

Mobile learning/SMS (Short Messaging System) academic administration kit

Judy Nix, John Russell and Desmond Keegan

The context for the use of mobile devices in academic administration is presented. Uses in administration, combating drop-out, distance education and learning support are described. Implementation strategies both in-house development and the purchase of a system from an SMS gateway provider are explained.

The context

Never in the history of the use of technology in education has there been a technology so widely available to citizens as mobile technology.

The statistics are stunning. In July 2005 it was announced that ownership of mobile devices had reached 2 billion for the first time. It is forecast that ownership would reach 3 billion as early as 2010. This is for a world population of just over 6.5 billion.

In research published in 2004 on audience characteristics, the British Broadcasting

Corporation (<http://www.bbc.co.uk/commissioning/marketresearch/audiencegroup2.shtml>) stated that respondents in the 16-24 age group ranked ownership of a mobile phone as a 'necessity'. The 16-24 age bracket is precisely the age bracket of students at universities, institutes of technology and higher and further education colleges.

Penetration of mobile devices in Ireland, France, Norway, Hungary and all other European countries is in the high 90% range and is fast approaching 100% as the following statistics show:

Country	Mobile Phone Penetration	Country	Mobile Phone Penetration
Austria	103%	Latvia	96%
Belgium	88%	Lithuania	96%
Cyprus	107%	Luxembourg	107%
Czech Republic	111%	Malta	107%
Denmark	101%	Netherlands	102%
Estonia	96%	Norway	106%
Finland	102%	Poland	71%
France	79%	Portugal	99%
Germany	91%	Slovak Rep	85%
Greece	100%	Slovenia	44%
Hungary	92%	Spain	94%
Ireland	101%	Sweden	113%
Italy	111%	UK	108%

*Data sources: WCIS (World Cellular Information Service) and Ovum.
Valid at end of December 2005*

One can safely assume, therefore, that every student in every institution in every European country possesses a mobile device.

The need

Academic administration

All students enrolled in all higher and further education institutions today have a frequent need for information from their institutions about timetable changes, assessment deadlines, feedback from tutors and other urgent administrative details. Although nearly all of these students carry a sophisticated communications device which they use constantly in all walks of life, isn't it strange that they do not use it in their education or training programme?

Equally, all higher and further education institutions today have a frequent need to provide information to their students about timetable changes, assessment deadlines, feedback from tutors and other urgent administrative details. Although nearly all of their students carry a sophisticated communications device which they use constantly in all walks of life, isn't it strange the institutions do not use them to communicate?

If a lecture, or similar activity, has to be cancelled at short notice the university or college can communicate with the student body concerned by the postal services or email. These are not always effective means of communication so many of the students will turn up for the cancelled lecture and be inconvenienced. The institution's administration may come in for criticism.

However, if a lecture, or similar activity, has to be cancelled at short notice, the university or college communicates with the student body concerned by SMS (Short Messaging System), all of the students will receive and read the message, no-one will turn up, no-one will be inconvenienced and the institution's administration will have been successful. SMS messages can be sent in this way

either to the whole student body, or a faculty, or a department or a class grouping.

Drop-out

Government decisions in a number of European countries have heightened the importance of the reduction of the drop out rate in universities and colleges. In some instances subsidies can be reduced if the drop-out rate is not reduced. The prevention of avoidable drop-outs has been an intractable problem in higher education for years and often costly methods, like increased counselling and mentoring, have been introduced to combat the phenomenon.

The University of Ulster in Northern Ireland has had great success in the use of SMS messaging for the reduction of student drop-out. It found that sending SMS messages to students who have been identified as being at risk has been a very successful approach for keeping students in the system and for maintaining the government *per capita grant*.

The University of Ulster sent out messages to students of the type 'Sorry, we missed you today'. The university initially feared that this might be intrusive. On the contrary, the students did not find it intrusive at all. The students appreciated it and wanted the university to expand the service to other areas – like assignment deadlines.

The University considers that speed is essential in dealing with drop-outs: 'Two weeks and they are gone'. Other methods of dealing with drop-outs have a lead time of several weeks. The University regards drop-outs reduction as a duty of care. They feel that a frequent cause of drop-outs is that 'Nobody cares'. Groups of 4,500 students can be alienating. The personal touch of a message on a mobile phone can be an answer (Keegan 2006).

Distance Education

In its faculty of education in 2002, the University of Pretoria, South Africa had hundreds of

students enrolled in the equivalent of a Post-Graduate Diploma in Education by distance education. None of these students had email or could avail of eLearning but all had a mobile phone. They were all full-time teachers employed in rural schools.

The university used mobile phones very successfully to administer their paper-based distance education programmes, achieving almost immediate communication by SMS messaging in an area where email was unavailable and post took 5 to 15 days.

The profile of these students in 2002 was as follows:

- The majority live in rural areas
- 100% are full-time employees (teaching)
- 0.4% had access to e-mail
- 99.4% had a mobile phone

Mobile phone support to these rural distance learning students entailed sending bulk, pre-planned SMSs to:

- all students;
- students of a specific programme for general administrative support as well as motivational support;
- specific groups of students extracted from the data-base for specific administrative support (customised group SMS); and
- small group or individual SMSs to specific students extracted from the data-base on an individual basis for specific administrative support.

The advantages and successes were significant:

- In response to a reminder for registration for contact sessions, 58% of the learners registered before the closing date compared to the normal expected percentage of below 40%.

- In response to a reminder of the contact session dates, 95% of the learners that registered for the contact sessions attended.
- Learners responded en masse and almost immediately to information provided in SMS-messages.

If it can be done successfully in rural Africa it can certainly be done successfully in Europe (Brown 2005).

Learning Support and 'at-risk' students

There have been efforts at EU and government level to encourage a wider participation in the third level education system by encouraging students from more diverse backgrounds to attend colleges. One of the major concerns in the third level education system in Ireland is the retention of students, an issue that is extremely important to the Institutes of Technology (ITs) nationwide. Over the past number of years, factors such as the falling number of applicants, a reduction in entry point requirements, increasing numbers of non-national students and students with disabilities have combined to change significantly the profile of students entering the IT sector. The reduction in the number of students opting for careers in the Science and Engineering fields has meant that the issue of student retention has become paramount for the existence of these courses.

The Department of Engineering in IT Tallaght, in Dublin, began to address these issues by implementing an Engineering Learning Support Unit (ELSU) in 2003. The main aim of this unit was to provide incoming students on Year 1 full-time Engineering courses with an extensive range of support services in order to make the introduction to third level education a smooth process, thereby improving student participation and retention. ELSU has been developed to provide a flexible student driven support network, covering both academic and non-academic issues, in order to facilitate an improved learning environment.

The main responsibilities of ELSU include:

- Providing the necessary resources and infrastructural supports to support first year students
- Early identification of 'at-risk' students

The use of SMS as a means of providing students with important information was introduced as part of ELSU at the beginning of the academic year 2005/2006. The main reason for implementing this tool was to allow students to be continually and quickly informed of any changes within their courses. Up to this point, email was predominantly used. However, it was found that email was not an ideal solution as not all students would check their college mail accounts on a regular basis and, therefore, would often not receive information they needed until it was too late. Furthermore, email was not appropriate for conveying important information at short notice.

Student details were obtained from a Microsoft Excel database and the SMS tool was implemented within Microsoft Outlook. Any member of the teaching/support staff could use the tool to send messages to an individual student, a group of students or the entire list of registered students in Year 1 Engineering.

Some examples of where the SMS tool has been used in IT Tallaght include:

- Notifying students about changes in their schedule/timetable
- Changes regarding room allocations for lectures
- Reminding students of mid-semester exam times, dates and venues
- Reminding students of deadlines for submission of course work
- Notifying students when their test/lab results have been made available on the department notice boards

- Making students aware of time/date/venue of ELSU support sessions
- Informing students of lecturer absence and/or cancelled classes
- Telling students about important events in the college

The SMS tool as part of Outlook was initially developed and implemented by a member of the lecturing staff but the Department of Engineering has decided to invest in a more sophisticated system for providing information to students via SMS, as they view it to be an important part of all courses within the department.

In IT Tallaght the use of SMS messaging has been viewed as a valuable addition to the academic environment for its simplicity and effectiveness in conveying information between staff and students (O'Shea 2005).

Implementation strategies

The recommended strategies for universities and colleges who want to introduce SMS messaging to their administration are either to develop an in-house solution or approach an SMS service provider.

1. In-house development

SMS is a mobile phone technology that allows short text messages to be sent and received on a mobile phone. Typically messages are 160 characters in length, but this can be extended by combining a number of messages together. For example if three messages are combined it would be possible to send a message slightly shorter than 480 characters long. However this normally means you would be charged for each message (3 messages in the example). Support for combining SMS messages varies from service provider to service provider and this should be checked if long messages are required.

Mobile operators have a node in their network called an SMS Service – Centre (SMS-C) that handles SMS message traffic. Typically each mobile operator will allow Third Party SMS aggregators/service providers to connect to their SMS-C's. Such aggregators are likely to have connections to many different operators or to other aggregators. Direct connections to an operator SMS-C are expensive.

Aggregators with direct SMS-C connections will recoup that cost by providing their own Application Interface by which other content providers can send SMS messages. Normally the cost for such a connection to an aggregator is much less. The bottom line is that it is much more cost effective to connect to an SMS aggregator than to a mobile operator SMS-C. Indeed connecting to an aggregator may give the application access to a much wider audience. For example, universities are likely to have international students that have mobile phones from their home country. It is likely that a connection to a local Mobile Operators SMS-C would not allow delivery of SMS messages to such students.

Writing an application that connects to an operator SMS-C requires specialist knowledge of the SMS protocols involved. SMS-C protocols such as SMPP (Short Message Peer to Peer) 3.4 are difficult and complicated to work with, are difficult to test, require expensive specialised equipment, expert knowledge and normally expensive SDK's (Service Development Kits).

Alternatively SMS Content aggregators will usually have a SOAP (Simple Object Access Protocol) or HTTP interface that can be used to develop applications. Such technologies are normally free to obtain and expert knowledge is readily available through developer forums on the internet. In addition content aggregators are usually very helpful and definitely more accessible than mobile operators for support questions.

In Summary – Advantages of SMS aggregators over direct operator SMS-C:

- Greatly reduced connection fee and ongoing monthly rate
- More likely to be able to deliver SMS messages to international mobile phones
- Aggregators normally use standard internet technologies such as SOAP or HTTP. Mobile operators normally require telecom specific protocols such as SMPP 3.4 which are complicated and expensive to implement.

For the purely financial and technical reasons outlined above it makes a lot of sense to connect directly to an SMS aggregator's SMS gateway.

The following is a typical call flow when sending an SMS message from a university application to a student.

- A university administrator uses the application GUI to enter an SMS message. The administrator then selects the distribution list for a particular student class or can enter a once off mobile number
- When the administrator clicks on 'send message', the application will build a connection towards the SMS aggregators SMS gateway.
- The SMS gateway will accept the message and forward it to the mobile operator that the recipient is with for delivery to their phone.
- Some SMS gateways will provide delivery reports back to the university application when the message is delivered to the recipient.

Legal requirements – SMS SPAM

In the last year or so some very strict rules governing the sending of unsolicited text messages have been introduced. Fines of up to €5,000 *per message* are being applied.

It is critical that the mobile phone owner's permission is obtained before any SMS messages are sent to their phone. This can either be in writing where the user signs an authorization when they register at the college or by the user sending a registration text message to the application.

Applications should adhere to the relevant data protection legislation and register with the local data protection compliance agency.

Mobile phone users should be able to remove themselves from the list at any time and access to this removal process should be immediate and easy to use.

Case study

NKI, Bekkestua, Norway, has introduced an in-house SMS service.

The setup

A GSM modem terminal in its simplest form is just a mobile phone that can be connected to a computer. There are, in fact, a lot of mobile phones on the market that can do this. However, NKI purchased a specialised GSM terminal, the Siemens T35i. This sort of terminal is cheaper than a mobile phone as it does not have a screen or keyboard. It also has an antenna that can be placed a good distance (about 5 metres) away from the terminal. This was a necessity as the

terminal was to be located in an underground server room and the signal from the GSM network was very weak. Being able to locate the antenna high up and close to the outer walls gave a much better signal.

Connection to the terminal is done via the serial port on the server. There is a fairly standard set of commands that are used by GSM terminals. These are a super set of the original Hayes AT commands for modems. Each manufacturer can also add custom commands, so for advanced programming the documentation for the modem may be necessary.

A decision was made to run the server on the LINUX operating system, but software etc is available for all major operating systems. LINUX was used as the rest of the web application stack is on it.

Once the modem is connected up, its time to find out if it works! The easiest way to do this is by using a terminal program such as hyper terminal or Kermit. With these programs it is possible to send "raw" code to the modem and check that everything is working.

A typical run in Kermit would look something like this.

```
at+cops?                -- check connection should return service provider
                        If no service provider check sim code with  at+cpin? or use
                        at+cpin=<code>
at+cmgf=1                -- set the modem in text mode
at+cnmi=2,1,0,0,1       --set the modem to listen
at+cmgs=+47xxxxxxx      -- xxx is destination number
at the ">" type your message end with Ctrl and Z to send
```

Figure 1: Typical SMS run in Kermit

If all goes well the first message has been sent by the modem. However, it is not possible to write this sort of code for each and every message that is sent. Gateway software is required. There is plenty to choose from. NKI chose an open source gateway called SMS Server Tools.

SMS Server Tools happens to be available for windows and flavours of UNIX/LINUX. It requires some set up work but nothing than an IT professional will struggle with, in fact it's a well-documented setup. Once the gateway is up and running, SMS messages can be sent by sending simple text files to the gateway. The text files contain the text to be sent, along with whom to send the message to. The gateway also accepts incoming SMS messages dumping the messages into the file system as a series of text files.

The text files format is extremely easy to read and to create with a computer program. NKI used Java, as that's what is used in the rest of the web development.

Conclusion

The whole process of setting up an SMS service is in fact pretty painless for an IT professional but not something to be attempted by normal users; then again creating applications to talk to Clickatel or other online SMS gateways is not something an average user should attempt either.

Price wise there is very little difference between the online SMS providers and running your own gateway. This is especially true if you are sending a lot of SMS messages, typically over 100K per year, then it can be cheaper to get a deal with a local mobile operator.

Another difference is the cost of handling an SMS that is sent back to the gateway. Online gateways charge for receiving an SMS; running your own gateway means there is no charge for receiving an SMS.

The basic function set of an internal SMS gateway is similar to that of an online gateway but when using your own gateway it is easier to transmit data such as logos and ring tones. Having your own gateway will also allow you to send other advanced content types, basically anything a phone can send and receive. At the moment most online gateways are offering the ability to send and receive SMS.

Evaluation

So is having your own modem worth it? The answer as so often with technology is "it depends". If you want a quick set up with minimum work and maintenance and you are mainly interested in sending SMS, the online gateways are your best bet. If you need to receive a lot of SMS messages or send other forms of content and you have the staff and infrastructure, then a modem and internal gateway will offer advantages. In NKI's case we wish to exploit and experiment with mobile communications and have the infrastructure and staff that allow us the luxury of having our own internal gateway

2. Using an SMS service provider

There are numerous SMS service providers in the market. Well-known providers would include:

- Saadian (www.saadian.com)
- KAPOW! (www.kapow.co.uk/)
- Clickatell (www.clickatell.com)

The use of an SMS service provider will incorporate these activities:

- Create a database, categorising the audience in as many ways as appropriate
- Write an application
- Create a text message - no more than 160 characters long
- Interrogate the database using a key word
- SMPP (Short Message Point to Point Protocol)

- Buy a link from a network operator based on the amount of messages to be sent, the time span for sending and the cost per message.

SMS gateway providers offer a range of mobile message distribution and management services. They offer a suite of messaging services and applications to help universities and businesses get connected and leverage the cost savings and efficiencies available through improved communication.

Services include:

Sending of desktop messages

This is accessible from any internet connected PC, the service provides a secure web-based account that can be accessed from anywhere in the world.

A practical interface ensures anyone in the university or business can have ready access to messaging from the desktop without specialist knowledge or training.

User features include:

- Sending to any GSM networks (home and abroad) and sending to any paging network
- Sending to e-mail addresses
- Receiving immediate confirmation the message has been accepted
- Sent message log
- Pre-defined message facility for common messages or templates
- Address book facility to select recipients by name
- Search facility to compose messages to individuals meeting a specific criteria
- Delivery status reporting for SMS messages
- Creating and managing group broadcast lists to combinations of mobile, pager, e-mail

- Receiving 2-way SMS responses direct to the desktop

Sending of group messages

Group messaging enables one to save time by pre-defining groups of people that one wants to send messages to.

This allows alerts and messages to be quickly distributed to any combination of mobiles, pagers and e-mail.

The system provides the ability to manage recipient lists through a secure web-account with any changes being implemented in real-time. The web-account also provides a message history log including delivery confirmations.

SMS gateway providers offer a simple, yet powerful and secure method of generating and distributing messages to mobile phones.

Most SMS gateway providers use a simple interface for staff to compose messages similar to the following:

Compose message		
To:	(insert number/s)	
Text:	(insert text of message)	
List	Reset	Send

Figure 2. Template for SMS messaging

This provides:

- Secure messaging from the desktop with no new software or hardware required.
- A feature-rich messaging capability from your desktop PC.

- Sending of messages to any combination of mobile phones and email addresses.
- Simple send screen including address book, pre-defined messages and message character count.
- Address book with import and search

Sending of two-way SMS

Sending two-way SMS enables contacts to respond to text messages via two-way SMS technology.

By providing a simple, effective and low-cost two-way SMS reply mechanism one can reduce the need for students or other users to make return telephone calls, which incur cost and tie-up resources.

Simple – the recipient simply replies to the message

Accessible – replies are delivered back to the desktop account from which it was sent

Flexible – systems usually provide options to re-direct the replies to e-mail, mobile, pagers or a secure web-based account.

Logistics

Two funding options

There are two ways in which the use of an SMS service provider can be accomplished:

1. Major bulk SMS with direct billing per SMS
A very straight forward desktop application is used to send the SMSs from. One needs to develop an integration with the main frame to ensure access to the student database (for mobile phone numbers of students according to modules and programmes).
2. Sponsored bulk SMS via SMS portal
It is possible to enter into an agreement with a private provider for sponsorship of SMSs. Within this contract the institution is entitled to 2,000,000 "free" (sponsored) SMSs each year. These sponsored SMSs allow the institution to

use 80 of the available 160 characters, while the remaining 80 are used by sponsors for information purposes, for example.

A web-based portal with user-friendly front-end is made available to all academic staff members and selected administrative departments. The system is also integrated with the main frame. SMS can be sent in either of the sponsored or not sponsored categories (Brown 2005).

Collecting mobile phone numbers from students

If an institution wishes to use SMS messaging with its students it will need to collect the students' mobile telephone numbers at the time of registration or re-enrolment. These numbers will need to be held in the institution's database so that mobile messages can be sent to the whole student body, or to all members of a faculty, or of a department, or to a class grouping or to individual students.

Permission in some countries

In certain countries it may be necessary to get the student's permission to send the message. This permission is best collected when the students' mobile phone numbers are being listed.

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Credits

The mobile learning administration kit is a product of the Leonardo da Vinci project *The incorporation of mobile learning into mainstream education and training* (www.ericsson.com/mlearning3).

There are 6 partners in this project:

- Ericsson Education Ireland, the International Customer Training Centre of L M Ericsson, the multinational telecommunications company, based at Dun Laoghaire, Co Dublin, Ireland is the contracting partner
- NKI Distance Education based in Bekkestua, Oslo, Norway is one of Europe's leading distance education and e-learning providers

- The Institute of Art, Design and Technology, is an Irish Institute of Technology based at Dun Laoghaire, Co Dublin, Ireland
- The Information Technology Foundation of the Hungarian Academy of Sciences is a higher level foundation linked to the Corvinus University of Budapest in Hungary
- Groupe SQLI - LNet Multimedia is a French software development company with offices in France, Switzerland and Morocco
- The European Distance and E-Learning Network (EDEN) is the leading European association of experts, stakeholders and administrators in distance education and e-learning, based in Budapest, Hungary.

