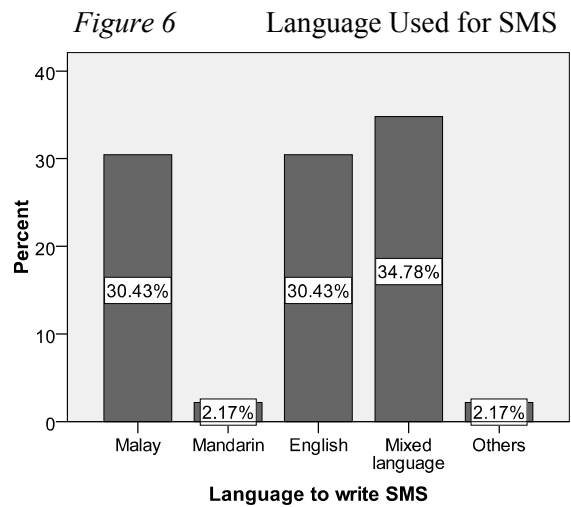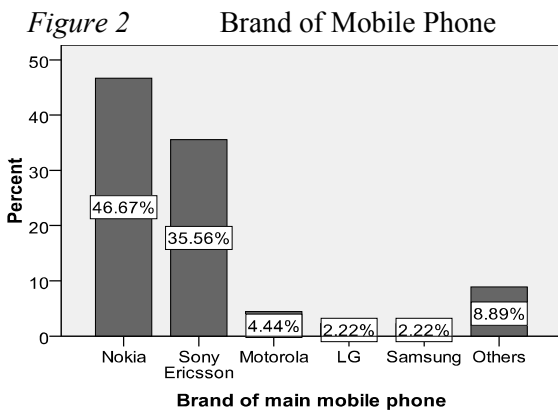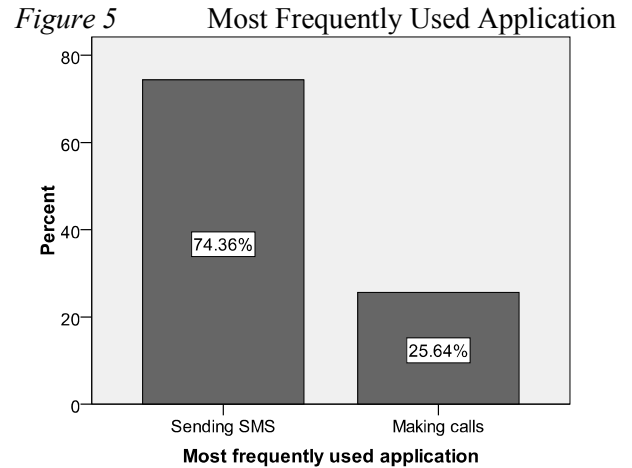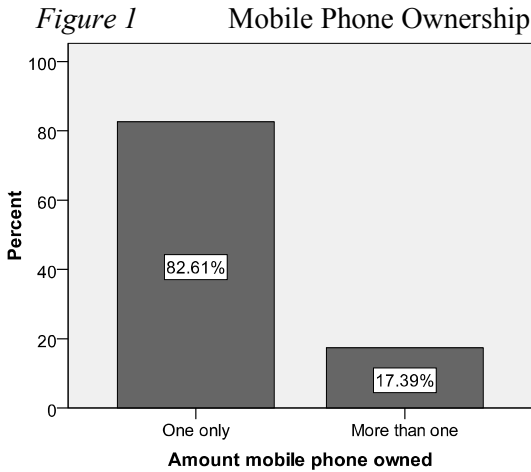
5.1 Preferences in Using Mobile Phones

In designing an SMS-based m-learning system, it is crucial for initial studies to include the analysis on the learners' preferences in using mobile phones. By this, the findings will also indicate how capable the learners are in using mobile phones for basic functions.

Figure 1 to 7 showed graphical representations of respondents' preferences in using their mobile phones. From Figure 1, it can be seen that mobile phone ownership among the students was high, whereby 17.39% of them owned more than one mobile phone. Their most common brand of mobile phone was Nokia, with 46.67% (Figure 2), while Maxis appeared to be more selected as the service provider (Figure 3). As for service plan, almost all students (93.48%) had chosen the prepaid plan (Figure 4).

The respondents' preferences in using SMS were described as the following statements. From Figure 5, it is also interesting to see that sending SMS was their most frequently used application from mobile phone. In terms of language, majority of students used mixed languages to communicate via SMS (Figure 6). However, there appeared to be a balance pattern in the percentage of average SMS sent daily. Some respondents sent around 6 to 10 SMS per day, while some even sent more than 20 (Figure 7).

These findings signalled the potential of SMS-based learning system since there was a preference in using mobile phone, specifically the SMS application among the respondents.

Figure 1   Mobile Phone Ownership

Figure 2   Brand of Mobile Phone

Figure 3   Service Provider of Mobile Phone

Figure 4   Types of Service

Figure 5   Most Frequently Used Application

Figure 6   Language Used for SMS

Figure 7   Average SMS Sent Daily

5.2 Preferences in Learning Methodologies of SMS-Based M-Learning

As seen in Table 4, respondents' preferences in the learning methodologies were analyzed from five variables, which are learning activities, assessment,

Table 4   Preferences in SMS-based M-Learning (Learning Methodologies)

Preferences in Learning Methodologies	Percentages of Agreement					Mean[a]	SD
	5	4	3	2	1		
Prefer to learn actively	23.9	56.5	17.4	0	2.2	4.00	0.789
Understand better in question-and answer way	19.6	54.3	21.7	4.3	0	3.89	0.767
Learning should be informal	10.9	39.1	39.1	10.9	0	3.50	0.837
Hard to learn when do not participate actively	6.5	13.0	56.5	21.7	2.2	3.00	0.843
Learning Activities						**3.598**	**0.559**
Should evaluate students' work	8.7	37.0	47.8	6.5	0	3.48	0.752
Should give feedbacks regarding work done	21.7	54.3	23.9	0	0	3.98	0.683
Prefer a two-way method to always assess work	21.7	47.8	26.1	4.3	0	3.87	0.806
Need to know questions been answered correctly	45.7	41.3	13.0	0	0	4.33	0.701
Assessment						**3.913**	**0.558**
Should allow to get any information to seek for	45.7	45.7	8.7	0	0	4.37	0.645
Should provide greater access to information	39.1	54.3	6.5	0	0	4.33	0.598
Can share the resources with others	26.1	43.5	28.3	2.2	0	3.93	0.800
Should give learning content related to classes	41.3	45.7	13.0	0	0	4.28	0.688
Resources						**4.228**	**0.555**
Allow students to collaborate with others	30.4	43.5	23.9	2.2	0	4.02	0.802
Allow students to communicate with lecturers	30.4	41.3	23.9	4.3	0	3.98	0.856
Can interact with the system	28.9	42.2	26.7	2.2	0	3.98	0.812
Should be interactive	32.6	45.7	21.7	0	0	4.11	0.737
Interaction						**4.015**	**0.656**
Suit needs as independent university students	34.8	43.5	19.6	2.2	0	4.11	0.795
Can self learn when no guidance from lecturer	6.5	37.0	41.3	13.0	2.2	3.33	0.871
Should give students more flexibility	21.7	54.3	21.7	2.2	0	3.96	0.729
Students can control own learning process	26.1	45.7	26.1	2.2	0	3.96	0.788
Personalization and individualization						**3.837**	**0.635**

[a]the means are determined by using a five-point Likert scale rating from strongly agree (5) to strongly disagree (1)

Table 5   Preferences in SMS-based M-Learning (Content Design)

Preferences in Content Design	Percentages of Agreement					Mean[a]	SD
	5	4	3	2	1		
Abbreviated content helps better memorization	15.2	41.3	30.4	13	0	3.59	0.909
Simple content is easily to be remembered	30.4	45.7	21.7	2.2	0	4.04	0.788
Learning content is precise	45.7	43.5	8.7	2.2	0	4.33	0.732
Learning content is written in English	39.1	41.3	15.2	4.3	0	4.15	0.842
Learning content is written in Malay[b]	6.5	13.0	39.1	17.4	21.7	2.64	1.171
Content is designed in linear form, i.e. not segregated	15.2	26.1	41.3	6.5	10.9	3.28	1.148
Text-based content helps better understanding	10.9	50.0	34.8	4.3	0	3.67	0.732
Content is readable in the mobile phone's screen	26.1	47.8	21.7	4.3	0	3.96	0.815
Content design						**3.71**	**0.549**

[a]the means are determined by using five-point Likert scale rating from strongly agree (5) to strongly disagree (1)
[b]the national language in Malaysia

Table 6   Preferences in SMS-based M-Learning (Learning Application)

Preferences in Learning Application	Percentages of Agreement						
	5	4	3	2	1	Mean[a]	SD
Educational text reading materials	21.7	43.5	19.6	13.0	2.2	3.70	1.030
Course alerts	30.4	43.5	19.6	6.5	0	3.98	0.882
Lesson tips	34.8	39.1	19.6	4.3	2.2	4.00	0.966
Multiple-choices quiz	26.1	30.4	32.6	10.9	0	3.72	0.981
Marks	30.4	41.3	17.4	8.7	2.2	3.89	1.016
Ask queries	30.4	45.7	17.4	6.5	0	4.00	0.869
Answers to queries	26.1	41.3	26.1	4.3	2.2	3.85	0.942
Queries auto-response	26.1	47.8	21.7	4.3	0	3.96	0.815
Discussions with friends and lecturers	10.9	30.4	34.8	19.6	4.3	3.24	1.037
Threads of discussions	10.9	30.4	32.6	17.4	8.7	3.17	1.122
Learning application						**3.75**	**0.738**

[a]the means are determined by using five-point Likert scale rating from strongly agree (5) to strongly disagree (1)

Table 7   Preferences in SMS-based M-Learning (Learning Delivery)

Preferences in Learning Delivery	Percentages of Agreement						
	5	4	3	2	1	Mean[a]	SD
Receive learning content in class	10.9	43.5	34.8	6.5	4.3	3.50	0.937
Receive learning content in hostel or home	23.9	45.7	28.3	2.2	0	3.91	0.784
Receive learning content at night	15.2	52.2	21.7	8.7	2.2	3.70	0.916
Receive learning content anytime	17.4	30.4	37.0	6.5	8.7	3.41	1.127
Receive learning content anywhere	17.4	37.0	39.1	4.3	2.2	3.63	0.903
Receive learning content more than once per week	21.7	45.7	30.4	2.2	0	3.87	0.778
Receive consecutive learning contents at a time	19.6	39.1	30.4	8.7	2.2	3.65	0.971
Receive notes automatically without request	34.8	37.0	23.9	0	4.3	3.98	1.000
Receive tips and alerts automatically without request	34.8	34.8	26.1	0	4.3	3.96	1.010
Learning delivery						**3.73**	**0.690**

[a]the means are determined by using five-point Likert scale rating from strongly agree (5) to strongly disagree (1)

Table 8   Preferences in SMS-based M-Learning (Learning Supports)

Preferences in Learning Supports	Percentages of Agreement						
	5	4	3	2	1	Mean	SD
Portal	35.6	46.7	15.6	2.2	0	4.16	0.767
Lecturers	24.4	57.8	17.8	0	0	4.07	0.654
Technical people	22.2	53.3	24.4	0	0	3.98	0.690
Course mates	22.2	42.2	28.9	6.7	0	3.80	0.869
Printed user manual	13.3	33.3	35.6	11.1	6.7	3.36	1.069
Practical demonstration	17.8	46.7	28.9	2.2	4.4	3.71	0.944
Recorded video	6.5	30.4	39.1	17.4	6.5	3.13	1.002
PowerPoint presentation	15.2	41.3	30.4	10.9	2.2	3.57	0.958
SMS helpline system	21.7	39.1	30.4	8.7	0	3.74	0.905
Learning supports						**3.72**	**0.610**

[a]the means are determined by using five-point Likert scale rating from strongly agree (5) to strongly disagree (1)

resources, interaction, and personalization and individualization.

From the preferences on learning activities, the result showed that most respondents agreed that they need to learn actively (mean = 4.00). Furthermore, some of them agreed that they found it hard to learn if they did not participate actively in the class (mean = 3.00). There were also positive responses towards respondents' preferences on assessment, where most of them agreed that they need the system's feedback (mean = 3.98) to know which answered had been answered correctly (mean = 4.33). There were even more positive responses towards preferences on resources. Most respondents reported that they need a system that gives greater access to information related to their courses (mean = 4.33), as well as sharing the information with others (3.93). Interaction was also seemed to be one of the key elements in a learning system identified by most respondents (mean = 4.11). From their perspectives, the system should allow students to interact with other students, lecturers, and the system itself. Most of all, in terms of personalization and individualization, majority of students need a learning system that allows them to be independent university students (mean = 4.11).

Conclusively, assessment, resources and interaction were three key elements in SMS-based m-learning methodologies that were mostly preferred among the respondents in the study (mean values = 3.913, 4.228, 4.015).

5.3 Preferences in the System Design

System design is the process to create the technical solution that satisfies the functional requirements of a system [29]. For the case of this study, the system design for SMS-based m-learning system was translated from four measurements, which are content design, learning application, learning delivery and learning supports.

5.1.1 Content Design

In designing a successful SMS-based m-learning system, it is crucial for the learning content to be designed effectively in the first place. Results pertaining to the respondents' preferences on SMS-based learning content design were summarized in Table 5. From the table, it can be seen that majority of students in the study preferred the course learning content to be precise (mean = 4.33) and simple (mean = 4.04) for them to easily remember it. However, most respondents prefer the learning content to be constructed in English language rather than the national language, Malay (mean for English = 4.15, mean for Malay = 2.64). The most intriguing result is, most of the respondents did not care much about the content readability within the limited screen of mobile phones.

5.1.2 Learning Application

After the content is effectively designed to meet the requirement, types of learning application to be applied in the system need to be clarified. Table 6 indicated several learning applications that were mostly preferred by the respondents. The applications were educational text, course alert, lesson tips, multiple-choices quizzes, marks, ask queries, answers to queries, queries auto-response, discussions with friends and lecturers, and threads of discussions. In general, all learning applications appeared to be preferred by at least some of the respondents. Specifically, it can be seen that among ten SMS-based learning applications listed, the three applications that were mostly preferred by the respondents were lesson tips, ask queries, and course alerts (mean values = 4.00, 4.00 and 3.98). Queries auto-response system was also seemed to be needed by some respondents (mean = 3.96).

5.1.3 Learning Delivery

After the learning applications were modelled into the system, researchers need to outline how the learning content can be effectively delivered by using the system. Table 7 demonstrated some findings related to the students' preferences in the SMS-based learning delivery. The highest preference in terms of delivery was that the respondents preferred the learning notes, alerts, and tips to be delivered to them via SMS automatically, without having to request for the content (mean values = 3.98 and 3.96). However, by location and time, more respondents preferred to receive the SMS-based learning content when they are in hostel or home, rather than to receive it in their classes (mean = 3.91). They also preferred to receive the content at night (mean = 3.70). In terms of SMS sending frequency, they did not mind to receive the learning content more than once per week.

5.1.4 Learning Supports

Learning supports are important key elements in ensuring the connectivity between learners and a learning system. As indicated in Table 8, learning

supports that mostly preferred by the respondents were portal (mean = 4.16), lecturers (mean = 4.07) and technical people (mean = 3.98). Course mates were also likely to be effective a learning support from the perspectives of some respondents (mean = 3.80).

6 Discussions

Findings from this study indicated users' preferences in SMS-based m-learning system from the aspects of learning methodologies, content design, learning application, learning delivery, and learning supports.

In terms of learning methodologies, the respondents seemed to prefer a system which offers the elements of resources, assessment and interaction as ways to learn through SMS-based learning. To fulfill this requirement, the SMS-based learning system can be designed in such a way that it is resourceful, able to assess work and allows interactivity among learners, lecturers and system. For instance, a question answering application will promote assessment and interaction elements of SMS-based learning system [13].

As discussed previously, this study outlined users' preferences in system design from the aspects of content design, learning application, learning delivery and learning supports. From the findings on content design, the respondents were not averse to receiving the content in simple and precise manners since it is easier for them to memorize. For the learning to be effective, the respondents prefer the content to be also written in English. These findings are consistent with previous researches and literature by Ismail et al. [30] who reported that the respondents feel supported since the SMS learning contents are brief yet powerful. Thus, these preferences suggested that there is a potential for SMS-based learning to work effectively from the perspectives of users since SMS content by nature, is normally abbreviated by people in its simpler and precise form.

As for learning application, majority of respondents prefer the applications of course alerts, tips and ask queries, if the applications are to be built in an SMS-based m-learning system. These findings suggest that the respondents need a learning system that can provide them alerts and tips regarding the course instantly, just by the tips of their fingers. They also required a two-way interaction with the system, whereby they need to acquire own knowledge via the SMS-based learning system. There was some evidence in this study that the respondents agreed that they need a system that

allows them to be independent learners. This result is concurrent with Vonderwell [31] who suggested that students need to become active learners and seek own learning strategies from their experiences. It was also reported in this study that some students prefer to have an auto-response system for their queries. This result implied that the students need feedbacks regarding works they have completed. Vonderwell [31] also stated that the students need prompt feedback and response from their lecturers regarding their queries and questions.

However, the respondents seemed less enthusiastic with the system ability to send learning content at anytime and anywhere they were. Specifically, more respondents preferred to only receive the learning content while they are at hostel or home, not in the classes. They also need the content to be delivered to them at night time only. These findings might imply that the respondents did not want the SMS-based learning system to be in concurrent with the class sessions. This result is considerably relevant to the campus-based students, for whom studying have to coexist with other demands on their time and attention. Thus, the system may be much more beneficial to the campus-based students as a complementary tool to the existing modes of learning.

In terms of learning supports, findings reported in the study had shown that most respondents preferred to receive learning supports from portal, lecturers and course mates. Therefore, the SMS-based learning system might as well works in conjunction with the e-learning portal in assisting students during the teaching and learning process. In addition, interactions of student-student and student-lecturer are also compulsory to develop good supports for students to use the system. These findings are consistent with findings by Vonderwell [31] who also implied that instructor guidance and support as well as peer support are important for communication and learning.

7 Conclusions and Recommendations

With the increasing mobility of peoples' lives nowadays, it is considered to be a necessity for the utilization of mobile technologies as an educational tool to support teaching and learning in educational institutions. Findings from this study serve to fulfill the preliminary stage in designing an SMS-based m-learning system. The analysis of USM undergraduate students' preferences revealed that, in designing an SMS-based learning system that reflects the needs of its user, the following elements need to be highlighted:

- greater access to information
- ability to assess learners' work
- promotes interaction between students, lecturers and system
- simple and precise content
- tips and alerts application
- allow students to query own information
- no conflict with classes time and location
- frequency of sending content

In light of findings obtained from this study, it is believed that further studies that involve the users' requirements analysis with elements of technicality. Admittedly, this paper only provides glimpses of Malaysian students' preferences from the perceptional inputs. A cleared understanding of users' preferences from a more technical aspect may provide useful insights pertaining to the process of tailoring SMS-based m-learning system design according to users' preferences. Another related issue worthy of research is whether users' preference is merely needed in the initial design stage, or whether it should be viewed as an ongoing process until the stage of developing the system.

In conclusion, this study proposes that, designing an SMS m-learning system requires an overarching view of the learning methodologies, content design, learning application, delivery and supports. The synergy between a learning system design and users' demands, thus, holds enormous potential.

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