Trigger: Bi-directional interaction via text messaging in a Web 2.0 student administration system

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SMS technology in the university sector has been used primarily to push information to students. *Trigger* offers a more flexible use of the technology, enabling two-way 'push-pull' information access. A restricted vocabulary of requests for information 'on-demand' enables students to receive time-sensitive data such as assessment details, class scheduling and location information updates at minimal cost, irrespective of geographical location. Trigger also has the potential to reduce the need for students to access university or home computer systems at peak usage times during the semester. Piloted at RMIT University in 2006, this SMS application was made available initially to a sample population of 183 students drawn from an information systems subject delivered to all business disciplines at first year undergraduate level. Surveys of uptake and usage of the technology were subsequently investigated via an online survey. The Technology Acceptance Model (TAM) was used to evaluate Trigger's 'perceived usefulness' (PU) and 'perceived ease of use' (PEOU). This innovative SMS technology extends studies completed at Kingston University and Huang et al's (2005) Kimono information kiosk and phone knowledge sharing system, built and evaluated at the MIT and Nokia research centre. This paper describes the RMIT University implementation experience including increased functionality, selection of system features and tested trigger words to other educational administrators considering implementation of SMS technology.

Keywords*:* mobile communication; short messaging service; SMS; text messaging, HCI. user interfaces

Utilising SMS technology in university administration

Innovative utilisation of available technologies such as the Internet, email and iPods has enabled universities to respond to student expectations driven by the "generation Y" marketplace. Students as clients are the change-drivers with reference to technology usage. Their changing expectations indicate a need to provide immediate responses to questions and a shift towards communications using SMS.

Current access to university systems is usually by "pull" where students actively seek the required information, typically by using a desktop with wired access to the Internet. Students may have to access multiple systems and a frequent request by students (e.g. Platts, 2004) is that they would like to be proactively informed of important announcements and significant events by e-mail or SMS, rather than have to "log on" to a variety of systems. For far too many of these "customers" administration is experienced as a frontline to be endured if they are to succeed in their pedagogic experience. Hence a key question for institutions emerges: *How can the intrusive complexity of student administration be made less of a burden?*

The ubiquity of text messaging via mobile phones has been well documented. In the UK, 4,825 billion messages were sent during September 2007, an average of over 1,2 billion messages every week, the same number of messages sent during the whole of 1999 (Mobile Data Association). Australian Mobile Market statistics indicate that Australians sent over eight billion SMS messages in the 2005/6 financial year, an average of at least 300 messages for each subscriber (Paul Budde Communications). Figure 1 shows the exponential increase in the volume of text messages that occurred in Australia from 2005/2006.

There is clearly wide scope for the institutional provision of text messaging in higher education administration. As mobile technologies have become widely used in the general community, particularly among those who will be entering universities over the next few years there is considerable interest in and anticipation about its application in the higher educational context. Where information is concise and timeliness and ease of access are important, smaller capacity mobile devices will have a major role to play in higher education, as they already do in other parts of student life.

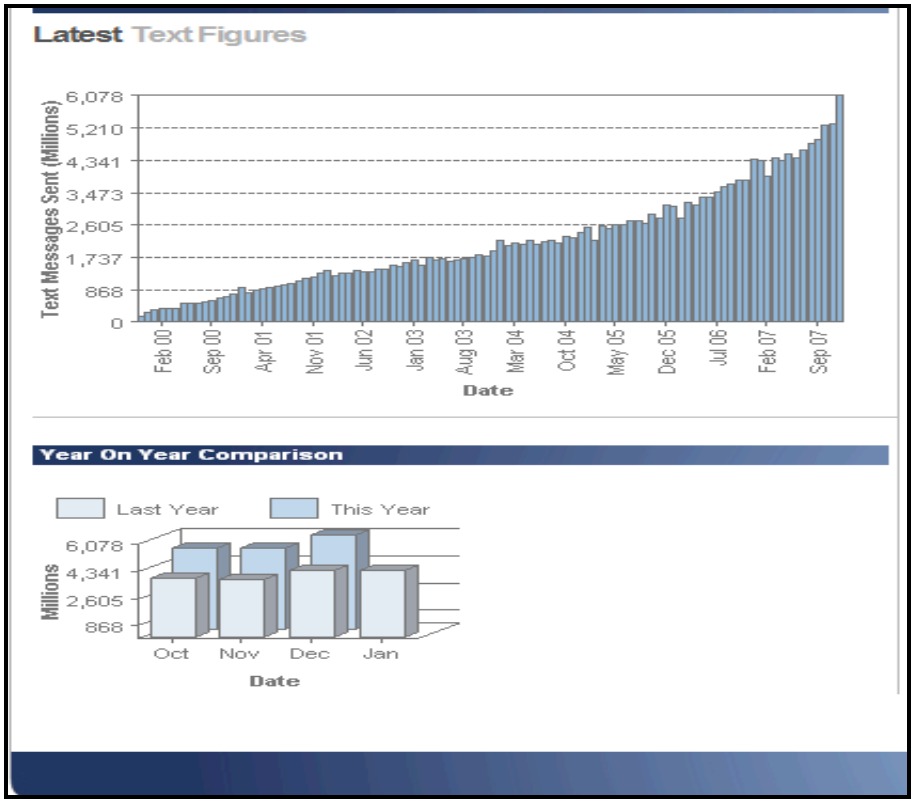

Figure 1: Text messages, Australia

Faulkner & Fintan (2005) highlight the importance to students of the technology's assistance in the transmission and receipt of private information whilst in a public space. Both staff and students expect messages to be transmitted and responded to without the necessity for a face-to-face interaction or both parties being at either end of a telephone simultaneously. Student responses such as "I tried to call you but you weren't there so …" or "and of course your message does not include a call back number" (Reisman, 2006, p.62), should not be acceptable excuses for late submission of assessment tasks.

Students themselves need to control the use of this technology, so as not to impinge on what for them is primarily a cheap social networking device. The language used for the triggers must be understandable by students. Further, accepted and desirable use may vary from student to student. For the foreseeable future, students will come with a mix of experience and ability, including aging baby boomers. Perceived "junk" messages will devalue the utility of SMS. Hence, the focus of this project will be on identifying ways of maintaining information quality.

The SMS application changes the administrative system from primarily information dispersal *to* students, to an information acquisition initiated BY students. SMS use also removes barriers for students in a new environment where accessing staff to ask questions, and locating information on the Web, can present difficulties. Embedding the use of SMS in the university culture will improve the student experience by increasing the effectiveness of 'student to student', 'student to staff', 'staff to student' and 'university to student' communication.

SMS technology can be used to increase the speed of delivery of important times, physical class locations, availability and web addresses of iPod resources, and assessment feedback by "pushing" information to students that helps them manage their time and university experience. The language used is of paramount importance to the success utility vs. usability of any such system. Not only technical restrictions (eg 160 characters per message) but appropriate sentence construction and use of words are required to enable SMS communication with students.

Words to trigger access to web based information

Alerts and reminders are amongst the many uses for SMS technology suggested in current research (Anderson and Blackwood, 2004; Traxler 2005). In the Higher Education sector barriers to student and staff interactions imposed by geography, time and memory can be removed. However, the nature of the

communication requires investigation. The pitfalls of information overload and delivery delay apparent on the Web will not occur but issues relating to understanding summarised short messages and recalling specific triggers may. High usability means that a system is typically easy to learn and remember; efficient, visually and perhaps aurally satisfying and fun to use; as well as swift in its capacity to recover from errors (Nielsen, 1993).

Words or triggers enable students to access stored information using an SMS application. In order to select the words to be used for the *Trigger* software application two factors were taken into consideration: These were ease of recall and ability to relay an immediate and accurate understanding of the type of response. Words used as triggers were 'Lectures', 'Tutorials', 'Latest Results', 'My Progress', 'Next Assignment', 'Next Exam', 'Due This Week' and 'Due Next Week'.

The deployment of triggers in this system can be viewed as being analogous to the functionality of a command-line interface. Command-line interfaces are experiencing a partial rebirth, especially in search tool applications (Norman, 2007) According to Faaborg (2007) whilst the command line predated the graphical user interface based on windows, icons, menus and pointers a move back to language started with web search engines. Google placed an emphasis on using language to quickly "typing to find what you want" rather than searching though complex navigation systems manually. The function required by the end-user determines whether a GUIs is superior to a command-line interfaces (CLI) based around using the keyboard for input. Case studies reported in the literature indicate no significant difference in task mastery between users of GUI and CLI interface designs (Hazari and Reaves 1994; Durham and Emurian, 1998). Overall the interfaces appear to differ less on overall performance than in relative needs for assistance (Baber, Hoyes and Stanton, 1993).

Norman (2007) advocates interfaces that allow a robust diversity of use, while maintaining some of the implicit flexibility of a natural language. Modern command or search languages represent a step forward to a new user-centric command line interface (Rasking 2007). CLI designs no longer require the strict adherence to syntax and form that characterised earlier control languages. They are tolerant of variations, assist re-entry of items typed earlier and can guide or predict user choices with auto complete; they are robust with slight touches of natural language flexibility. CLI designs are now well able to support different modes of interaction such as text messaging.

The depiction of computers in speculative fiction such as Stanley Kubrick's 1968 cinema classic "2001: A Space Odyssey" -has often represented the interface as conversational in function, able to deal with the common sense nature of the dialogue between the user and the device. The idea of the computer as an anthropomorphic entity, one that you can simply have a chat with and extract the information desired remains a fallacy even in this day and age, made painfully evident in early work by Weizenbaum(1966), whose legendary ELIZA program effectively duped some users into believing that they were actually having a natural language conversation with a computer.

The problem, according to Keeler and Denning(1991), lies in the ambiguous nature of the computer as a medium in human communication. Is it an intermediary for the exchange of information, a machine capable of actions or a blend of the two? The command line interface of early computing afforded the staccato semblance of a one-way conversation: Short bursts of text resulting in favourable actions by the device, or a cryptic error message. The advent of the graphical user interface effectively jettisoned whatever fractured conversational metaphor may have been present. Engagement with the computer was now through a process of discovery in the new Windows-Icons-Menus-Pointer realm. The visual aspect was dominant with text to a bare minimum. Conversations depend on turn-taking with text in either their written or spoken variants.

Enter the mobile phone: A gadget that is the par excellence of convergent technologies, being both a computer and a communications medium, as well as other things, all melded into one. And what of the future of GUIs on these micro-contraptions? Some researchers are of the opinion that screens should be eliminated from mobile devices altogether with interaction entirely dependent on audio and vocal channels (Barras, 2008). Text messaging has become the 21st century equivalent of the command line interface allowing the user to access disparate systems in a near conversational manner, the emerging patois of SMS.

Research approach

Trigger was piloted at RMIT University in 2006. The sample population was drawn from a first year undergraduate students information systems subject delivered to all of the business disciplines. Students

in the sample were provided with an opportunity to participate in order to access information 'on-demand' and receive time-sensitive data. This innovative application of mobile technology enables students to access information, at a minimal cost, irrespective of geographical location, using a limited vocabulary of requests.

The emergence of SMS technology in the higher education sector has been primarily used to push information to students. This innovative use of the technology enables two-way, 'push-pull', information access to the students that provides the student with control. This work extended the studies completed at Kingston University and Huang *et al's* (2005) Kimono information kiosk and phone knowledge sharing system, built and evaluated at the MIT and Nokia research centre. Each of the previous studies illustrated the potential impact of SMS technology in higher education. For example, "…feedback was generally positive and lab members noted that they find the information presented on the kiosk useful" (Huang et al, 2005, p.143).

A total of 183 students registered for this pilot study. By completion, responses were obtained from 25 students in the evaluation. The software application was developed by Pearson Education Australia in conjunction with RMIT University and it enabled students to access assessment, class scheduling and location information 'on-demand'. The technology also provided staff with the ability to remind students about tasks required immediately prior to the class.

Surveys of students registered to participate in the pilot were conducted to investigate the uptake and usage of the technology. The information quality in relation to the triggers available and responses from the Trigger application was also surveyed. In order for the technology to be effective the language used for the triggers was designed to facilitate easy transfer from their social involvement with the technology. The information made available to students using the SMS Trigger application piloted at RMIT provided time-sensitive information. The information sent included reminders for deadlines for assessment, time and location information about lectures and workshops, time and location information about examinations and assessment tasks; and assignment and exam marks.

Research methodology

A project based methodology was used to scope, develop, prototype, test, and review in order to establish proof of concept. The methodology supported fast development of the technology prototype in conjunction with the identification of innovative uses of mobile technologies and a holistic and rigorous evaluation of 'best-practice' usage of applications specifically designed for the higher education sector.

This project utilised an online survey to collect data from the students involved in the pilot. The survey questions were developed based on hypothesis generated using Davis's (1989, 1993) Technology Acceptance Model (TAM). Quantitative data was gathered using a five point Likert scale. The TAM is used to explain and predict how users come to accept and use novel forms of technology. The model suggests that when users are presented with a technological system, the perceived usefulness (PU) and the perceived ease-of-use (PEOU) influence their decision about how and when they will use it. As the intent of the research was to develop a technology application that had a positive impact on the student learning experience both technology 'perceived usefulness' (PU) and 'perceived ease of use' (PEOU) were evaluated.

Hypotheses based on the TAM underpinned the student survey tool for the SMS technology pilot (Appendix 1). The use of the model enabled an evaluation of the benefits of SMS in relation to supporting student services, specifically scheduling information and assessment feedback. The study methodology was used to meet the aims of designing learning and teaching situations using relevant technology based systems. Trigger was designed to facilitate access to, and delivery of, course scheduling and assessment feedback and relevant downloads needed for learning success.

The Trigger prototype was trialed for 9 weeks of semester 2 2006. Although all of the students were contacted to elicit feedback at the end of semester only 14% responded to the online survey. The poor response rate and the relatively slow uptake seemingly connected to outgoing assessment feedback was mirrored in a similar technology study undertaken at Kingston University and reported on by Stone (2004) The two-way communication process enabled by the SMS technology application is illustrated in Figure 2.

As SMS technology usage has increased the communication channels between the University and students, changes to the associated relationships also require investigation. It is important to recognise

that cultural acceptance of SMS influences student acceptance of the service technology within the university context.

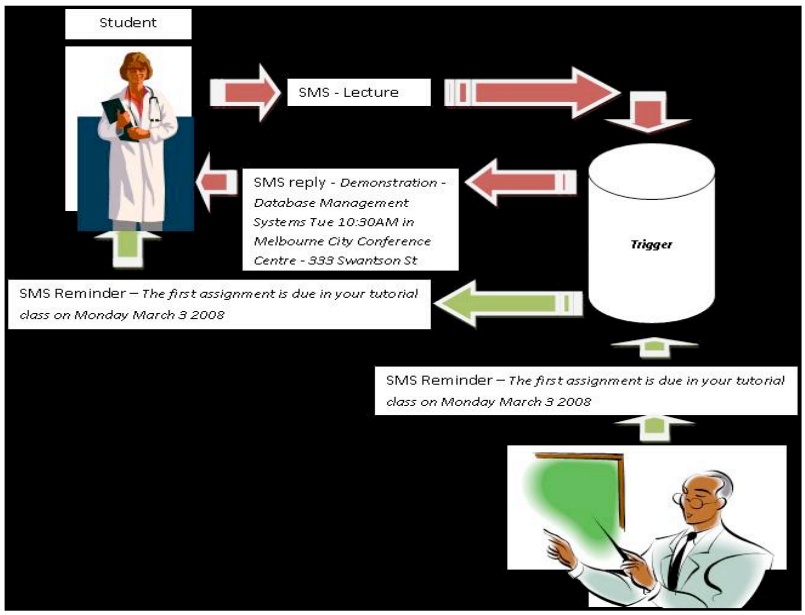

Figure 2: *Trigger* enabled multidirectional flow of SMS text messages

Preliminary findings

Data collected informed an understanding of the effectiveness of particular triggers. Twenty five responses were collected from students. As the data set to evaluate the application of the technology was relatively small the findings can only be treated as indicative. Student responses were collected on a five point Likert scale: Very Frequently, Frequently, Infrequently and Very Infrequently. The words *frequent, useful* and *relevant* were used. Missing responses were also recorded and a quantitative analysis was conducted.

Frequency of use of SMS triggers

Student responses to the survey instrument indicated that 98% found the web interface that facilitated registration into the SMS system easy to use. The language used to engage and instruct the students and the layout of the web interface were obviously effective for the student cohort participating in the pilot and responding to the survey. Discussions and research that provide clarity and guidelines to assist in the creation of SMS messages for business purposes based communication systems is just commencing. "Trigger Control Cards" were provided to students courtesy of Pearson Education Australia. These wallet-sized paper cards contained samples of responses, that enabled the students to have an abbreviated ready access lexicon to the online registration address and reminders of the possible text triggers at any time. This site is displayed in Figure 3.

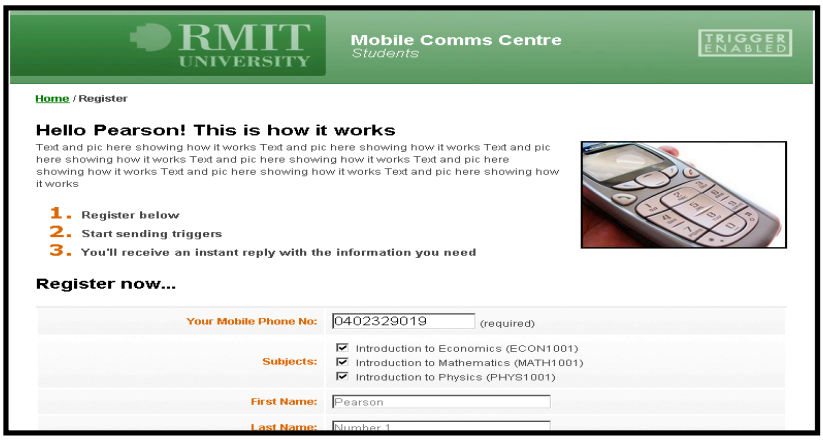

Figure 3: Student registration web site

Once registered, the *Trigger* prototype welcomed the students by SMS and Email using their given name (recorded by the software application during registration). Students' perceptions of the usefulness and relevance of each Trigger available was surveyed. The analysis indicated that the four triggers provided to assist students in completing assessment tasks on schedule and receiving fast feedback in the form of results were perceived as useful by at least 64% of the responding students.

Students gave a 96% approval rating with regards to the convenience of the system for accessing information about their assessment. There was an appreciable difference between the expected use of triggers to elicit information relating to exams at the end of semester or for the next due assignment. The pilot study does not enable causal linkages to be made and the difference could merely be a matter of time or the appropriateness of the trigger language. In one study, Khaslavsky and Shedroff (1999) found a causal link between language and response differences where welcome messages and reminders about assessment feedback sent by SMS technology - described as 'seductive' - caused spikes in registrations into the system.

The pilot study recorded student expectations with respect to using the available triggers. Student preferences indicated their view of the functionality of the application and an indication of the success of the choice of words used as triggers. Table 1 indicates the percentage of students who stated they would use a particular trigger frequently or very frequently.

Table 1: Frequency of trigger use

Trigger Words	Trigger Sample Response	Frequently	Very Frequently	Total %
Lectures	Demonstration - Database Management Systems Tue 10:30AM in Melbourne City Conference Centre - 333 Swantson St	52%	12%	64%
Tutorials	Database - Designing for data Wed 01:30PM in 108.09.003	40%	16%	56%
Latest Results	98%	44%	24%	66%
My Progress	11.25% (with 75% of assessments still to be released)	44%	20%	64%
Next Assignment	Presentation and Spreadsheet Assignment due Mon 12:00PM worth 25	52%	16%	66%
Next Exam	End of Semester Exam conducted during the University Official Examination period Mon 12:00AM in TBA	40%	16%	56%
Due this week	Assignment 1- ISYS2056	44%	16%	58%

Student Perceptions of the usefulness and relevance of the SMS responses to triggers

Table 2 indicates the percentage of students who found the response to a particular trigger effective or extremely effective. The language use in the response and the functionality combined underpin students' perceptions.

Table 2 Student perceptions of the usefulness of SMS responses to triggers

Trigger Words	Effective	Very Effective
Lectures	56%	16%
Tutorials	48%	24%
Latest Results	44%	24%
My Progress	20%	40%
Next Assignment	32%	44%
Next Exam	44%	28%
Due this week	40%	24%
Due Next week	53%	20%

The student perception of the usefulness of the lecture and tutorial trigger responses was marginally higher than their evaluation of the usefulness of the actual triggers. In relation to the responses to questions about assessment the students' felt more strongly than the triggers used to elicit information. The timing and feedback in relation to assessment is critical to the students' experience and they recorded higher rates of response to 'Very Effective' as compared to 'Very Frequently'. Students overwhelmingly supported the relevance of the information delivered using SMS to their needs. An alignment between the trigger words and the standard designed responses was obtained.

Ubiquitous computing encompasses a wide range of disparate technological areas brought together by a focus upon a common vision of possible future relationships between people, practice and technology (Bell and Dourish, 2007 p133). It has been envisioned as technology that stays out of the way, more noticeable by its absence than its presence (Birnbaum 1997;Wieser, 1998). Ubiquitous computing enables new classes of services that only make sense by virtue of being embedded in the environment. These technologies profoundly affect the way people access and use the new services they make available (Fano and Gershman, 2002; Weiser, 1998). Services previously associated with locations become attached to individuals. Service providers are challenged by the requirement to pay continuous attention to their customers. Akin to any efforts involving new technologies there are no simple guidelines and many difficult issues inherent in the social implications of ubiquitous computing (eg privacy, security, visibility, and control).

These disruptive aspects cannot dispel the considerable attractions of technologies designed for continuous interaction, technologies, that address interruption and resumption of interaction, represent passages of time and provide associative storage models (Abowd and Minatt 2000). Our pilot study represents one small addition to the use of these new technologies. It provides university administrations with an opportunity to create a calmer environment by reducing the frequency of frustrations such as missing classes or homework**.**

Conclusion

This application of mobile technology enables students to access information, at a minimal cost, irrespective of geographical location, using a limited vocabulary of requests. SMS an innovative vehicle to disseminate and provide access to information transferred between universities and first year undergraduate students. The intention was to alter the students' behaviour in relation to access to timetabling information. In this manner the technology use could be defined as persuasive according to Fogg's (1999) description that requires a technology application to intentionally alter client behaviour and make an activity easier.

The SMS application reduced the need for students to access University or home computer systems to find subject timetables and locations, assessment schedules and feedback or marks. In addition students could check the reading or work expected to gain the best learning outcome from a class, at any time before the scheduled occurrence. The system piloted at RMIT University was ubiquitous in that once a student was registered, the system recognised the individual and provided information tailored to be relevant to them, "Only information that is selected to be of interest is then transferred to a handset" (Huang et al, 2005, p.143). This system extended the use of the current Internet infrastructure and usage by enabling receipt of Internet based information on mobile phone devices on-demand. The SMS system enables dynamic information transfer with live updates and potentially allows students to better schedule and organise themselves. The cost to students is minimal as all that they require is a mobile phone. Further research was undertaken in 2008 to extend the dataset of survey responses, gather qualitative information from both the student and academic stakeholders and to investigate the quality of the information provided by the system. Given the perceived relevance of this technology to the net-savvy student cohort understanding 'how' to use the technology effectively in the higher education sector to support administrative services irrespective of geographical location is important.

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Appendix 1: Survey questions

1. Assessment
a. How effective did you find the SMS service for the provision of assessment scheduling information?
b. How effective did you find the SMS service for the provision of assessment results?
c. Are you satisfied with the security of the message delivery for assessment results?
d. Are you satisfied with the access to assessment results via an individual message sent to you?
e. Are you satisfied with obtaining access to assessment results by sending a text message to Trigger?
f. How convenient was the ability to access assessment information anytime, anyplace?
g. Did the system improve your ability to schedule assessment task work?
2. Lectures, demonstrations and tutorials
a. How effective did you find the SMS service for the provision of lecture, demonstration and scheduling information?
b. Are you satisfied with the access and delivery of scheduling information?
c. How convenient was the ability to access scheduling information anytime, anyplace?
d. Did the system improve your ability to attend class?
e. How often would you use the SMS service to obtain class location information (Weeks 1 -3)?
f. How often would you use the SMS service to obtain class topic information?
3. System usage
a. Was the SMS messaging system easy to use?
b. How useful were the responses from the SMS system for the following Triggers: lectures, tutorials, next exam, next assn, due this week, due next week, latest results, my progress
c. How relevant were the responses from the SMS system for the following Triggers: lectures, tutorials, next exam, next assn, due this week, due next week, latest results, my progress
d. Are you satisfied with your current provider in terms of messaging cost?
e. How accurate were the SMS information responses to the Triggers sent?
f. How would you rate the information quality of the SMS responses to your requests?
g. How easy were the SMS responses to understand?
h. How would you rate the system in terms of availability?
i. How often would you use the SMS service to obtain responses to the following Triggers: lectures, tutorials, next exam, next assignment due this week, due next week, latest results, my progress
4. Satisfaction
a. Was the process for registration into the SMS system easy to use?
a. Was the explanation of how to use the SMS system effective (Cards, EMAIL, communication in class?