Handbook of Mobile Teaching and Learning
DOI 10.1007/978-3-642-41981-2_9-1

Use of Short Message Service for Learning and Student Support in the Pacific Region

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Abstract

The Pacific island communities face challenges such as digital divide, shoestring budgets, and escalating costs in the delivery of quality education to the people. In addition, the widely scattered nature of islands and communities requires proper communication infrastructure for the learners to access education. This chapter heralds the emergence of mobile learning (mLearning) initiatives in higher education in the Pacific region. It focuses on the introduction of mLearning at a University in the Pacific islands, which developed a fit-for-purpose mobile-learning infrastructure that primarily utilized the short message service (SMS). The university hosts an in-house setup open source SMS gateway that facilitates its custom-made SMS services. The SMS services developed serve the purpose for notifying students with important course information, exam timetable information, course mark information, and library book due dates, and students could also attempt quizzes in their courses via SMS. These SMS services are mostly provided as support services to overcome the challenges faced by the learners in the Pacific community.

1 Introduction

Mobile learning or mLearning is a concept arising from the global emergence of mobile technology and the acceptance of the use of mobiles by the general population to provide assistance in various aspects of their livelihood. In the learning and teaching processes, mLearning invariably allows for just-in-time, just-for-me, and just-enough learning to the users. According to Brasher and Taylor (2004), mobile learning is defined as "any sort of learning that happens when the learner is not at a fixed, predetermined location, or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies." With mobile devices being cheap, widely available, and educationally interesting compared to desktop and laptop computers, they are more likely to be accepted by learners. To the learners mobile devices offer several communication channels such as email and voice and text messaging and wireless access to educational materials and resources (Traxler and Kukulska-Hulme 2005) and social media.

Mobile learning in developed countries such as the UK has seen a massive growth in the recent years (Oller 2012). According to MobiMOOC (2011), the UK MoLeNET program (a program for the implementation of mobile learning) has been supported with more than $25 million in funding by government and academia, and it involves more than 40,000 learners in 104 different projects involving 147 colleges and 37 schools. Also, in the USA mobile-learning programs either provide mobile devices to students directly or allow students to bring their own technology (BYOD) given that 75 % of teenagers

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DOI 10.1007/978-3-642-41981-2_9-1

have mobile phones as stated by Wallace and Madden (Tsinakos 2014). A number of mobile-learning projects such as Qualcomm's Wireless Reach and On-the-Go have been very successful upon initiation. The aim of these projects was mainly to escalate student access to educational content and enhance communication between instructors and learners through online tools and resources (Tsinakos 2014).

On the other hand, in the developing countries, the potential for mLearning is comparatively lower. In Africa and the Middle East, the number of mobile-learning projects is low showing that the mobile learning is still in its infancy (Tsinakos 2014). There are isolated cases, for example, the Kenyan government piloted a project to send bulk SMS to primary school teachers in remote rural areas (Traxler and Kukulska-Hulme 2005). Motiwalla's study in 2007 found that mLearning tools were better suited for institutions in developing countries due to its nature of flexibility, cost effectiveness, and very convenience to these institutions which are populated by students who are categorically different. Moreover, with the current trend in technology, the quick adoption of new technologies by the younger generation means that mobile devices are becoming effective tools for learning. In the Pacific the reach of telecommunications is wider than that of the Internet; mobile learning can be a feasible, plausible, and an effective learning tool in the region where learners find difficulty in accessing learning materials from their learning centers due to poor Internet connectivity (Finiasi et al. 2013).

The University of the South Pacific (USP) has explored the benefits of mLearning for the Pacific region and how it would work on the three pillars of mLearning – just for you, just enough, and just in time – to make learning easier and more accessible to students keeping in mind the various limitations and restrictions, some unique to the Pacific region.

1.1 Mobile Devices in the Pacific

In the Pacific region today, growing public evidence suggests that ubiquitous mobile devices, especially mobile phones and more recently tablet computers, are being owned by a large percentage of people who use it for various purposes that the devices and their applications have to offer. The vast increase of mobile ownership in the region is accredited to the better call/SMS rates, affordable data packages, its simple yet exciting features, changing lifestyles, and a growing need for connectedness (Ulfa 2013). The increasing usage of Facebook and other social networking sites also contributes to the growing percentage of mobile ownership and usage in the Pacific. In the modern age, the mobile devices are in the midst of communication as "staying connected" is a part of the social need.

The mobile technology has grown parallel to the Internet, and now these devices can be used to connect to the Internet. An added excitement is that while there is a sharp decline of costs in the technological market, the mobility, portability, high speed, and storage capacity attributes of the devices are very attractive. Due to the high demand of mobile devices, the value for a phone would be depreciated within a short period of time from its original release date. Hence the region is usually inundated with older versions which are available at very affordable prices, although there is also a demand for the latest and high-end mobile devices.

Figure 1 gives the mobile subscriptions for selected Pacific island countries from 2000 to 2013. The trend shows the rapid increase in the number of mobile users and is following trends similar to that of Asia, Europe, Commonwealth of Independent States (CIS), Africa, and the USA. More information about global mobile trends can be obtained from the ITU website (ITU 2014).

1.2 USP Mobile Learning Initiative

The USP has a student population of approximately 30,000 (Dashboard and Business Intelligence System – USP 2014) and comprises 14 campuses and 9 centers spread over and owned by 12 member countries – Cook Islands, Fiji Islands, Kiribati, Marshall Islands, Nauru, Niue, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, and Vanuatu (Jokhan and Sharma 2010). See Fig. 2.

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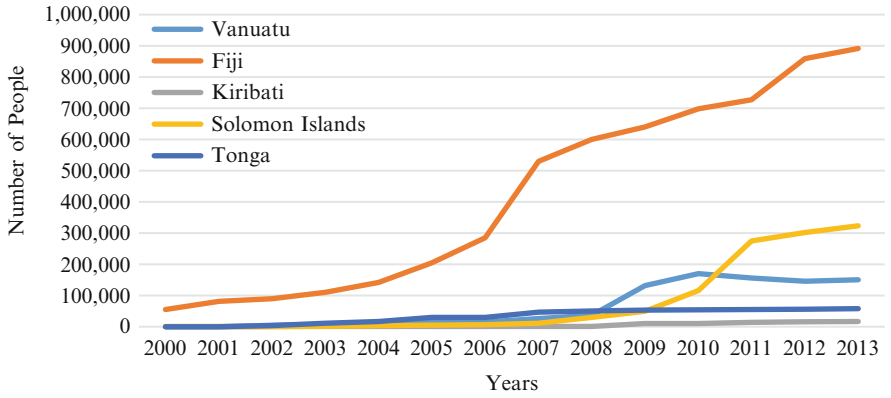

Fig. 1 Mobile subscriptions in the Pacific region (Source: International Telecommunication Union 2014)

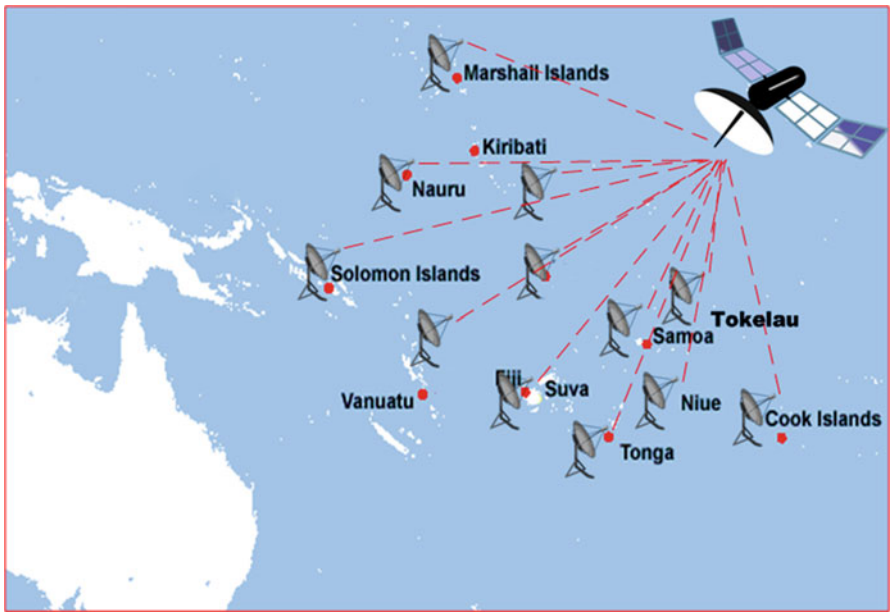

Fig. 2 USP member countries connected throughout the Pacific region

As the member countries struggle with their priorities, there are additional challenges of low and intermittent electricity supply, low Internet penetration, high cost of Internet and telecommunications, lack of financial resources to develop and maintain the ICT infrastructure, and low spending power of the people. Despite these challenges, it is imperative that USP reaches its students in all its member countries with the opportunity for quality education.

Each member country houses at least one campus, varying significantly in size and student population. The main campus (Laucala Campus) is based in Suva (Fiji Islands) (Jokhan and Sharma 2010). The USP students study through various modes, namely, day-to-day classes, referred to as face-to-face mode; print mode mostly for flexible education; full-time online, referred to as online mode; and finally the blended mode which is a mix of face-to-face and online or print deliveries. Most of the courses and programs offered in the region are administered and facilitated from the main campus. The smaller centers are part of the larger campuses spread in remote locations or on the smaller islands in some regional countries.

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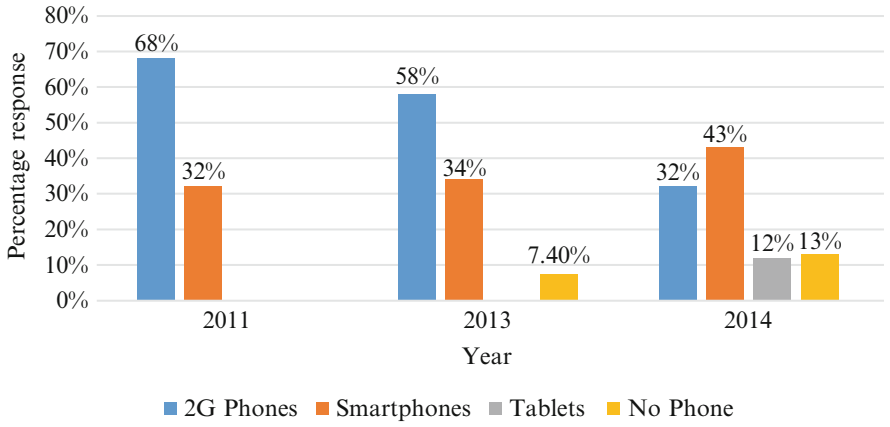

Fig. 3 Mobile devices with students in USP

Notably, the regional governments, NGOs, and the World Bank (ICT Overview 2014) have indicated the need for the developing countries to embrace and leverage on ICT to provide feasible, cost-effective solutions to important issues such as entrepreneurship, shared prosperity, digital divide, and sustainable development and economics.

For USP, it is not only a matter of availability and accessibility to education for its students but also an attempt to create global citizens. The university owns and runs its own telecommunications system, known as the USPNet. This chapter concentrates on the work carried out in the USP with the development of the technologies for mLearning for the Pacific region and illustrates the successes of the SMS-based applications in its teaching and learning processes and the student support services.

1.3 Types of Phone in the University of the South Pacific

An initial survey carried out in 2011, with a response by 834 students, showed that a significantly large percentage of students (68 %) owned 2G phones compared to smartphones. This survey led the technical team to focus on the development of SMS-based applications as the SMS feature would be readily available on both 2G and 3G phones, and almost all students would benefit from this. However, the students' preference and possession of mobiles are shifting more toward smartphones as the survey carried out in 2013 indicates an increase in smartphones and a decrease in the possession of 2G phones. The 2013 survey was carried out with 1,245 students of the university (Finiasi et al. 2013).

The 2014 USP MOODLE logs show that Cook Islands has 121, Fiji 14,392, Kiribati 450, Marshall Islands 118, Nauru 75, Niue 9, Samoa 443, Solomon Islands 2,213, Tokelau 3, Tonga 788, Tuvalu 147, and Vanuatu 1,263 registered student mobile numbers.

Another survey conducted in 2014 with 1,399 student responses has shown a further rise in the number of smartphones in the university. The percentage of smartphone users has increased to 43 % in a year's time, and more accurately it increased by 13 % in a span of 4 years. Interestingly the increase seems to be occurring steadily with the USP students. A meaningful extrapolation certainly heralds the beginning of smartphone and tablet computer era for the Pacific region, although a little delayed compared to the developed countries.

Also, as shown in Fig. 3, students' possession of tablet computers was also observed, and this comprised mainly of iPads and Android tablets. This large percentage of tablet users in the university can be attributed to the introduction of the tablet learning project (TLP) by the university in 2013, in an attempt to support students' online and print learning (Kumar et al. 2013).

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1.4 Evolution of Mobile Learning at USP

With students of USP more widely scattered with less access to learning materials and poor Internet connectivity, connecting within the classroom can be difficult.

Considering the large student ownership of mobile devices, the diversity in the region, socioeconomic background of the students and parents, growing popularity of ICT tools and technologies, and finally that the university already has an established eLearning system (MOODLE), the idea of deploying mLearning to facilitate and support teaching and learning was deemed to be an important one. Through this goal, the university adopted the initiative to deliver learning services and content via mobile devices.

The very first use of a mLearning tool was the SMS notification service in semester 2 of 2011, in the two first-year science courses (mathematics and information systems). The pilot run in the online mathematics course showed an increase in the assignment submission rate from 68 % to 83 % and an increase in its pass rate from 54 % to 73 % when timely SMS notifications were sent to students compared to not sending students these notification in a previous assignment (Sharma et al. 2011). In a survey, students said the reminders were helpful and reminded them to turn in their assignments. In parallel, the Centre of Flexible Learning carried out a survey within the university securing important information on ownership of different mobile devices and which mLearning services students wanted to be introduced in USP. Work carried out by these two groups served to provide an insight into the development work required based on the unique challenges of the Pacific region.

2 Short Message Service for Students

The short message service (SMS) is a service mechanism designed to send and receive short messages over a mobile network. It began in Europe in 1992 under the Global Systems for Mobile Communication (GSM) specifications, and today it is one of the most successful and prominent wireless data services over mobile networks (Brown et al. 2007). The SMS messages have a limit of 160 characters per message with a 7-bit encoding and 70 characters per message with a 16-bit Unicode format. Today, the Third Generation Partnership Project (3GPP) is responsible for the maintaining of SMS standards. The SMS feature is supported in all 2nd-, 3rd-, and 4th-generation phones which make it an ideal communication app for the region.

2.1 Short Message Service Gateway

An SMS gateway is a messaging software that can allow sending and receiving of SMS from/to computer systems (preferably servers) to/from mobile phones. An SMS gateway presents a number of benefits to institutions, organizations, and their stakeholders. Firstly, for educational institutions, it can be used to enhance the teaching and learning processes. So in 2009 highlights were on how an SMS gateway was setup in Hong Kong Institute of Technology and specific applications programmed to promote mobile learning in the institution (So 2009). Secondly, such gateways can be very useful in times of disaster. Disaster authorities and organizations can send out immediately disaster warnings and evaluation plans which are also cheap and do not depend on electricity or the Internet. One recent model built is the SMS-based flood monitoring system which potentially provides timely notifications to the affected residents and the relevant authorities on the height of flood waters (Azid and Sharma 2012). Finally, an SMS gateway enables a two-way communication where users can also request relevant information on their mobiles by sending SMS.

As an example, the USP has integrated an open-source SMS gateway named Kannel (Kannel 2014) into its own telecommunications system to meet the SMS needs. Kannel has been installed and configured on a server running the Linux operating system and is hosted in university premises. It communicates with

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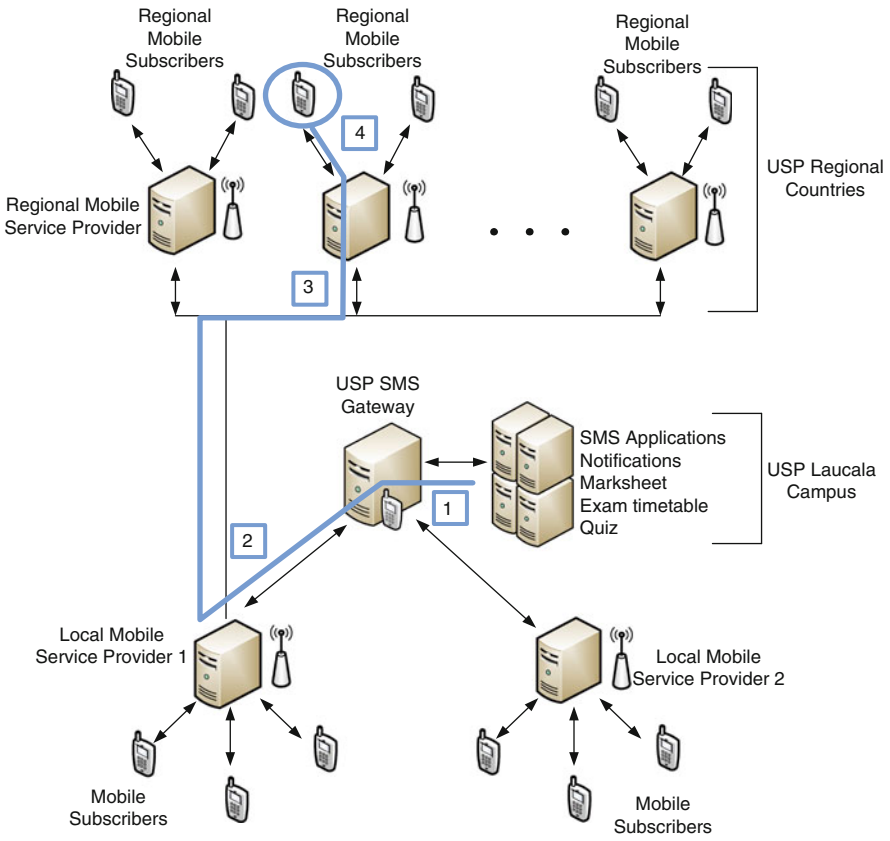

Fig. 4 The SMS gateway architecture

the mobile service providers and SMS centers (SMSCs) to receive and send SMS to its users. The SMS gateway is configured to work with the mobile network providers in the region and thus is able to have a connection established with the mobile service providers SMSCs. Figure 4 illustrates the SMS gateway architecture at USP.

The two-way communication applications allow the user to send SMS requests to the application, and then the application appropriately sends an SMS response to the user. This tool is ideal in the education ecosystem where information is warranted on a frequent basis while keeping within the shoestring budgets, with reference to students as well as the university. The university has entered into contractual agreements with two local mobile service providers and has a common short code assigned by both the providers where students use this short code to send out SMS.

For a proof of concept (PoC) on the how the in-house SMS gateway facilitates distribution of an SMS to users, an SMS notification from a course instructor to his students is given below. The series of steps corresponds to the path and numbers shown in Fig. 4 and is for the one-way communication applications.

1. The course instructor uses MOODLE to send out an SMS notification to a group of selected students who can be situated in any of the campuses and centers where the course is offered. As a PoC only an SMS traversing the network to a single student is considered. From the SMS notification application, the SMS travels to the SMS gateway.
2. The gateway decides on which SMSC to send the SMS based on the recipient's phone number. The SMSC is located at the mobile service provider's network. Here, for example, it is identified that local mobile service provider 1 will handle the SMS.

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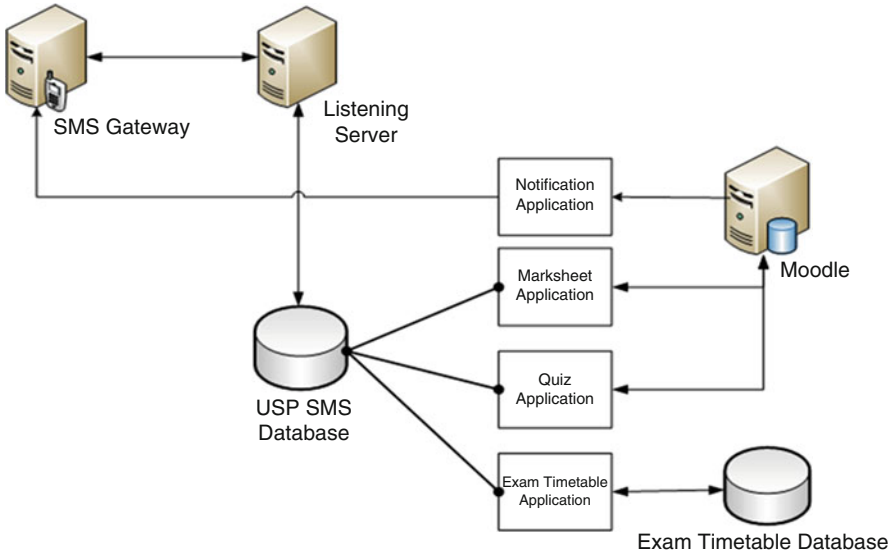

Fig. 5 The SMS application architecture associated to the SMS gateway

3. Once an SMS is received by the service provider at its SMSC, it decides whether the SMS is intended for a local number or regional number. For this case, we have the recipient in the regional campus; thus the local provider forwards the SMS to the regional mobile service provider.
4. The regional mobile service provider sends the SMS to the recipient – the student whose phone is connected to the network via cellular technology.

2.2 SMS Application Architecture

The SMS application architecture was designed after the deployment of the SMS Kannel gateway. The design of the architecture is such that all the SMS applications are directed to a single short code "6013." This common short code was obtained from both the service providers so that it is easy for students to remember and utilize. The architecture for the SMS application system is shown in Fig. 5, and the functionality of the design is described later for the one-way and two-way communication.

The main advantages of this design are:

- Modular applications – the applications developed are separate applications running on a server. The failure of one application to run will not affect the other applications unless the fault is affecting all applications at once.
- One-way and two-way communication – the design allows for both one-way and two-way communication applications to run and be accessible by users.
- Link to multiple mobile networks – the gateway can be easily linked to more than one mobile network thus allowing communication to flow from/to users of any mobile subscriber identity module (SIM) cards.

2.2.1 One-way Communication

A one-way communication involves sending out SMS from an application only. This communication system is used for the SMS notification application. The following steps, further illustrated by Fig. 6, are taken for the one-way communication in order to send out SMS notifications to students:

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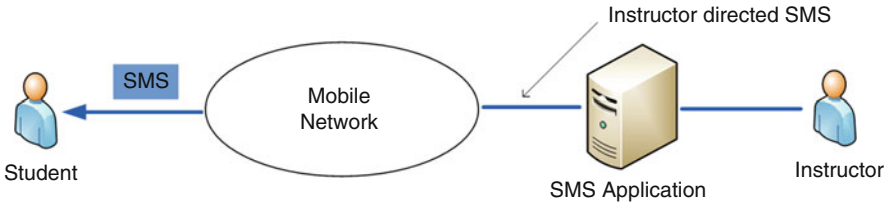

Fig. 6 A one-way communication for SMS application

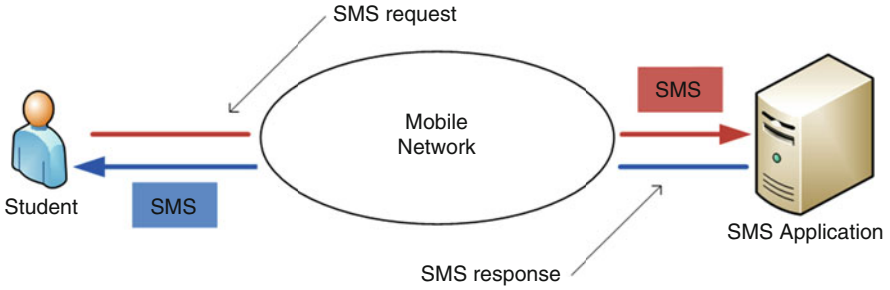

Fig. 7 A two-way communication for SMS applications

1. The instructor uses the MOODLE web interface of the application to write a SMS and send it to the recipients.
2. The SMS is passed from the application to the SMS gateway.
3. The SMS gateway sends the received SMS to the mobile service provider network(s).
4. The mobile service provider(s) sends the SMS to the recipients.

2.2.2 Two-Way Communication

A two-way communication involves a user sending an SMS request to an application and receiving an SMS response from it. Here we consider a scenario where a student requests for a service from the SMS exam timetable application. The following steps, further illustrated by Fig. 7, are taken for the two-way communication:

1. The student sends an SMS request in a specific syntax to the short code, and that is received at the SMS gateway.
2. The listening server fetches the SMS from SMS gateway and writes it to the SMS database.
3. The specific application which is continuously polling the SMS database fetches the request SMS and processes it for the appropriate response. In the case of the SMS exam application response, the examination timetable and other important information such as seat numbers and venue, corresponding to the student identification, will be fetched. The application may also have to query external database (s) to get a response.
4. The application prepares a response SMS with the student's exam timetable information and writes it back to the SMS database.
5. The listening server fetches this new response SMS and passes it to the SMS gateway.
6. The SMS gateway then sends the received SMS to the mobile service provider network.
7. The mobile service provider(s) sends the SMS to the recipients.

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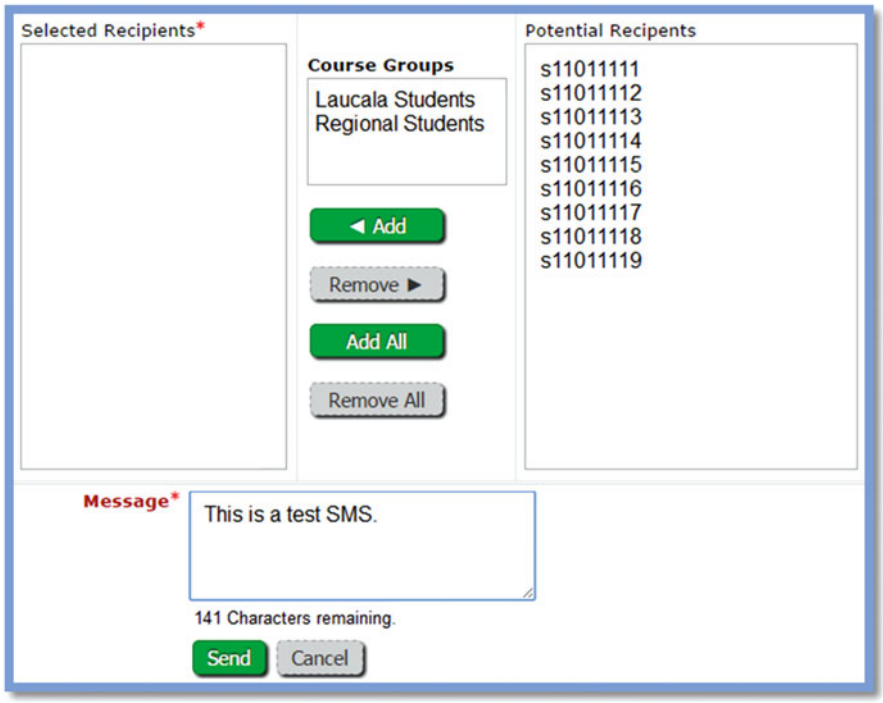

Fig. 8 Sample SMS block on MOODLE

3 SMS Applications and Their Usage

This section essays the different SMS applications designed and implemented in the USP. It also considers the usage and advantages of each application and the student feedback.

3.1 SMS Notification Application

The SMS notification application was the first mLearning application that was introduced by the university. The one-to-many application is a feature of MOODLE, and facilitators of courses on MOODLE have access to this application. The instructors or facilitators can send an SMS notification by typing out a 160 character or less SMS on the web interface of MOODLE and send it to all or a selected group registered in their courses. Figure 8 shows a snapshot of the SMS block that an instructor uses to send out SMS to the students. Once the SMS is sent from this web interface, it will be sent to all those students who had registered their numbers on MOODLE.

The SMS notifications have been used by instructors for important announcements to their students. An instructor can send out an SMS as a reminder for upcoming tests, release and due dates for assignments, cancelation of tutorials and lectures, and changes to schedules. The SMS notification application has been very effective for the university and useful for its students mainly because SMS can reach students at places where there are no internet facilities and students can receive SMS with the possession of a mobile phone with no cost incurred by the recipients. The university has secured significant concessions from the mobile service providers through contractual agreements and bears the full cost of SMS notifications. The university has also extended the service to other support sections. Table 1 lists the main sections within USP with reasons for the usage of the SMS notification service.

In 2013, the SMS notification service was available to the university's preliminary, foundation, and first-year courses – a total of 95 courses. The usage of SMS notification amounted to more than 249, 000

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Table 1 University support section using SMS notification service

Sections	When to send out SMS
Campus life	For special events on campus. For example, USP Open Day, social events, orientations
Student administrative services	For deadline and due dates concerning registrations and fees
Campus directors	For urgent messages such as changes to schedules, for students in local campuses
Marketing office	Mobile marketing of university
Emergency working group	For natural disaster awareness, early warnings, and closure of university

Fig. 9 A mobile screenshot of the SMS marksheet application

SMS sent to the different groups of students. In 2014, the service was expanded to include all undergraduate students and students enrolled the TVET arm of the university.

3.2 SMS Marksheet Application

The SMS marksheet application is another unique and exciting app developed in-house which integrates the marksheet – an electronic repository of marks on MOODLE to SMS. The application allows students to access marks of assessed tasks contributing toward their continuous assessment of flagged courses using the SMS feature of their mobile phones. Once the course coordinator feeds the course marks into the MOODLE marksheet and activates the retrieval of this information via SMS (along with the access of MOODLE marksheet via web), the students can access their marks using SMS.

Since a student's mark is confidential, a validation test is carried out by the application in order to confirm that the user identified by the phone number which is stored in the user's profile database is indeed requesting for his/her own marks.

To obtain the course marks, a student has to send a specific syntax SMS to the university SMS short code of 6013. The syntax is given below with an example:

Marks[space]<Student_ID>[space]<Course_Code> e.g. Marks s12345678 AF101

where the student ID number s12345678 has requested for the marks for course AF101. This request and the reply received from the database are captured in Fig. 9. It is also noted that if students use the wrong syntax in the request SMS, the SMS request is dropped by the application, but information is logged.

Figure 10 shows the number of SMS requests that were received from the students in semester 1 of 2013. The app secured a high buy-in and acceptance from the students. However, since the service is free,

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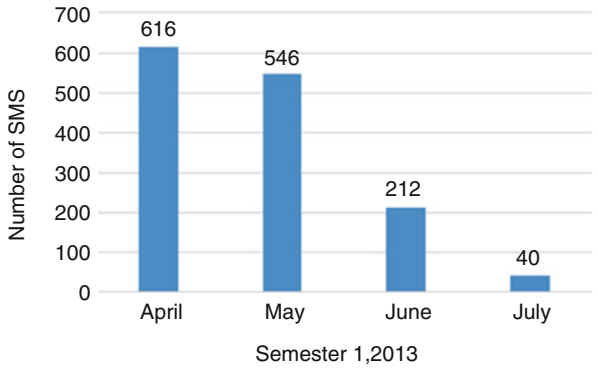

Fig. 10 The SMS marksheet application statistics for Sem. 1 of 2013

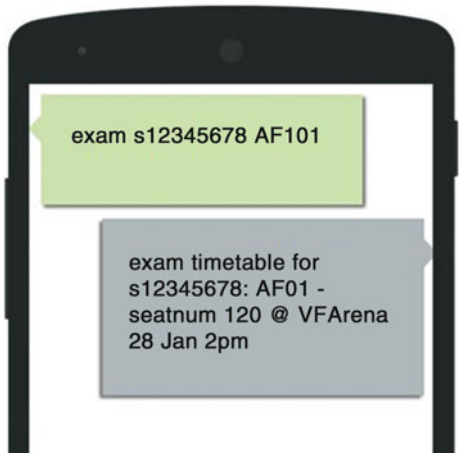

Fig. 11 The exam timetable application statistics for 2013–2014

the students use the app repeatedly and sometimes unnecessarily. Currently, the technical team is working on making this app sustainable and cost-effective.

3.3 SMS Exam Timetable Application

The SMS exam timetable application is a request-response application just as the SMS marksheet application. This application enables the students to send the request SMS and receive their exam timetable as an SMS response. The application is activated a week before the examination period. The application can be accessed by sending a request SMS to 6013. A specific syntax SMS is needed to be sent to 6013. The syntax is given below with an example:

Exam[space]<Student_ID>[space]<Course_Code> e.g. Exam s12345678 AF101

where the student with ID s12345678 has requested the exam timetable for course AF101. This request and the reply received from the database are captured in Fig. 11. The user can also omit the course code and would be receiving the exam timetable information for all courses he/she is enrolled in the semester. No authentication is needed for this service.

The application has benefitted many students, and now the university rarely has students miss their final exam because of reasons such as not being aware of the dates, times, and venues for the exams. Figure 12 shows the number of SMS requests the students sent and SMS responses coming to them containing their

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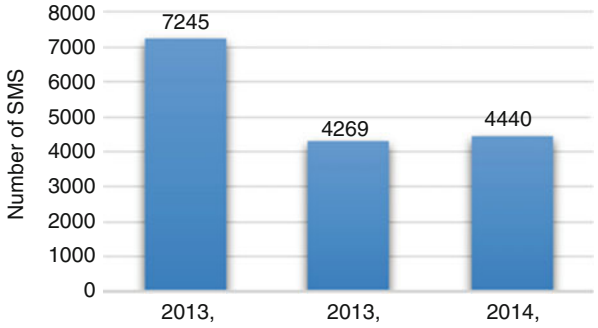

Fig. 12 A mobile screenshot of the SMS exam timetable application

exam timetable information. The service is viewed as one of the best and most utilized applications introduced in the university. Students commented that they enjoyed the service and found it useful.

3.4 SMS Quiz Application

Recent years have witnessed a significant increase in the percentage of mature age and working students enrolled in USP; in 2014 this stands at 35 %. As a consequence, there is a growing expectation to take more assessments outside of classrooms, irrespective of the modes of delivery of courses. To take these real-time assessments to the cohort, the university has ventured into the SMS-based quizzes. The SMS quiz application is a two-way communication system designed to provide quiz in a form of questions having explicit answers. There are no open answer questions in the quizzes.

The quiz application is used for the following:

a. Short assessments – can take place either inside or outside classrooms or even be facilitated inside and outside classrooms in parallel, depending on the need. Currently, USP has trialed out the application in some courses for short quizzes inside and outside classrooms, together with an option given to students to either take the quiz using mobiles or use the traditional pen-paper approach.
b. Receive on-the-spot student feedback in a classroom – the quiz can be opened to a class by the instructor to get *just-in-time* feedback on a recently taught concept by posing a few questions in class and letting the students attempt the quiz. The instructor can then decide whether to advance or spend more time with the particular concept. This subject evaluation tool will be introduced in USP in 2015.
c. Promotional activities – mLearning team has been mandated to take marketing to mobile devices and actively help out during the university-wide promotional activities such as open day, orientation day, and parents and partners event, to name a few. The quiz is activated for a specific period of time for different stakeholders to attempt and win prizes.

To access the SMS quiz application, students send a SMS to the university short code (6013). The SMS message to initiate the quiz follows a simple syntax of "Quiz QuizCode." The QuizCode is used to refer to a particular quiz the student wishes to attempt. In the screenshot example in Fig. 13, the quiz code is "AF."

The SMS quiz application would then appropriately fetch a question and send to the students, and the student can then send the answer by typing in the quiz command, followed by the quiz code and finally the answer. For assessment purposes, each student is identified by the mobile number they register in the number database. Ideally, the session is terminated when the student has finished the quiz, and a response with the score is provided by the application to the student. Figure 14 illustrates the process described.

Figure 15 shows students in a first-year mathematics course using their mobiles to take the SMS quiz. It was found in the courses that about 80 % students preferred to take the quiz using the mobiles.

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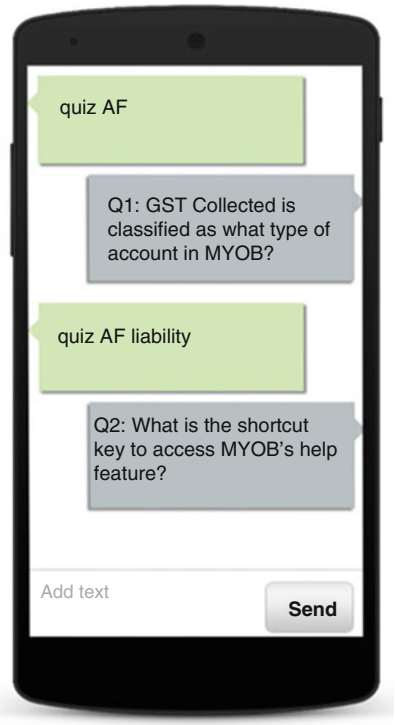

Fig. 13 A screenshot of SMS quiz

3.5 SMS Library Application

The SMS library application was developed to send the university's library alerts and notifications to the users through SMS. It is used for alerts like sending item due notice in advance, book reservation approvals, and book renewal messages. The application developed reads all emails sent to it from the library for alerts mentioned earlier. The application extracts the relevant information and formulates a SMS to be sent out to the student. This makes it easier to notify students. Even if a student forgets to check his/her email, he/she would still be notified via the SMS. This benefits the students to avoid paying overdue fines, they can know if their reservation was successful or not, and books will be returned on time for other students to borrow. Figure 16 briefly illustrates how the library application works.

3.6 SmartDial

The SmartDial feature has been adopted by the university as an alternative to the SMS short code system. SmartDial uses Unstructured Supplementary Service Data (USSD) – a service provided by a number of mobile service providers. The SmartDial feature avoids any typing errors by the students that may occur while using the specific syntax method. The SmartDial system uses menus and can have multiple SMS services as items on the menu. The university has reserved the short code *811#, and students need to dial to this number to use this service (see Fig. 17).

4 Student Feedback

In order to gauge the effectiveness of the SMS services and applications, continuous feedback from students has been very important. Various approaches can be deployed, which includes online questionnaires through MOODLE, emails, and SMS surveys. Students appreciated the usefulness of the service, highlighting accessibility and lack of costs to students.

DOI 10.1007/978-3-642-41981-2_9-1

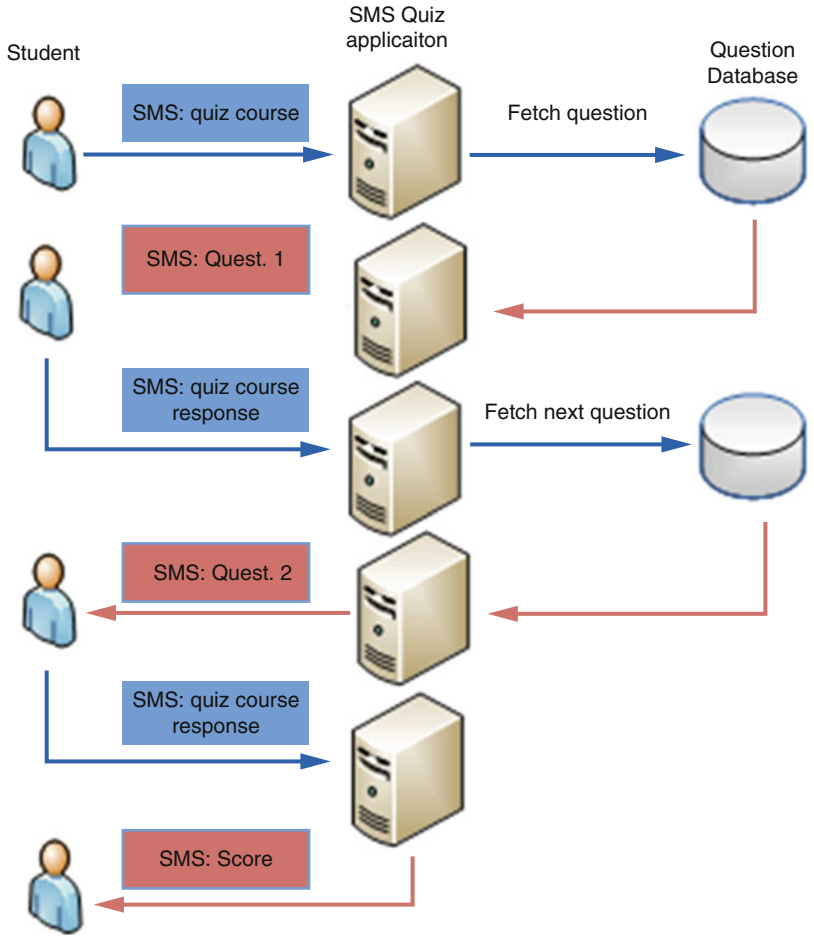

Fig. 14 SMS quiz message flow

Fig. 15 The students using SMS quiz application in a first-year mathematics course

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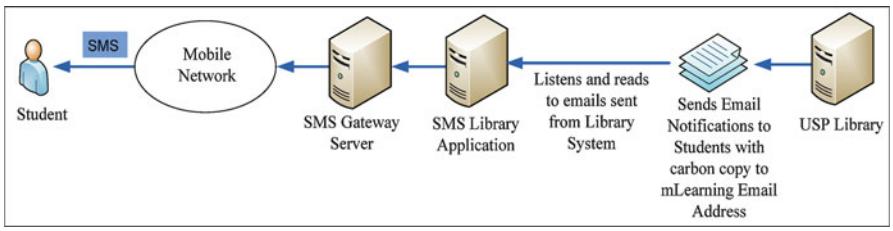

Fig. 16 SMS library application process

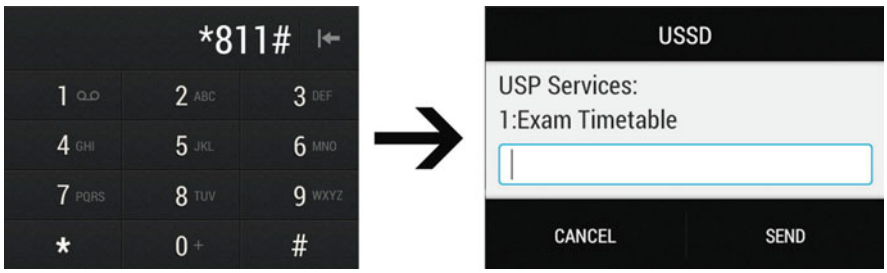

Fig. 17 Screenshot of the SmartDial service

Figure 18 shows the general feedback received from students on different SMS applications from an online survey carried out in 2014, with a sample of 1,426 students. We see that receiving notifications and exam information through SMS were perceived to be very useful to students. Nonetheless, the reason why many students that did not use the SMS quiz application and hence remained neutral in the survey was because the application was piloted in only a small number of courses.

5 Suggestions for Future Applications

The student surveys carried out in 2012–2014 have progressively indicated a significant increase in the percentage of smartphones. However, strong ownership and usage of basic mobiles still persist which validate the need to continue work on SMS-based services and learning support for the students. Invariably, SMS services still provide that immediacy and mobility that allow us to better reach our learners. The SMS-based notification, marksheet, exam timetable, library, and quiz applications have been developed based on students' recommendation, but with growing awareness and acceptance of mLearning, students are coming up with suggestions for more applications. A couple of applications in consideration include accessing final grades and locating classrooms through SMS. While the former will need careful consideration of security and confidentiality issues, the latter is to be piloted in the beginning of the new semester in 2015. Students especially freshman and visitors would greatly benefit from such an application.

While most SMS services designed have been based upon students' recommendation, additional requests are sporadically received from academic and support sections as mLearning and SMS-based services make their presence felt in the university. There is a request logged for new SMS services such as automatic staff leave from HR, campus life information such as careers fair, counseling services, IT services outage, and emergency notices, for example, tsunami warnings, earthquakes, and political uprisings, to name a few major ones.

Students have also requested Android versions of the aforementioned applications and some new ones (course finder) as well as the web-based applications (edutainment modules) which are currently running

DOI 10.1007/978-3-642-41981-2_9-1

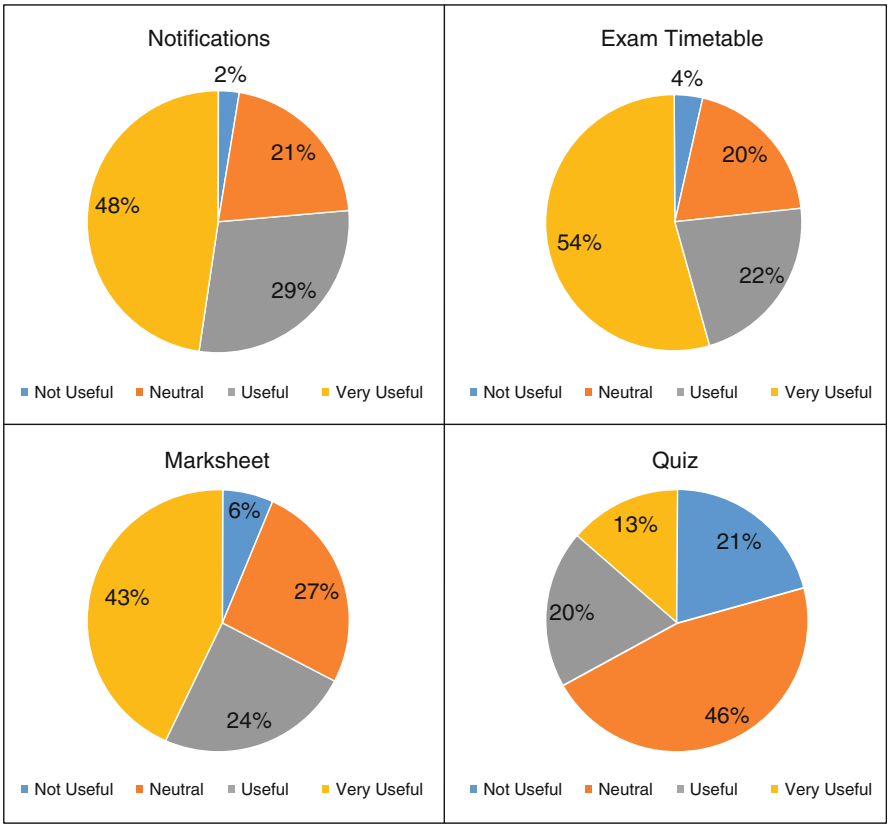

Fig. 18 Usefulness of SMS applications (Source: data collected from mLearning surveys in USP)

in the university. While USP has a few apps such as edutainment modules and course finder already in operation, it is expected to introduce others in the coming semesters.

5.1 Supporting Mobile Learning Projects

Another institutional ICT project carried out under the banner of mLearning was the use of tablet computers to facilitate and enhance flexible learning for students based in the region campuses. The project – known as the *Tablet Learning Project* – was carried out in 7 of the 14 USP campuses situated in 5 countries: Fiji, Tonga, Samoa, Vanuatu, and Kiribati. Around 600 students studying courses via flexible learning modes (print and online) in 2013 benefitted from this initiative. The major aim of TLP was to make flexible learning through a distance easier for students based in the regional campuses. In the first phase, the tablets were setup as an electronic repository of course materials and educational applications suited for the disciplines. The second phase, after security internet availability issues have been addressed, will be implemented in 2015 to enable students to enjoy inter alia all the SMS applications though their tablet computers.

6 Future Directions

The Pacific region inherits an array of challenges and opportunities due to the geographic isolation, nonuniform secondary school education, English being the second or even third language, student diversity, shoestring budgets, varying teaching resources, and lack of infrastructure to outline the major ones. Nonetheless, the university continually seeks to adopt from outside or design in-house efficient and

DOI 10.1007/978-3-642-41981-2_9-1

cost-effective pedagogical tools and technologies to meet the expectations of its member countries in the region. To make education more accessible and flexible, USP has been integrating ICT in education in the recent times.

Some of the landmark ICT tools include smart classrooms, Moodle-based early warning system, online mathematics diagnostic test and remedial activities, and online and blended courses. More recently we have witnessed the introduction of mobile learning, denoted as mLearning – the "next big thing" in learning for the Pacific region. The mLearning is seen to be an indispensable weapon in the ICT armory which inter alia helps establish a learner-centered education system providing more power and responsibility to the learners.

The student surveys carried out in 2012–2014 have progressively indicated a significant increase in the percentage of smartphones. However, strong ownership and usage of basic mobiles still persist which validate the need to continue work on SMS-based services and learning support for the students. Invariably, SMS services still provide that immediacy and mobility that allow us to better reach our learners. Work on SMS applications will continue strongly in the future. It must also be stated that there is a definite shift toward ownership of smartphones in the university; hence, work on web-based applications and Android versions will be carried out in parallel in the coming semester.

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