# SMARTPHONES AND REGULAR CELLULAR PHONES: ASSESSING THEIR IMPACT ON STUDENTS' EDUCATION AT THE UNIVERSITY OF ZULULAND (MAIN CAMPUS).

by

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Submitted in fulfilment of the requirements for the degree of Master of Commerce in the Department of Business Management in the Faculty of Commerce, Administration & Law at the University of Zululand

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## DECLARATION

I, the undersigned, declare that the work on the topic **"Smartphones and regular cellular phones: Assessing their impact on students' education at the University of Zululand"** is my original work, from the conception to the execution of the study, and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

Sello Mokoena Date

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## ACKNOWLEDGEMENTS

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## DEDICATION

I would like to dedicate this dissertation to **GOD** the Almighty for His love and for making me the person I am today. To my beloved parents, and to **GOD,** my heartfelt thanks that my parents are the two pillars of my life and the lives of my brothers and sisters.

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## ABSTRACT

Mobile phones are everywhere and mobile learning is emerging as a potential learning environment at the University of Zululand. The aim of the research is to assess the impact of mobile phones on students' learning at the University of Zululand pertinent to the study is the work by Thornton and Houser (2005) also searched the use of mobile phone capabilities to enhance Japanese students' learning for English lessons.

The University of Zululand is dominated by black-African students, making the study focus to be based on this group. The research information was collected from this group as they are the majority population on the Campus.

The study drew evidence from a structured questionnaire which was designed and distributed to postgraduate and undergraduate students in all Faculties. The median test / Wilcoxon's signed test rank was used to determine the objectives of the study. Further more; analysis using a chi-square test was employed for an association test between the study factors, to further determine whether there is a significant association between the students' opinion regarding mobile phone as a useful tool for learning the type of mobile phone the students use, and the gender of the students.

Another association test was done to further determine whether there is a significant association between each mobile phone capability, the type of mobile phone the students use, and the gender of the students. Finally a binomial test was employed to determine whether there is a significant difference between the proportion of smartphone users and regular cellular phone users.

The findings of the study revealed that students consider that their mobile phones are useful tools for their learning regardless of their mobile phone type and gender. Other findings were that students consider that the ability of each mobile phone capability is a useful function for their learning independent of their mobile phone type and gender. This result revealed that regular cellular phone users may have the experience of smartphone capabilities.

Students contended that their mobile phones are distracting during lectures when they are in use. They preferred to use their mobile phones for learning in other environments where they viewed them as useful for learning, not during lectures. The final study findings revealed that there are many more users of smartphones at the University of Zululand than the regular cellular phone users.

The researcher recommends that there is a need for higher learning institutions to incorporate the students' mobile phone for learning activities to enhance students' learning. Well-structured and well-defined requirements for using the student mobile phone for learning are needed. A practical investigation of students' learning using the mobile phone is needed, and they have to be assessed for capturing the investigation results to evaluate their performance while they are learning to use their mobile phones.

# CHAPTER 1

## THE PROBLEM AND ITS SETTINGS

### 1.1 Introduction

Mobile phones are increasingly becoming the ever-present penetration and transformation of everyday social practices and space. Together we are drawn to the learning students' outreach possibilities inherent in smartphones applications such as Facebook, Twitter and MySpace. The functional value of a smartphone is promoting students' consumption in mobile technology and experience in learning via the mobile devices. This study examines whether mobile phones and their capabilities are useful for students' learning, the impacts on students using mobile phone capabilities at a certain time, and the learning environment in which students prefer to use them. The new mobile phones' functions include camera, computer applications, music player, GPS (Global Positioning System), and gaming features. These mobile phones are no longer only a tool for communication but a necessary instrument of individuals' social and work life. In developed and developing countries most people have adopted the use of mobile phones in learning processes. They are an attractive tool for communication and interpersonal relations, and have become increasingly used in an educational context. Some people tend to seem depressed, lost and isolated without their mobile phones. This makes their daily activities bizarre (Takao, Takahashi and Kitamura, 2009).

According to Liu, Tao and Nee (2008), being aware of other students is most important for student activities on campus. Messages can be shared among students through mobile phones. There are so many features supporting communication models on mobile phones. A web-based collaborative learning environment requires computers and the internet. The internet

has widely promoted collaborative learning among students, now provided by our mobile phones. Today mobile phones are included in this environment because one can access the internet, so easily supporting web-based collaborative learning anywhere/anytime.

Mobile phone use in libraries was identified as troublesome; they were the cause of noise in the library. Library authorities enforced library policies banning mobile phones use in libraries. Distractions caused by cellular phones in libraries led to their complete banning. The enforcement approach used for a cellular phone user in libraries is to hand out a slip that reads: "Dear Cell Phone User. Your private conversation is being overheard by other library users, who wish not to be disturbed. It is the library policy that cell phones are not to be used in the library. Thank you." This slip brings the attention of library users to the need for a visitor to switch off his/her cell phone when entering the library. Today libraries have formal policies banning mobile phone users. These policies remind the user to turn off the ringer when entering the library (Heaton and Master, 2006).

Participants in the classroom and parents should find a way of using the smartphones' capabilities by supporting the classroom contact session between the lecturer and the student (Campbell, 2006).

According to Ally (2009), the use of wireless, mobile, portable and handheld devices is gradually increasing and diversified across different sectors of education, both in developed and developing countries. Some mobile learning is advocated to be defined and theorised in terms mobile devices and technologies, others are defined in terms of learners' mobility, mobility in learning and, lastly in terms of the learners' experience of learning using a mobile device. In spite of different definitions of mobile learning this is still new and unclear. This concept is emerging as completely new and different alongside the mobile workforce and the connected society.

Mobile learning creates new ways of accessing and sharing knowledge. For an example, designing lecture notes to be viewed by the students on their mobile phone for their preparedness for school work wherever. They are, is another one / way of mobile learning. Looking at the wider context of mobile learning, mobile devices are responsible for the new forms of art, employment, language, commerce as well as learning. They are part of every transformation of discourses and knowledge (Ally, 2009).

Most research has focused on Western universities' use of mobile phones to support student leaning on campus. Little attention is paid to African rural universities booming with students carrying new advanced mobile phones on their daily schedule. The present study assesses student opinion on mobile phones as useful tools for enhanced learning at the University of Zululand. The findings could elicit management decision on incorporating mobile learning services on campus using the students' mobile phones, supported by special software applications (apps).

### 1.2 Problem statement

Mobile learning through the use of mobile phone development and new capabilities has integrated and changed both the learning and the academic environment of students at the University of Zululand. This raised the question: to what extent have mobile phones impacted on students? The purpose of this study is to assess the mobile phone capabilities enhancing learning at the University of Zululand, and whether the mobile phone is a useful tool for student learning at the University of Zululand. The university management can develop the delivery of education through the use of mobile phones. This would increase our students' engagement with and commitment to their learning activities (Clough, Jones, MacAndrew and Scanlon, 2007).

According to Clough et al., (2007), researchers and educators have adopted mobile devices as tools that support and enhance the learning experience. There has been a near-ubiquitous market penetration of mobile devices such as smart phones, cellular phones and PDAs, in both formal and informal learning contexts, with learners of all age groups. The new smartphone acts as a PDA with similar features, which are easily used both in classroom and outside in field-work.

### 1.3 Research questions

Are the smartphone and the regular cellular phone a useful tool for enhancing student learning?

What smartphone and cellular phone capabilities/features enhance student learning?

Is a mobile phone a good tool to support student learning environments as opposed to computers, laptops and notebooks?

What is the most preferred mobile phone type for student learning?

### 1.4 Objectives of the study

The increase in technological support of mobile phones in our personal daily activities has brought an opportunity for these devices to be used as educational tools for students on campus. Today they offer services which were offered by the old paradigm of PCs and laptops. The competitive advantage of mobile phones in learning is their mobility, size, and capabilities incorporated in these devices. They are convenient, efficient and effective when used in learning settings (Starkweather and Stowers, 2009). The researcher's interest is in the

extent to which these mobile phones have enhanced student learning at the university when the student is using the devices to access the internet to gather information relevant to his/her courses.

Prior research has proposed that the use of mobile phones to enhance student learning increases student attention to school work and participation in learning activities, and enhances motivation and the learning experience (Eteokleous and Ktoridou, 2009). The general objective of this study was to discover the impact of mobile phones on student academic learning. The research seeks to address the following objectives:

**Objective 1:** To determine whether mobile phones have a positive impact on students' academic learning by assessing the student opinions and experiences, and whether in particular their opinions are associated with:

- the type of mobile phone
- the gender of the student.

- **Objective 2:** To determine the most preferred environment in which students use mobile phones to support learning activities, and hence the most preferred time when they use them for learning.

- **Objective 3:** To determine which features students regard as contributing significantly towards the learning process. To further determine whether students regard some features as more important than others.
- **Objective 4:** to determine the most preferred mobile phone type for student learning.

## 1.5 Hypothesis formulation

The main hypotheses are as follows:

**Null hypothesis**: students consider that their mobile phones are not useful learning tools.

**Alternative hypothesis:** students consider that their mobile phones are useful tools for academic learning.

## 1.6 Value of the study

The findings of this study will be useful to both smartphone designers as well as the university management team. The smartphone designers could use this information to design better applications targeting students. The management at tertiary institutions can use the findings in designing programmes that incorporate smartphones as a learning and communication tool. The cornerstone of the present study is that it is going to be conducted in a comprehensive university located in a rural society for the purpose of promoting mobile learning on campus. Most studies relating to the present study have been conducted and published by urban universities.

## 1.7 Research methodology

The research methodology are steps, procedures and strategies used in collecting and analysing data in a research investigation, so that information can be obtained from data (Polit and Hungler, 1991). The study subjects are students from the University of Zululand. Quantitative research method was used to properly analyse and give a clear picture of the study.

### 1.7.1 Sampling

For the purpose of the study the geographical parameters were strictly limited to students from, the Faculty of Science and Agriculture, the Faculty of Education, the Faculty of Commerce, Administration and Law, and the Faculty of Arts. Sample 1 has been represented as the sample of the pilot study which is going to be 10% of the actual study sample. The pilot study sample has been drawn from the Faculty of Science and Agriculture. Sample 2 will consist of all four faculties of the University of Zululand. The reason for sampling all the faculties was to come up with a sample representing the university population of students. The study focuses on students' opinion on using their mobile phones as learning tools to enhance their daily learning and educational activities.

### 1.7.2 Sample size

Our study focused on black African students' aged from 18 to 35. The definition does not include Indians, Coloureds or Chinese persons as indicated in the South African Constitution. The sample size used for the study was 386 students.

### 1.7.3 Data collection methods

The data was collected from the students using a structured questionnaire. The questions are quantitative in nature, so quantitative research method is used. A stratified sampling method was used for the selection of participants of the study. Section B responses are on a 5 - point Likert scale from 'Strongly Disagree' (1) to 'Strongly Agree' (5). Section C responses are on

a 5-point semantic differential scale ranging from 1= Poor to 5= Excellent. Only quantitative data was collected and analysed.

### 1.7.4 Distribution of the questionnaire

A structured questionnaire was distributed to the respective Faculties at the University of Zululand to students as participants of the study. Random sampling was used with the criteria for selection to fill out the questionnaire being any black African student at the university. A copy of the questionnaire is included in the Appendix B.

### 1.7.5 Data analysis techniques

This study has analysed data using descriptive statistics, median test / Wilcoxon's signed rank test, chi-square test, Friedman test (non-parametric ANOVA) and lastly the binomial test for the study findings and results. Responses were analysed using the Statistical Programme for Social Sciences the, (SPSS) package.

## 1.8 Limitations of the study

As mobile learning is defined as a new venture of learning using the mobile devices for students there are many challenges in employing mobile learning using the students' mobile phone as learning tools. Learning using mobile phones with wireless internet connectivity indicates many challenges and limitations. They have small screens, small multifunctional keypads, low display resolution, and less computational power. This challenges the practice of mobile learning using the mobile phone. However, through the developments and mobile

technologies innovations, the availability of these gadgets in the life of any individual is key. Qualitative analysis could have been used, too, in order to obtain a better understanding of student perception of mobile phones' impact on students' education through focus groups, interviews and other data collection methods. However, the present study has employed only quantitative analysis, using a well-structured instrumentation.

The study focuses on one mobile device, the mobile phone. It could have included other mobile devices such as i-pods, PDAs and laptops, but the researcher decided to focus on mobile phones, the smartphone and the regular cellular phone as they are the most used mobile devices and affordable to many students on campus.

The study focus was at the University of Zululand, on black African students. The study could have used two African universities and different racial groups to achieve more depth in understanding mobile phone impact on students' education in different higher learning institutions. However, the study was restricted to Unizulu because a broader one would have required more money and more assistance. The University of Zululand is dominated by black Africans so they conveniently represented the study sample.

The presented limitations of the study are a clear indication that the findings cannot be generalised only to the University of Zululand. The findings do indicate, however, whether mobile phones are useful tools for students' learning, and also furnish the opinion of students on mobile phone capabilities in enhancing mobile learning.

## 1.9 Summary

The first chapter has given a summary of the study and some insight as to what to expect in the following chapters. The next chapter is organised as follows: the theoretical framework of

models supporting the study investigation, the history of mobile phones, studies relating to the uses of mobile phones and other mobile devices for learning and the capabilities of mobile phones in enhancing learning.

# CHAPTER 2

# AN OVERVIEW OF THE LITERATURE

## 2.1 Introduction

According to Eteokleous and Ktoridou (2009), the advances in mobile technologies have brought additional opportunities in the new era of mobile learning, making it possible and easy to enrich the learning experiences of individual learners. The opportunities offered by the most recent mobile technology, in the development of mobile phones present new opportunities and new challenges to educational systems. For data analysis the study by Eteokleous and Ktoridou (2009) used the chi-square ($x^2$), the non-parametric statistics test testing for the distribution of scores across the groups. The main objective of the present study is to assess the impact of mobile phones on students' education, and provide guidelines and recommendations for universities to implement mobile learning on campus through capabilities provided by students' mobile phones.

According to Caverly, Ward and Caverly (2009), with the 3G internet-capable mobile phones, there are over 60 000 apps (software applications) for 3G mobile phones. These apps are promising to be part of educational development. Devices like the blackberry for example allow people to read and send e-mails and read and update a shared calendar. Students have a wide range of demand for self-organization. Their requirements are: to attend classes, meet course deadlines, revise for exams and manage group and individual projects. They can manage their self-organization through the capabilities of the mobile phone, as mobile learning is becoming more suitable for students, and exciting through the models of the product. This learning environment easily enhances collaborative learning for both educators and students.

Today these tools are directly used as part of classroom activities to promote new methods of teaching and learning. According to Thornton and Houser (2005) Japanese college students saw value in receiving English lessons sent as text messages to their mobile phones. Students reported that the use of text messages for teaching and learning during class was an effective and efficient means of providing help in large lecture halls for communication between the two parties involved. Educators can use mobile phones for the purpose of teaching and learning by using quizzes, in-class tests, lecture schedules, lesson material and notes, and supplying web-based curricula (Eteokleous and Ktoridou 2009).

## 2.2 The study's theoretical framework

This study fits into the theoretical framework of Consumer Behaviour, Marketing Research and the model of Unified Theory of Acceptance and Use of Technology (UTAUT):

**2.2.1 The theory of consumer behaviour:** The change in consumers' products and services preferences and their different ways of buying produce the study of consumer behaviour. The study of consumer behaviour aims at having knowledge on how consumers will behave in the future, especially as a result of experience and knowledge influencing their buying decisions (Lamb, Hair, McDaniel, Boshoff and Terblanche, 2008).

There are three components in the model of consumer behaviour, namely, individual factors, social factors and the purchase situation. These components influence the consumers' decision to buy or not to buy a product or service.

Individual factors influencing consumer buying decision: These are factors such as perception, motivation, learning, values, beliefs, attitudes, personality, self concept and lifestyle. They are the first major group of factors that influence consumer decisions to buy or

not to buy. They have a powerful effect on consumers through advertisement and post-purchase behaviour (Lamb et al., 2008).

Social factors influencing consumer buying decision: According to Lamb et al., (2008) these are external environmental factors existing from interactions between the consumer and the social system. They are the second most important group of factors influencing decision making including all effects on buying behaviour. These social factors affecting consumers' decision to buy or not to buy are social class, reference groups, opinion leaders, culture, subcultures and family life cycle.

Purchase situation influencing consumer buying decisions: At the time of purchase individual consumer behaviour is influenced by the existing purchase conditions. The three conditions that play a major role in buying are: 1. the reason for buying, 2. the time of buying and 3. the physical surroundings affecting buying (Lamb et al., 2008).

As mobile phone ownership and use have increased, researchers have indicated that the product capabilities enhance students' learning activities as does the use of PCs and laptops. These products' buying power is in sufficient quantities, leaving the marketers, designers and programmers happy to satisfy the market need. Smartphones and feature phones are changing mobile consumer behaviour through the mobile internet, and SMS is a powerful marketing tool to reach mobile phone users. Young adults are the hot target market, most of them are found in higher education institutions using or carrying these products around campus anytime/anywhere during the day. Through these product improvements they have been useful for students' mobile learning, enhancing the higher education institutions' competitive advantage in promoting learning.

**2.2.2 The marketing research theory:** This theory is explained as a fixed organised plan and objective process by managers to incorporate their clients opinions, by collecting, recording and analysing data to support managerial decision-making (Lamb et al., 2008). This plan provides a better anticipation of clients' needs and competitive activity, allowing the organization to respond faster to new opportunities, and effectively overcome threats.

According to Nemati, Khan and Iftikhar (2010), for designers' innovations on mobile phone capabilities are the result of research into the importance of consumer satisfaction with the new product/service and the innovations the mobile devices provide. These innovations and technological developments in mobile phones are introduced according to consumers' needs indicated through market research, thus automatically increasing consumer satisfaction. As the mobile phone market is regarded as the fast growing market, mobile phone companies undertake marketing research from time to time to bring new changes and features to attract consumers.

The role of marketing research: Marketing research is used to examine and discover data relevant to support marketing decisions. As it is a problem-orientated process, managers use it when they need assistance and guidance in solving a specific problem and identifying new opportunities (Lamb et al., 2008).

The process of marketing research: This is the organised plan which supports managerial decisions to anticipate future new opportunities and effectively counter threats of the new opportunities. This process consists of eight steps:

Defining the marketing problem – situation analysis

Formulation of the research objectives

Collection of secondary data – reconsidering the objectives

Planning research design – sampling, data collection, and questionnaire design and data analysis techniques.

Collection of required data

Analysing and interpreting the data

Preparations and presentation of the report

Through undertaking marketing research on the use of regular cellular phones and smartphones in higher education institutions, new potential opportunities could be spotted in supporting students' learning environments, processes and activities on campus. Based on other research studies on mobile learning by Thornton and Houser (2005) and Eteokleous and Ktoridou (2009), the mobile phone capabilities were adopted in supporting and enhancing learning activities anytime/anywhere. The managerial board of the university is responsible for making decisions on learning services delivery. Undertaking a process of marketing research, the institution could identify the new opportunities to channel their learning services delivery with the support of mobile phones to enhance student learning. The management would decide how mobile learning could be implemented on campus using students' mobile phones and the university system to meet the university's mobile learning objectives.

### 2.2.3 The principles model of Unified Theory of Acceptance and Use of Technology (UTAUT)

According to Abdulwahab and Dahalin (2010), the UTAUT theory was suggested by Venkatesh, Morris, Davis and Davis (2003), by the combination of eight famous models/theories in their varied training. These theories/models had different ideas and

principles and were mixed to reach a combined view of user acceptance of Information Technology (IT).

This theory integrates elements across eight models of information technology use. Mobile learning using the mobile phone is the focus of the present work and also in gaining the vital view of the incorporation of students' mobile phones to support learning at the University of Zululand. The UTAUT theory for the present work covers mobile learners, the use of mobile phones to support mobile learning systems and conducting learning activities. This UTAUT model could also be applied in new challenges of mobile learning context through the use of students' mobile phone. It is considered the mobile learning context and user factors. It incorporated one additional construct into the UTAUT model in order to account for the impact of mobile phone on students' education and mobile learning acceptance: self-management for learning. The research constructs used in marking this study are performance expectancy (PE), effort expectancy (EE), social influence (SI), perceived mobile phone capabilities (PMPC) and self-management for learning (SL). These constructs were presented to determine the behavioural intention (BI) for learning using the mobile phone. The student mobile phone type and gender of the student were hypothesised so that differences would restrain the influences of these constructs on behavioural intention (Wang, Wu and Wang, 2009).

**The eight theories:**

Theory of Reasoned Action (TRA): In the unified model of UTAUT this theory is the most fundamental and influential on human behaviour, through (i) attitudes towards behaviour, (ii) subjective norms (Wang et al., 2009).

Technology Acceptance Model (TAM): This model was originated to predict technology acceptance usage. It has been widely applied to various types of technologies and users.

Perceived usefulness and ease of use of the technology are the construct elements of the TAM (Wu, Tao and Yang, 2008).

Theory of Planned Behaviour (TPB): This theory is mainly known as the extension of the TRA by including the construct of perceived planned behaviour control, and IS successfully applied to the understanding of individual acceptance and usage of various technologies (Wang et al., 2009).

Combined TAM and TPB (C-TAM-TPB): This is the combination theory of two models indicated, combining theory predictors of the TPB and the TAM with perceived usefulness from the TAM and the model known as the C-TAM-TPB (Wu et al., 2008).

Diffusion of Innovation Theorem or Innovation Diffusion Theory (DOI or IDT) – This theory was adapted from properties of innovations postulated by the IDT and refining the set of constructs that are used to explore individual technology acceptance use. These constructs include relative advantage, ease of use, image, visibility, compatibility, results indication and voluntariness of use (Wang et al., 2009).

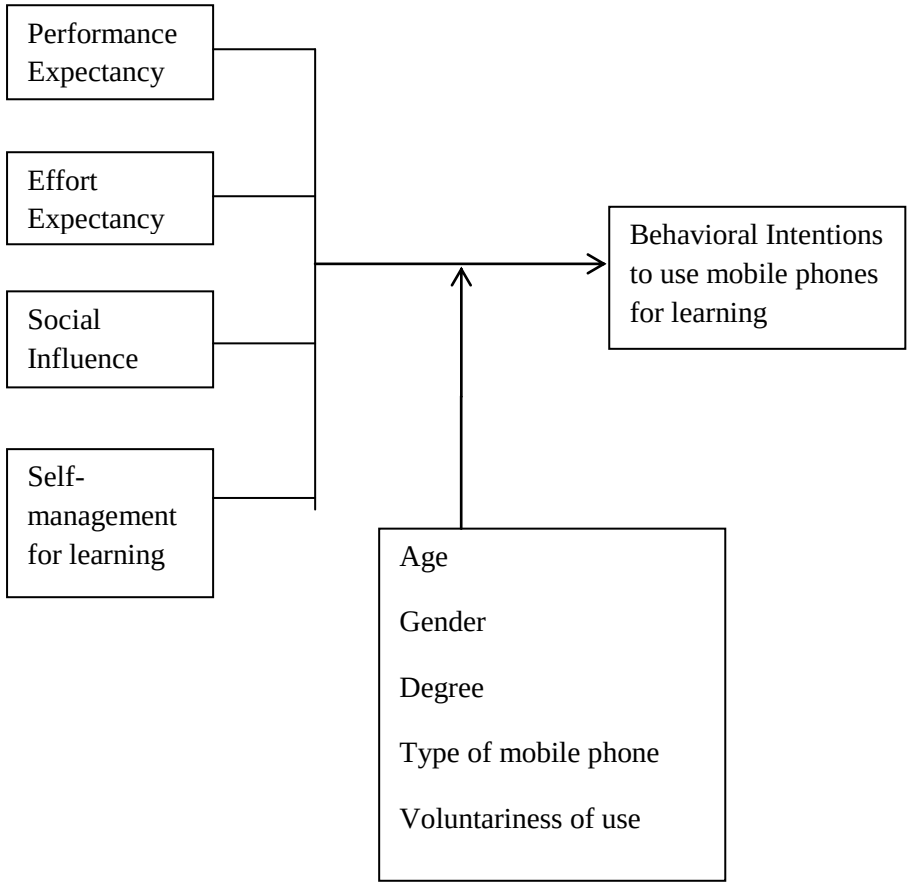
Social Cognitive Theory (SCT): This model consists of five core constructs: expectations performance, outcome expectations, personal self-efficacy, and anxiety. This model is applied and extended to the context of the computer (Wang et al., 2009).

Motivational Model (MM): This model is for understanding the new technology acceptance and use, through understanding the intrinsic and extrinsic motivation of technology in use and accepted (Wang et al., 2009).

Model of PC Use (MPCU): The originality of this model is also based on the theory of human behaviour in using personal technologies (computers). It was used to predict P.C. use.

The MPCU consists of six constructs: job fit, complexity, long-term consequences, effect towards use, social factors and facilitating conditions (Wang et al., 2009).

**Figure 2.1. A Conceptual Model of UTAUT in the context of mobile phones**




Source: Venkatesh, Morris, Davis and Davis (2003)

These variables indicated in the conceptual model are defined below (Abdulwahab and Dahalin, 2010).

Performance expectancy: It suggested five constructs from existing models to capture the concept of performance expectancy: perceived usefulness (TAM and C-TAM-TPB), intrinsic motivation (MM), and job fit (MPCU), relative advantage (IDT), and outcome expectations (SCT) (Wang et al., 2009).

According to Abdulwahab and Dahalin (2010), this is the level of an individual user who believes that using the mobile phones for learning will help in enhancing his/her performance. This building part of the UTAUT was reported as more important in all measurements despite environmental settings.

Effort expectancy: Three constructs from different models relate to effort expectancy: perceived ease of use (TAM), complexity (MPCU), and ease of use (IDT). The critical determinant of behavioural intention in early stages of mobile learning is effort expectancy in the early stages of behaviour (Wu et al., 2008).

Social influence: The extent to which a person perceives that it is important to use a new information system through social influence. Social influences are key in shaping one's use of new technologies. Three constructs from the models capture the concept of social factors: subjective norms (TRA, TPB, C-TAM-TPB), social factors (MPCU) and image (IDT) (Wu et al., 2008).

Perceiving that the individual user believes that he/she should use mobile phone technology for learning and it is important. The social influence construct has the most facts and ideas from six theories/models used (Abdulwahab and Dahalin, 2010).

Self-management for learning: It is defined as the degree to which an individual feels he/she is self-disciplined and can engage in autonomous learning using the mobile phone devices. Since mobile learning is defined as learning using the mobile devices, it is expected that a person's level of learning using the mobile phone will have a positive impact on his/her behavioural intention on self-management for learning through mobile learning (Wang et al., 2009).

Behavioural intention: The behavioural construct has a straight impact upon the individual actual use of technology. This construct originates from the Theory of Reasoned Action (TRA). The technology acceptance model is the key standard in user acceptance research due to its importance in information management, so behavioural intention was introduced to Management Information System (MIS) through the technology acceptance model (Abdulwahab and Dahalin, 2010).

User acceptance: In this study user opinion and behaviour is used as the indicator of user acceptance, as it is quite a challenge to have data about the actual usage (Abdulwahab and Dahalin, 2010).

**Value of the study**: The findings of this study will be useful to both smartphone designers as well as the university management team. The smartphones designer could use this information to design better applications targeting students. The management at tertiary institutions can use the findings in designing programmes that incorporate smartphones and regular cellular phones as learning and communication tool. This work attempts to propose a procedural model of UTAUT modification through incorporation of mobile phones into student learning settings, and through management decision-making. This model is geared towards the user acceptance of mobile phone use for student learning on campus, and it demands attention.

### 2.3 History of mobile phones

According to Lipscomb, Totten, Cook and Lesch (2005), businesses like Motorola and General Electric were tasked with improving mobile technology. During the 1970s, when cellular phones were emerging in the market, the first mobile phone was the size of a small

briefcase. In the 1980s and today cellular phones are products which are even smaller than a pack of cigarettes. They are offered in different colours for their attraction to customers, and some are designed for men and some for women. They have a number of features to choose from, like ring tones, mobile music, push-to-talk, television clip playing, streaming video, wireless cameras, browsers and entrance exam preparation reviews. Companies like Nokia and others are trying to come up with another technology for mobile phones, creating a new hybrid that combines PDA functions, camera imaging, and music and wireless internet capabilities, i.e. smart phones. Most of the people dominating this market are young adults. Blacks are predicted to be the hot target market for mobile phone industry growth dominating tertiary institutions.

The first demonstrated hand-held phone by Martin Copper of Motorola in 1973 weighted 2 kg. There are two types of mobile phone; the low-end and the high-end. Low-end mobile phones are referred to as feature phones. The high-end mobile phones, with more advances in computing abilities are referred to as smartphones. The first smart phone was designed by IBM; it was called Simon. Smartphones allow the user to instal much more advanced applications based on a specific platform. Mobile phones use rechargeable batteries to keep the power to upload applications. The Nokia communicator lines were the first of Nokia smart phones, starting with Nokia 9000 released in 1996. They run complex operating system software providing a basis for applications developers. The GSM mobile phones require a small microchip to function which is called the Subscriber Identity Module, or SIM card. The SIM card is used to identify the subscriber on mobile telephony devices such as mobile phones. It is approximately the size of a small postage stamp. It is placed underneath the battery in the rear of the unit (Heeks, 2008).

## 2.4 Learning with mobile phones (m-learning)

### 2.4.1 A wider context of mobile learning

The report from the International Telecommunication Union 2006 (ITU) states that 77% of the population in developed countries are mobile subscribers. The appearance of mobile, wireless and satellite technologies are changing our daily life and our learning. Mobile phones are provided with the new internet supporting small-screen and wireless devices. M-Learning could be considered as learning that happens when the learner is not stationed, at a predetermined location, or where handheld devices such as mobile phones, PDAs and palmtops and tablet PCs are dominant technologies (So, 2009).

According to El-Hussein and Cronje (2010), the technology in use for learning is fully mobile when using wireless digital-device technologies, and used by students for self-management as they participate in higher education. It places a strong emphasis on mobility in learning. Mobility in learning refers to the capabilities that the mobile technology devices have brought in a physical context and activities of students as they participate in higher learning institutions. The activities of learning processes, the behaviour of students as they use the mobile digital devices for learning is interesting and compelling. Understanding mobile education focuses only on technologies and hardware, hand-held and mobile phones. The present study focuses on the mobile phones such as cellular phones and smartphones as whether they are useful learning tools for student learning, with mobile phone capabilities that promote or enhance mobile learning for students on campus. The attention is on what the students experience when learning or education is delivered via their mobile phones, together with assessing mobile phones' unique contribution in enhancing students' education. Collaborative learning practice is easily enhanced through mobile learning using mobile phone technologies. Different researchers' results and results from the work of El-Hussein

and Cronje (2010) indicate that using mobile phones to deliver higher education content will enhance learning and training at higher education. Mobile phone provides support for students in learning and training through their capabilities as:

enables quick content delivery

supports time in project-based group work

engages students in learning-related activities in a diverse physical location

enhances availability and accessibility of the information network

There has been a slight change in traditional learning processes through the use of mobile phone capabilities in learning, shifting the world of learning to be more collaborative and learner-centred, enhancing the students' learning experience. Smartphones increase students' access to information anytime/anywhere while supporting the individual-participation in learning activities using mobile phone. Technology mobility provide students with the ability to access the internet using the WAP and the Wi-Fi. This has stolen the market for standard desktop personal computer that connects the internet using landline stations. The standard of learning has been improved; e-learning is practiced anytime/anywhere cancelling situated e-learning. The new smart phone provides capabilities that include the video camera, telephone, GPS, film player, games, e-book, e-mail, and facilitation of internet access, music MP3, SMS and MMS. Obviously these capabilities can be useful to student learning settings and practice (El-Hussein and Cronje, 2010).

### 2.4.2 Mobile learning research and development

According to Attewell and Savill-Smith (2004), the background of the mobile learning project was a three-year project by the Pan-European Research and Development Group with partners in Italy, Sweden and the UK. The purpose was to use mobile devices like mobile phone to supply the ability to read, write, and also the ability to do basic mathematics for the learning experience of young adults (age 16-24), to promote development and achievement of long-life learning objectives. The project coordinators were the Learning and Skills Development Agency (LSDA), with project partners including two commercial companies (Cambridge Training and Development Limited in UK, and Lecocnado AB in Sweden). Research results on the impact of mobile phones and their possible use in learning by Attewell and Savill-Smith (2004) state that mobile phones are appearing widely in the outer-side communities that surround the cities of developing countries increasing the opportunities of bringing education to these communities. The locations of our institution represent the geographical areas where opportunities of getting education through our mobile phones are possible as mobile phones are spread more widely. Mobile phones enable effective, efficient and affordable communication, and are thus important to teenagers' identity and friendship. In most instances SMSs are used to encourage students to prepare and revise early for their examinations. Mobile phones have been used as a subject of teaching. They are used to encourage the student creativity in educational activities.

According to Avellis, Scaramuzzi, and Finkelstein (2004), the potential of mobile phones in educational training and learning is relatively new in mobile learning arena; they are small portable and compact. They are mobile devices which are relatively low in cost, lightweight and work for hours and days using electric charges for disposable or rechargeable batteries. Their internet access bandwidth has been increased in a short space developing the product's

capabilities as e-learning is surely becoming an important part of training for the future (Attewell and Savill-Smith, 2004).

### 2.4.3 Research and development in designing mobile learning toolkit

According to Attewell (2005), research and development in mobile learning systems and learning materials have supported the uses of mobile phones for education. Through the lessons of research and development the researchers and designers have had to come up with practical methods and learning activities accessed on mobile phones. An easy to use toolkit for mobile learning has been designed for teachers in education and training. The research and development findings state that traditional lessons are less interesting than mobile learning practice for students. Mobile phones make it possible to reduce costs and the inconvenience of signal disturbance in some far away-rural areas; this is where education courses and content should be delivered via the mobile phone. All stakeholders' perspectives were examined for the production of this toolkit including educators, students, mentors, researchers and developers.

### 2.4.4 Toolkit for educators using the mobile phone

Researchers and designers have designed the mobile learning toolkit for educators to deliver learning using their PCs to create learning materials and course content which are accessed via the student mobile phones by Attewell (2005). These tools include:

**An SMS quiz authoring tool:** the educator is able to automate an answer system for multiple choice quizzes. This quiz is presented in a power-point presentation with a mobile number on

the slides, so that students can send answers to the questions by SMS and receiving instant results (Attewell, 2005).

**A media board authoring tool:** this tool supports collaborative learning involving the user in the exchange of information and learning tasks for groups of students. In the media board the educator creates internet messages which are general but consist of visualised images. Students connect text and images to areas of the image and to the areas of text, then send them back to the educator by e-mail or MMS from their mobile phone, more especially in chemistry studies (Attewell, 2005).

According to Nielsen and Webb (2011), as a form of communication texting is becoming increasingly contingent to innovative educators. They use texting and cell phones in general as powerful and effective professional and learning tools. The institution's assessment dates, reminders, and study tips of the day are easily shared through the uses of texting using the mobile phone. For an example, Twitter (www.twitter.com) as a service is a great tool through which a tertiary institution provides and shares relevant information with the students, educators, staff and parents. Its advantage is that it operates across different systems which bring commonalities in participation in teaching and learning.

### 2.4.5 Mobile phones: a Learner-Centred Design (LCD)

According to Danielsson, Hedestig, Juslin and Orre (2004), the LCD's main attention is on designing learning environments that enhance an understanding of social contexts of learning and capitalizing on the use of personal technologies like mobile phones based on how students communicate and interact. The LCD methodology gives particular attention to the need to integrate private use of mobile phone technologies into public learning settings. The

participatory design (PD) in the product use is seen as a demand in a specific context of development, involving the users, designers working together to exchange perspectives, learning about each other's skills and values and together identifying the most suitable set of requirements. The LCD was developed as a possible choice for user-centred design (UCD). The LCD moves beyond usability issues to the challenge of developing computer systems that support people in the learning environment, developing high levels of knowledge and skills in work practices that are new and unknown.

### 2.4.6 Mobile phone technologies available for mobile learning

According to Eteokleous and Ktoridou (2009), the benefits of mobile phones integration into student learning on campus are useful with the mobile phone capabilities that are easily supporting learning. Which are:

**SMSs (text messaging):** Short Message Services allow users to send/receive messages of up to 160 characters between mobile phones.

**MMSs:** Multimedia Messaging Service serves the same purpose as SMSs, but it allows the inclusion of graphics.

**GPRS (General Packet Radio Service)**: This mobile data service is available to users of specific phone types; it can be used for WAP service, SMS, MMS, email, and access to the World-Wide Web.

**Wireless access points WAPs**: There are two types of wireless standards: Wireless Fidelity – (Wi-Fi) and WAP (Wireless Application Protocol). They are primarily for internet access on mobile phones.

**Bluetooth**: A short-range wireless communication between PCs, PDAs, mobile phones, camera phones, printers and digital cameras, etc. Bluetooth uses Radio Frequency (RF) for communication between multiple devices within a 30-foot range. It uses a globally available frequency band (2.4GHz) for world wide compatibility.

**3G and 4G phones**: 3G technologies enable network operators to offer users services: wireless voice telephony, video calls, broadband wireless data with data transmission capabilities enabling speeds up to 14.4 Mbit/s on the download and 5.8 Mbit/s on the upload. The 4G mobile phones provide up to 100 megabits per second transmission adequate for multimedia operations (Eteokleous and Ktoridou 2009).

### 2.4.7 Possibilities in mobile learning

It is known that mobile technologies have changed life preparedness; today using a GPS (Global Positioning System) means you will never get lost again. The mobile phone technology connectedness is continuing to swing across different landscapes. Soon the importance of deploying mobile technologies in both learning and teaching will be obvious and unavoidable. A few decades ago graphic calculators were a revolutionary addition in the classroom environment, but are now often used for statistics and business classes. Using portable devices in educational cycles is not a new practice. Whether you are ready or not for mobile learning this paradigm represents the next step in a long tradition of technologically mediated learning. This paradigm will come up with new practices, tools, applications, resources and designing strategies to understand the situations of ubiquitous, pervasive, personal and connected learning. This connection could be in a formal education experience (attending a workshop, participating in a training session, attending classes), or an informal education experience for situated learning (receiving performance support while on the job).

There is no disconnection when using mobile technologies. Mobile technology devices allow the user to have relationships with information in his/her own ways; learners are uniquely served by mobile learning. This makes the learning experience more memorable relating, new information to the old information already known. There is a great possibility that mobile learning will have a direct positive effect on learning, as technology helps to strengthen students' motivations, focuses attention, and validates the relevance of learning to performance (Wagner, 2005).

### 2.4.8 Wireless technologies in education

According to Barker, Krull, and Mallinson (2006), today's education and ways of teaching and learning happen anytime/anywhere, through new wireless mobile technologies bringing completely, new effective and important changes in education on campus. The merit of using these new wireless technologies in learning is that they enhance group work on projects, engaging learners in learning-related activities in diverse physical locations and enhancing collaborative learning and communication in the classroom. Learning with wireless devices appears to be boundless, especially within academic society. Mobile phone quality and capabilities increase have brought improved learning situation for wireless technology when students record information during lessons. The most important feature of the new mobile phone technologies is that they extend learning practice beyond the classroom as they are portable and provide additional methods of learning through their capabilities. The three European projects investigated wireless technologies in education (M-Learning, DfES / Becta PDA project and MOBILearn, were aiming not to replace traditional learning but to re-engage those who have left educational institutions (M-learning, 2004) using the mobile phone device. The present study aims to identify possible mobile phone capabilities

enhancing students' education on campus, for their adoption in students' learning practice. A study project in Japan by Thornton and Houser (2005) investigating the extent to which mobile phone technologies were used for learning purposes among university students, and measured students' reactions to retrieving educational material developed specifically for mobile phones. The present study looks at the extent to which new mobile phone technology capabilities enhance student education on campus.

### 2.4.9 Mobile phones impact on education

The aim of this research is to assess the impact of mobile phones in learning as they enhance students' learning in different ways. Mobile phones easily promote collaborative and different types of learning through their wireless connection to the internet. Their adoption in learning processes by the university management as student-learning and communication device tools is useful. In the classroom mobile phones motivate students to be more engaged to the lesson promoting learner-centred participation. This indicates the dynamic support that the mobile phone has brought to students' learning practice. According to Barker et al., (2006) the impacts of mobile phone technologies on learning are portability, collaboration and motivation enhancing students, parents and teachers' education system.

**Portability**

According Barker et al., (2006) mobile phone portability enables student learning to be practiced anytime/anywhere in obtaining or retrieving course information via their mobile phones as they are carried from class to class or wherever. Their portability can improve a wide variety of learning settings, namely a field trip, the classroom, or outside the campus.

**Collaboration**

Social networks such as Facebook and Twitter accessed on students' mobile phones allow students to form groups to distribute and add together their knowledge, and share information with ease, and this could result in a more successful collaborative learning. The use of mobile phones results in increasing parents' involvement in education, and thus their children's learning and capabilities (Barker et al., 2006).

**Motivation**

Where mobile phones are used, incorporated in a large classroom students appear to be more engaged in learning processes. Mobile phones in education increase students' will to learn. They take the initiative in using the device as a learning tool. Teachers report that the use of mobile phones in learning increases group participation in activities done during learning in class (Barker et al., 2006).

### 2.4.10 Mobile learning at university level

Attewell and Savill-Smith (2004), referred to mobile learning as the process of using smartphone and cellular phone devices which are pocketed and used wherever and whenever by students to be able to receive unbroken transmission signals. Wireless technology innovations have improved students economic lifestyle and literacy practice. The mobile phone functionalities enable users to communicate while on the move. They are not confined to one particular place to be effective. These devices are improving the users' behaviour in daily activities and in different ways. Most students use mobile phones for social communication and few have understood their effectiveness in enhancing learning processes and their educational practice.

### 2.4.11 Using mobile phones in the classroom

According to Kinsella (2009), as the university's lecture halls become large classes of over 100 students, students' mobile phones can be used to solve the problem of communication between the lecturer and the students, but a piece of software to support the adoption of the mobile phone is needed (Attewell, 2005). Students send anonymous text messages of questions and comments to the phone number displayed in the application, then each student can see the resulting communication on a big screen behind the lecturer. This application makes a good interaction between the students and the lecturer; students in a large class get their answers in a controlled manner from the lecturer. The support of the software applications platform has turned the mobile phone into a small classroom computer; this has enhanced the clear understanding of mobile learning (Kinsella, 2009).

According to Scornavacca, Huff and Marshall (2009), through the use of SMSs novel application, students' communication has grown, influencing the students' learning experience, especially in large classes. Despite the mobile phone wireless connection to the internet a mobile phone is not hesitated to be a preferred mobile communication device. The potential merit of a mobile phone as an educational tool is that it allows mobile learning out side the classroom. Mobile phone professionals are employing the student mobile phone in informal learning or on-demand learning. Students' qualities and characteristics have supported the use of mobile phones, and students have regarded the device as an essential tool. It is always adjusted to work correctly, and the battery live is generally measured in hours and days.

**The TXT-2-STUD system**

The TXT-2-STUD (text-to-student) system was established to encourage students to carry mobile phones on campus for their learning growth. Nowadays students carry SMS enabled mobile phones anytime of day. At the start of lecture students are reminded that if they have any questions or comments during the lecture they may send SMSs to the number appearing at the corner of the slides. The educator is able to receive messages from students while conducting the lecture using this TXT-2-STUD system platform. This system software allows the educator to read messages sent by students via their mobile phones on her/his computer screen. In analysing a pool of results the educator is able to send the answer messages back to any mobile phone. This is possible if the educator's mobile phone is connected to his/her laptop and SMS management tool is installed. Scornavacca et al., (2009) collected data through a questionnaire with questions on students' perceptions of mobile phone use in the classroom, from 'strongly disagree, disagree, neutral, agree to strongly agree on the usefulness of the TXT-2-STUD system on a 5-point Likert scale. The majority of students at the University of Zululand carry their mobile phones during lectures. SMSs are one of the cheapest mobile phone services which make communication more effective, efficient and interesting between the two parties involved. The adoption of this system could easily enhance our students' participation during lectures. Almost the majority of the class could be engaged and participating, growing students' positive relation to their courses-work and providing more information and answers to choose from. Scornavacca et al., (2009) indicated that students' felt that the use of the TXT-2-STUD would increase their interactivity and their interest in attending classes, and overall it would be a useful and enjoyable addition to their classroom learning activities.

**Two new classroom dynamics to be designed by the University Information Communication Technology Department (ICT):**

**Open channel:** This operation allows students to send questions and comments using a mobile phone to the lecturer's laptop via SMS without interrupting the class. The lecturer will read the messages on the laptop screen and decide whether to answer or comment on the message received. Unaddressed questions during the lecture will be provided by the lecturer afterwards via SMS (Scornavacca et al., 2009).

**M-quiz:** During the lecture the lecturer presents a slide containing questions related to the topic, with four possible responses (A, B, C, and D). Students are allowed to discuss the question and then use their mobile phones to select the answer. The concept of a real-time graphical display and showing of aggregate results displayed on the main screen is used to start class discussions (Scornavacca et al., 2009).

### 2.4.12 Students managing study time through SMS communication

According to Jones and Edwards (2009), students recommend texting as a powerful service that could work as a reminder about work to be done, important deadlines and administrative changes on campus. The texting management tools guide students' intercession in learning activities, in lecture halls, seminars and Virtual Learning Environments (VLEs). Students use their mobile phone diaries and schedule functions. They are enabled to progress towards better understanding of time management strategies on campus through the use of mobile phones. The study by Jones and Edwards (2009) aims to control the university communication culture using mobile phones, the SMS service to promote greater connectivity between students and their lecturers. A comprehensive questionnaire was used

for data collection, and a focus group method was used on how students feel about receiving reminders about their school work to be done or when it is due. Today students who own smartphones see a particular potential for keeping in contact with their lecturers by receiving questions and reminders about deadlines and attending lectures. The SMS seems to be the mobile phone capability that promotes instant communication between students and their lecturers, and being aware of the deadlines and work to be done. This practice keeps students one step ahead with their school work delivery to them to budget their time.

**Using SMS communication for distance learning**

According to Nonyongo, Mabusela, and Monene (2005), a long time ago universities were using the post to deliver and conduct learning for distance learning students, communications which at time got lost or took a long time to reach students. Today mobile phones are playing a major role and are being used as a mechanism for delivering distance learning between students and the university. SMS communication is the most preferred mobile phone service to facilitate distance learning in that the message goes directly to the intended student. In the Nonyongo et al., (2005) study, searched students approved the use of SMS communication between them and the university. The use of SMS communication easily covers rural and remote students from informal settlements with limited technological infrastructure. This benefits both the university and the students as to the cost effectiveness of their education and learning processes, and narrows the gab between the student and the university. Distance Learning Southern Africa (DEASA) has addressed the use of mobile phones as a solution to communicating with scattered university students away from the learning centre. At Farmboraugh college students access their day-to-day information timetables, assignment due dates and College events using SMSs as a communication tool.

## 2.5 Studies on the extent of mobile phone use for students' learning and education at universities

Studies on promoting mobile learning using the students' mobile phones have been researched all over the world. Most of them have been carried out world-wide in higher education institutions, especially in the United Kingdom and the United States.

In the planning and organizing of the present work, it was noted that there is research evidence on students using mobile phones at South African universities to facilitate their studies. These universities are the Cape Peninsula University of Technology in Cape Town and Rhodes University in the Eastern Cape Grahamstown (Barker et al., 2006; El-Hussein and Cronje, 2010).

The research aims of Barker et al., (2006) and El-Hussein and Cronje (2010) were; *inter alia,* to the nature and extent of mobile phone involvement in students' learning settings and their enhancing of students engagement in learning and their learning experience. Students are provided with academic updates and schedules on university activities via their mobile phones which accelerates the students' academic performance. These studies point out that it is mainly students who use these gadgets, so they are the hottest target market for the designers (Baker et al., 2006; El-Hussein and Cronje, 2010).

The aims of these two studies are pertinent to the present study. The present study seeks, *inter alia,* by assessing the impact of mobile phones on students' learning, to anticipate mobile learning practice through the incorporation of students' mobile phones as a useful learning tool. Furthermore this study aims to research the most preferable mobile phone capabilities to enhance learning at the University of Zululand, where the present study has been conducted. Lastly it aims to identify whether differences exist among smartphone users and regular

cellular phone users promoting and practising mobile learning using the students' mobile phone.

Most reviewed journals relating to the present work were from European universities. In their research design, they used questionnaires with open-ended and closed-end items for students to respond to. Examples, Jones and Edwards, (2009) at the University of Bath in the United Kingdom; Eteokleous and Ktoridou (2009) at the University of Nicosia and Frederick University in Cyprus). In the study by Jones and Edwards (2009) a questionnaire was administered to a sample size of 81 students with the response rate of 88%. The findings of the these study, were similar to the study of Eteokleous and Ktoridou (2009) with the sample size of 71 students and report that students' regarded the texting of reminders about work to be done, important deadlines and administrative changes were regarded as effectively aiding time management. Students also felt that texting was better then e-mailing. Both these studies used students as their study sample, encouraging the present study to do so too.

The technique of using a questionnaire and surveys in these two studies motivates the current researcher to use this technique for the present study. Using a similar route, but differing in the items used in the instrument, the present study's questionnaire will only have closed-end items, because the study is only quantitative and uses a descriptive research design.

The work of Jones and Edwards (2009) and Eteokleous and Ktoridou (2009) shed some light on the present research as to what should be more or less expected from it. The study work of Nonyongo et al., (2005) used a questionnaire also, on views of SMS communication use for Open Distance Learning (ODL). Students reported that they were pleased to receive the SMS, which were very useful for learning purposes. This work's findings reported that SMS communication is the key mechanism to replace the old version of post if you are studying in the ODL mode. The study was conducted at the University of South Africa (UNISA).

Kinsella (2009) studied the use of students' mobile phones for lecturers to interact with large classes of over 100 students. The aim was to find the solution to the communication problem experienced in large classes. The findings revealed that there was a high level of participation and engagement by students during lectures. The study endorses the mobile phone as learning and communication tool, especially in the United Kingdom and the United States.

The study by Thornton and Houser (2005) examines the use of mobile phones in English education in Japan at Kinjo Gakuin University. They presented three studies in mobile learning. The first study has similarities with the current research investigation, in dealing with students' use of mobile phones to enhance learning. 333 female students aged from 18 to 21 from different fields of study were included for the study sample. The present study will use both men and women. The findings of the study by Thornton and Houser made it clear that mobile phone capability (e-mail) involvement in students' learning helps students to fulfil educational purposes. 66% reported using a mobile phone (occasionally or often) to ask other students about classes and lectures, 44% used the device for studying. Students suggested that they would like to receive administrative information about classes on their mobile phones. These findings relate to the anticipated results of the present research on mobile phones enhancing students' learning.

## 2.6 Functional capabilities of cellular phones and smartphones

### 2.6.1 Mobile phone capabilities through mobile services usage

The Global System for Mobile Communications (GSM) has been recognized as the first communication technology and it has dominated the market in the developed world. In Sinisalo and Karjaluoto (2009) mobile technology is reported to have advanced to where

mobile phones are cheap enough and powerful enough to use. A well planned mobile technology development giving the subscribers access to the internet via their mobile phone supports modern education and lifestyles through multimedia services and e-mail. Other services such as novel location based services and mobile TV and a wide-spread use of 3G and General Packet Radio Service (GPRS) dominate the mobile devices world (Sinisalo and Karjaluoto, 2009).

### 2.6.2 Classified mobile services

According to Sinisalo and Karjaluoto (2009) there are many more advanced platforms of mobile services users are equipped with. Students are more engaged in using the SMS mobile services than users of basic mobile phones. These services include Multimedia Messages Service (MMS), accessing the web with HTML, browser, e-mails, JAVA, and WAP. The WAP is used to view the internet on a mobile phone. Webb (2010) states that these mobile phone applications (apps) were designed to save time and enable the user to do on the move what they work on at their desks. The customer's requirements is that mobile services will allow the user to make purchases, subscribe to services, and get news and other relevant information via mobile communication.

### 2.6.3 Smartphone a potential device to students' information search

According to Starkweather and Stowers (2009), the new mobile phone called the smartphone has increased students information search possibilities. Smartphones are defined as a merging device that includes cellular telephone, programmable information management features and the internet access. They have reduced the product's cost, and size, and you do not have to

carry more or heavy devices for instant communication. Social networks such as Twitter, Facebook, and MySpace support students with a lot of information that is shared with friends, loved ones, family and relatives. The Blackberry, Palm Pre and iPhone are designed with more than fifty thousand specialized applications. Smartphones offer a number of technologies, including GPS tracking, a digital camera with more advanced mega pixel, and digital music.

According to Johnson, Levine and Smith (2009), in the 2009 Horizon Report states that these new mobile devices will be in use on campuses within a year or less. A smartphone is thus a necessity for a student at high school or university. In fact today most students on university campuses carry mobile phones, either for reading e-mails, texting messages, accessing the web or making phone calls (Thornton and Houser, 2005).

### 2.6.4 SMS (texting messages) via mobile phones

In Taiwan SMS lessons have helped students to memorize vocabulary. Using SMS lessons via mobile phone motivates the students. SMSs can be sent at predetermined times with distributed repetition at optimal intervals (Lu, 2008).

According to Richardson and Lenarcic (2008), SMSs have entered the higher education environment as a way to push information to students through their mobile phones. Students are already using this technology in time management and interpersonal communication, both of which are critical skills. Immediate access to an assessment topic and to due dates has the potential to reduce stress levels within the student population through effective integration of SMS technology with the university systems, and ensures that the technology will satisfy the needs of the customer.

### 2.6.5 Retrieving and sending e-mails via the mobile phone

According to Thornton and Houser (2005), students reported that e-mail was one of the most used features of the mobile phones. At the moment the new mobile phones allow the reception of messages of 10 000 more characters than the older models. Students exchange an average of almost 200 e-mails on their mobile phones each week

### 2.6.6 Accessing the mobile web via the mobile phone

Students are the most active users of the internet but most of them do not use the web to retrieve educational material relevant to their study, because only a few lecturers offer information in online segments for their courses. Internet-based course material should be decomposed into small pages. Even with courses offering web-based materials, redesigning is necessary if they are to be accessed via mobile devices. This could aid effective learning because students always carry their mobile phones around campus, so they will have notes wherever they go (Thornton and Houser, 2005).

## 2.7 Summary

The second chapter of the study firstly examined the theoretical models supporting the study investigation, the history of mobile phones, followed by uses of mobile phone devices in students' learning settings. Journal articles revealed that the use of mobile phones enhances students' learning and engagement in educational activities. Finally the mobile phone capabilities were discussed.

The journal articles on mobile learning gave the lead for the researcher to look out for the literature and suggest statistical tools and instrumentation to be used for analysing data for the following Chapter. The articles set the path for the feasibility of the present study and provided benchmarks of the present research design. The reviewed literature shed some light on the present study's methodology to be used and indicated that students have been participants for mobile learning studies. The present study has also used students. Most of these studies' areas of research are universities, which is pertinent to the present study, which is conducted at the University of Zululand.

# CHAPTER 3

## RESEARCH METHODOLOGY

### 3.1 Introduction

This chapter discusses the research methodology used in the investigation. The study presented is a descriptive study, observing a representative subset. A cross-sectional research design was conducted by assessing variables of interest in a sample once, and applying results of the population. This study uses a quantitative method. Quantitative researchers seek statistical perceptions, the collection of facts, and study the relationship of one set of facts to another (Bell, 1993). They use techniques that are likely to produce quantified and, if possible, generalized conclusions. According to Hopkins (2000), quantitative research is about quantifying relationships between variables, expressing the relationships between variables using statistics such as correlations, relative frequencies, or difference between means or medians. Research methodology uses a deductive form of logic, wherein theories and hypotheses are tested in a cause-and-effect order (Creswell, 1994). The study focus is on the impact of mobile phones (smartphones and regular cellular phones) on students' education (m-learning) at the University of Zululand, through the use of mobile phone capabilities to enhance learning. The research methodology comprises procedures and strategies used in collecting and analysing data in a research investigation, in order to obtain information (Polit and Hungler, 1991). The main study targeted students are from all Faculties of the University of Zululand (UNIZULU). A pre-test was conducted by sampling from the Faculty of Science and Agriculture, in order to determine the effectiveness of the measuring instrument. The pre-testing of a measuring instrument consists of trying it out on a small number of participants having characteristics similar to those of the target group of respondents (Singleton, Straits, Straits, and McAllister, 1988)

For this research methodology we clarified the problem statement, objectives of the study, and the study hypothesis, followed by sampling methods and sample size used for the study. Finally the data collection and data analysis methods are discussed.

### 3.2 Problem statement

Mobile learning through the use of mobile phone developments and new capabilities has integrated and changed both the learning and the academic environment of students at the University of Zululand. This raises the question: To what extent do mobile phones impact on students' education? The purpose of the study is to assess the mobile phone influence on learning, whether they are useful for students' learning, at the University of Zululand.

Most reviewed research articles focus on Western and Eastern universities in using mobile phones to support students' leaning on campus. Little attention has been paid to African rural universities where smartphones have become increasingly popular among students. The present study has been assessing mobile phones with capabilities enhancing students' learning at the University of Zululand. The support gained for the hypothesis (that cellular phones enhance students' learning) will motivate management decisions on incorporating mobile learning services on campus using the students' mobile phones, which are supported by special software applications (apps).

### 3.3 Research questions

Are the smartphone and the regular cellular phone useful tools for enhancing students' learning processes?

What smart and cellular phone capabilities/features enhance students' learning processes?

Is a mobile phone a good tool to support students' learning environments as opposed to computers, laptops and notebooks?

What is the most preferred mobile phone type for students' learning?

### 3.4 Study objectives

The increase in technological support of mobile phones in our personal daily activities has brought an opportunity for these devices to be used as learning or educational tools for students on campus. Today they offer services which were offered by the old paradigm of PCs and laptops. The competitive advantage of mobile phones in learning is their mobility, size, and capabilities incorporated in these devices. These devices are convenient, efficient and effective when they are used in learning settings (Starkweather and Stowers, 2009). The researcher's interest is in the extent to which these mobile phones affect or enhance students' learning at the university when they are in use for learning and or when the student is using the devices to access the internet to gather relevant information for his/her courses.

Other prior research proposes that the use of mobile phones to enhance students' learning increases the students' attention to school work, their participation in learning activities, and their motivation and learning experience (Eteokleous and Ktoridou, 2009). The general

objective of the study was to discover the impact of mobile phones on students' academic learning. The research seeks to address the following objectives:

- **Objective 1:** To determine whether mobile phones have a positive impact on students' academic learning by assessing the students' opinions and experiences. To further determine whether their opinions are associated with
    - the type of phone
    - the gender of the student
- **Objective 2:** To determine the most preferred environment in which students use the mobile phone to support learning activities, and hence the most preferred time that students use mobile phones for learning.
- **Objective 3:** To determine which features students regard as contributing significantly towards the learning process. To further determine whether students regard some features as more important than other features.
- **Objective 4:** to determine the most preferred mobile phone type for students' learning.

### 3.5 Population and samples

For the purpose of the study the geographical parameters were strictly limited to students from all four Faculties, namely the Faculty of Science and Agriculture, the Faculty of Education, the Faculty of Commerce, Administration and Law, and the Faculty of Arts. Sample one has been represented as the sample of the pre-test which is going to be 10% of the main study sample. The pre-test sample has been drawn from the Faculty of Science and Agriculture. These respondents are used to determine the validity and reliability of the instrument items. Sample two will consist of all four faculties of the University of Zululand.

The reason for sampling all the four faculties was to observe with a representative sample representing the university population of students (cross-sectional study). The study focuses on students' opinions and experience on using their mobile phones as learning tools to enhance their daily learning and educational activities.

The university is divided into four Faculties, with postgraduate and undergraduate students in each. A purposive sampling method was applied to target students with the characteristics of age and gender. A stratified sampling method allows the research to target undergraduate and postgraduate students from all faculties of the university. The samples were divided into strata of postgraduate and undergraduate students from all respective Faculties. The stratified random sampling (probability sampling) method that has been used to determine the final sample is considered as a probability equivalent to quota sampling. As the university is dominated by black-African students, the results of this study are limited to this section of the population from the University of Zululand.

### 3.5.1 Sample sizes

**The pre-test**

A pre-test was conducted to develop and form the feasibility of techniques used, determining the reliability of measures applied in the final sample. For the pre-test a well structured questionnaire was designed to test the closed-end items for their validity and reliability for the instrument used (Hopkins, 2000). Participants for sample 1 were from the Faculty of Science and Agriculture.

The sample size for the pre-test is calculated as follows:

np = sample size for the pre-test

n = sample size for the main study (386)

10% (percentage adequate for the pre-test)

np = 386*10%

np = 39

**The main study**

Table 3.1 Student Population at the University of Zululand (2010)

| **Faculty** | **Postgraduate students** | **Undergraduate students** | **Total** |
|---|---|---|---|
| 1. Arts | 425 | 4112 | 4537 |
| 2. Education | 323 | 5103 | 5426 |
| 3. Commerce, Administration and Law | 75 | 2771 | 2846 |
| 4. Science and Agriculture | 337 | 1541 | 1878 |
| Total | 1160 | 13527 | 14687 |

Source: University of Zululand website, (2010).

A 95% confidence level is used which results in a risk estimate of 5%. At 95%, our response distribution is 50%. The formula to calculate the sample size is:

$n = X^2 NP (1 – P) / d^2 (N - 1) + X^2 P (1 - P)$ (Krejcie and Morgan, 1970)

n = required sample size

$X^2$ = the table value for 1 degree of freedom at the desired confidence level

N = the population size

P = the population proportion (assumed to be 0.50 since this provides the maximum sample size)

$d^2$ = the degree of accuracy expressed as a proportion of 0.05 (Krejcie and Morgan, 1970).

$n = X^2 NP (1 – P) / d^2 (N - 1) + X^2 P (1 - P)$

$= 3.841*14687*(1- 0.5) / 0.052 (14687 - 1) + 3.841*0.5 (1 – 0.5)$

$= 3.841*7433.5 (0.5) / 0.0025 (14686) + 1.92 (0.5)$

$= 3.841*3716.75 / 36.72 + 0.96$

$= 14276.04 / 36.96$

n = 386

The formula to calculate the sample sizes from each stratum is: nh = (Nh / N)*n (StatisticsTrek, 2010)

Where:

nh = sample size from each stratum

Nh = population size from each stratum

N = total population

n = required sample size (StatisticsTrek n.d. 2010)

**Calculating the sample size for each stratum**

**1. Faculty of Arts**

**undergraduate:**

nh = 4112 / 14687*386

= 108

**postgraduate:**

nh = 425 / 14687*386

= 11

**2. Faculty of Education**

**undergraduate:**

nh = 5103 / 14687*386

= 134

**postgraduate:**

nh = 323 / 14687

= 8

**3. Faculty of Commerce, Administration and Law**

**undergraduate:**

nh = 2771 / 14687*386

= 73

**postgraduate:**

nh = 75 / 14687*386

= 2

**4. Faculty of Science and Agriculture:**

**undergraduate:**

nh = 1541 / 14687*386

= 41

**postgraduate:**

nh = 337 / 14687*386

= 9

**Table 3.2 Sample sizes**

| **Faculty** | **Postgraduate students** | **Undergraduate students** | **Total** |
|---|---|---|---|
| 1. Arts | 11 | 108 | 119 |
| 2. Education | 8 | 134 | 142 |
| 3. Commerce, Administration and Law | 2 | 73 | 75 |
| 4. Science and Agriculture | 9 | 41 | 50 |
| Total | 30 | 356 | 386 |

Source*:* Own calculations

For the pre-test a structured questionnaire has been designed to test the closed-end items for their validity and reliability for the instrument used. Participants for sample 1 are from the Faculty of Science and Agriculture.

For the main study the same structured questionnaire has been used and for testing the hypothesis of the study, in obtaining the objectives of the study and analysis of the problem investigated. Responses will be analyzed using the Statistical Package for Social Sciences (SPSS).

### 3.6 Instrumentation/ Data collection methods

A structured questionnaire was used to collect all information from the respondents / participants of the study. The purpose of conducting a pre-test was to validate the items of the present study instrument. English has been used as the preferred language as it is most often used by students for communication during learning. English is also the official medium of communication at the University of Zululand. Each participant was asked the same questions and, all participants responded to the same questions. Responses were designed in a 5-point Likert scale with 1= Strongly Disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Strongly Agree. Final responses were on a 5-point semantic differential scale: range 1= Poor to 5= Excellent. Only quantitative data was collected and analysed.

#### 3.6.1 Questionnaire design

**Introduction of the research topic**

**Section A**: Biographical information

**Section B**: Mobile learning using the mobile phones to enhance students' learning on campus; the student opinions and experience.

**Section C**: Mobile phone capabilities to easily enhance mobile learning on campus; the student opinions and experience.

**The questionnaire is divided into three sections, displayed in the Appendix B.**

### 3.6.2 Questions in the questionnaire

The first page of the questionnaire introduces the research topic and sets out the reasons for conducting this study. The guidelines to administer the questionnaire will be stated to respondents. Some of the questions to be asked are given below.

**Section A:** Biographical Information

Question 1: Gender

Question 2: Age

Question 3: Degree

Question 4: Is your mobile phone a smart or cellular phone?

**Section B**: Mobile learning using the mobile phones to enhance students' learning on campus; the student opinions and experience.

This section asked questions on the use of mobile phones for learning. These questions were closed-end questions responding on a 5-point Likert scale.

**Section C**: Mobile phones' capabilities to easily enhance mobile learning on campus; the student opinions and experience.

Section C clarified the most preferable mobile phone capabilities to enhance students' learning on campus. The participants were responding on a 5-point semantic differential scale.

### 3.7 Distribution of questionnaires

The questionnaire was distributed to all faculties at the University of Zululand. Questionnaires were purposively distributed to the study respondents from 08H00 to 16H00 for two weeks.

### 3.8 Data analysis techniques

The data analysis techniques are step-by-step procedures which are followed in order to gather data, and analyse them for the information they contain (Jankowic, 2005).

Data collected was quantitative in nature, summarized in tables and graphs. The SPSS package was used for calculating and analysing descriptive statistics, median test / Wilcoxon's signed rank test, chi-square test, Friedman test (non-parametric ANOVA), and the binomial test.

Descriptive statistics are described as procedures used for reducing information by set of measurements (Bless and Kathuria, 1993), and quantitative data was summarized in the form of tables and bar graphs. Descriptive statistics are used to summarize information and tabulate it to be more readable and accessible.

Inferential statistics assist the researcher to draw conclusions from his/her observations about the population of the study (Babbie, 1992).

A median test / Wilcoxon's signed rank test was used to test whether the median rank is less or greater than the hypothesised value. Confidence intervals are generated using a bootstrap method. A chi-square test was used when the researcher whished to investigate whether a certain number of subjects, objects or responses fall in various categories to test the

differences between the observed set values from the ones which were expected (Bless and Kathuria, 1993).

The Analysis of Variance (ANOVA) has been used to determine whether the differences among two or more means are greater than the expected ones by chance. ANOVA is a very powerful statistical technique, a method of statistical inference that evaluates whether there is only systematic (non-random) difference among the tested medians. Friedman's test was used to detect differences in treatments of mobile phone capabilities across multiple test attempts (Sibaya, 1998).

According to Babbie (1992), the binomial test is an exact test of statistical significance of deviations from a theoretically expected distribution of observations into two categories. This test was used to determine whether there is a significant difference between the proportion of the smartphone users and regular cellular phone users.

The following definition must be noted when interpreting the results of the statistical analysis, since large sample statistics have relatively small variances:
Statistical significance is concerned with whether a research result is due to chance or sampling variability; practical significance is concerned with whether the results is useful in the real world (Kirk, 1996).

### 3.9 Validity and reliability

According to Babbie (1992), validity and reliability are two very important aspects of any research work. Validity refers to the degree to which an empirical measure adequately reflects the real meaning of the concept under consideration. There are different kinds of validity, viz: face validity, expect jury validity, criterion validity, construct validity and

content validity. Of particular importance in this study is content validity and construct validity.

Construct validity refers to testing the linking between measuring instrument and the overall underlying theoretical framework. If the test has a construct validity it ensures that the measurements are actually and logically related to other concepts in the framework. Construct validity is usually measured using the correlation coeffient. When the correlation is high, the tool could be considered as valid (Twycross and Shields, 2004).

For the present study to achieve construct validity, firstly it was important to develop a theoretical framework on how the study variables relate. Secondly, it was important to understand what each hypothesis attempts to test, so statements were positively and negatively worded and the scores were arranged as follows in a Likert scale: 1= strongly disagree, 2= disagree, 3= neutral, 4= agree, and 5= strongly agree. The advantages of using the Likert scale are the ease with which we can develop the scale, and the fact that reliability can be measured at the same time as the data is collected (Clason and Dormody, 1994).

The other part of the study items in the instrument was in a semantic differential (SD) scale ranging: 1 = poor to 5= excellent. The semantic scale measures people as reactions to growth and activity (stimulus) words and concepts in terms of rating on bipolar scales defined with contracting adjectives at each end. Semantic differentials are reliable measures of a person's overall response to something (David, 1970).

Content validity refers to the degree to which a measure covers the range of meanings included within the concept (Babbie, 1992). In order to achieve content validity for the present study, questions were carefully chosen. They were designed to address each hypothesis, which means that each hypothesis has a set of questions in order to ascertain relevant information.

Reliability refers to the extent which the measure will produce trustworthy and consistent results (Hopkins, 2000).

Data collection for the present work involves the use of a well-structured questionnaire design with closed-end questions only to conduct and administer the questionnaire. According to Gendall (1998), a questionnaire design is a clear and carefully considered process of designing the instrument (tool) for data collection, but it has always remained elusive. The fundamental principle of a questionnaire design is that a respondent defines what you can do: the type of questions you can reasonably ask, the type of words reasonably used, the concept that you can explore and the methodology you can employ as a researcher. With factors such as gender, age, socio-economic status, race, location and mobility impact the respondents' ability to act or respond in a specific way to the physical aspects of respondents' lives and environments.

Triangulation is defined as a combination of data or methods so that diverse viewpoints or standpoints cast light upon a topic under considerations. Validity and reliability can be maximised through the employment of qualitative and quantitative approaches to strengthen the study results and measures. This sociological approach argues that these two traditions need not be separated, but have equal status, and should interact in any research studies (Olsen, 2004).

According to Niglas (2000), there are four types of triangulation, viz: data triangulation, theory triangulation, investigator triangulation and methodological triangulation.

Of particular importance to the present study is the concept of theory triangulation as different theories supporting the study were reviewed. Theory triangulation refers to the use of different theoretical viewpoints for determining the complete hypothesis as well as for interpreting the single set of data (Niglas, 2000).

The present study can also fits with the concept of methodological triangulation as the research instrument was designed, piloted and compared to others of previous studies for validity. Methodological triangulation refers to the use of multiple methods to study a single problem or phenomenon. It may also involve the use of the same methods on different occasions and situations (Niglas, 2000).

### 3.10 Ethical considerations on mobile learning.

According to Robert (2011), through the diversity of mobile phone capabilities and their context of use in learning, it is not easy to advocate the ethical considerations to work/do for the improving of every situation of the device and the practice of m-learning, and no one should consider this to be desirable. In teaching and learning an ethical issue that arises should be judged by teachers, as they control the process of teaching and learning. In replacing the ethical effectiveness in mobile learning, Robert (2001) stated that it might be possible to use the so called "blind rule-following". Given the developments in mobile learning, experts will need to reflect continuity on the moral significance of mobile technology-enhanced learning.

In conducting the present study we required permission from the supervisor. The questionnaire instrumentation designed indicated confidentiality to respondents' answers, as the instrumentation does not require identity particulars of respondents. The questionnaire topic was provided to give a brief, clear understanding of the study research topic, enabling the respondents to understand the study investigation.

### 3.11 Summary

In chapter 3 we discussed the methodology used for the study, sample sizes, questionnaire distribution and design, and lastly the data analysis techniques adequately supporting data analysis of results in the following chapter, which assert results from analysed data and conclusions on results obtained for the present study.

As pointed the three categories for scoring responses have been created, viz: the Good Learning Tool (GLT), the Moderate Learning Tool (MLT), and the Poor Learning Tool (PLT).

\

# CHAPTER 4

## RESEARCH FINDINGS

### 4.1 Introduction

In Chapter 4 the results are discussed on a question-by-question basis. Section A question 5 will clarify the distribution of the mobile phone type assessing the difference between the proportion of the smartphone users and the regular cellular phone users using a binomial test. Sections B and C of the study questionnaire will clarify and reach the study objectives 1, 2 and 3 in building up to the study hypothesis, mobile phones are useful tools for students' learning. The study results will be presented in graphs and tables.

### 4.2 Realization rate

385 respondents, selected using a non-probability stratified random sampling gave us the sample size of the study. Black African students at the University of Zululand made up the sample frame for the present study.

386 questionnaires were used for the study. Of the 386 distributed, 385 were returned. In the returned questionnaires all questions were answered.

### 4.3 Results on a question-by-question basis

Results from section A contain the biographical information is reported by making use of graphs and tables. The realization rate by each question will be indicated. Section B will be analysed by making use of the median values in ranking the section statements for the

purpose of the study to reach objectives 1 and 2. Section C is analysed using a Friedman test (Non-parametric ANOVA) for the study to reach objective 3. A Chi-square test was employed for cross-tabulation of statement B1 and statement B3 with the student gender and the mobile phone type they use. This association test was done to test the significant association between factors to reach the main study objective, objective 1. Cross-tables were developed for section C. To test whether there is a significant association between each mobile phone capability with student gender and their mobile phone type. A Chi-square test was used. Lastly, the binomial test is used to determine whether there is a significant difference between the proportion of smartphone users and regular cellular phone users to reach objective 4.

### 4.3.1 Descriptive results analysis

**Section A**

Section A provided data collection for the respondents biographical information to be used in classification such as gender and mobile phone type, which will eventually be used for cross-tabulation in the analysis. Tables will describe respondents' biographical information.

Question 1: Gender

This question required the respondents to indicate their gender according to the gender items presented. The results for question 1 are illustrated in Table 4.1

**Table 4.1**

**Gender distribution of the sample**

| | Frequency | Percent |
|---|---|---|
| Female | 190 | 49.4 |
| Male | 195 | 50.6 |
| Total | 385 | 100.0 |

Source: own calculations

Question 1 was answered by the total sample of 385 respondents. Of the 385 respondents 195 **(50.6%)** were male and 190 **(49.4%)** were female.

Question 2: Age in years

This question asked the respondents to indicate their age in years. The results for question 2 are illustrated in Table 4.2

**Table 4.2**

**Age distribution of students**

| | Frequency | Percent | Cumulative Percent |
|---|---|---|---|
| <=18 | 25 | 6.5 | 6.5 |
| (18,20] | 57 | 14.8 | 21.3 |
| (21,23] | 121 | 31.4 | 52.7 |
| (24,26] | 79 | 20.5 | 73.2 |
| (27,29] | 55 | 14.3 | 87.5 |
| (30,32] | 27 | 7.0 | 94.5 |
| (31,33] | 12 | 3.1 | 97.7 |
| (34,36] | 5 | 1.3 | 99.0 |
| 36< | 4 | 1.0 | 100.0 |
| Total | 385 | 100.0 | |

Source: Own calculations

The largest percentage of respondents **31.4%** fell in the 20-22 year age range, followed by the **20.5%** who fell in the 22-24 year age range, **14.8%** in the 18-20 year age range, **14.4%** in the 24-26 year age range, **7%** in the 26-28 year age range, **6.5%** in the 18 year age range, **3.1%** in the 28-30 year age range, **and 1.3%** in the 30-32 year age range. This question was completed by all respondents. Using 18 years as the starting point for age restriction results were recorded from <=18 years upwards. The lowest percentage of respondents **(1%)** fell in the 36< year range.

Question 3: Faculty

The respondents were asked to state their faculties where they are registered. The results for question 3 are illustrated in Table 4.3

**Table 4.3**

**Distribution of students by Faculty**

| | Frequency | Percent |
|---|---|---|
| Arts | 118 | 30.6 |
| Education | 142 | 36.9 |
| Commerce, Administration & Law | 75 | 19.5 |
| Science & Agriculture | 50 | 13.0 |
| Total | 385 | 100.0 |

Source: Own calculations

The largest percentage of respondents per faculty of the study sample indicates that **36.9%** of users of mobile phones are from the Faculty of Education, followed by **30.6%** from the Faculty of Arts, **19.5%** from the Faculty of Commerce, Administration and Law, and lastly **13%** from the Faculty of Science and Agriculture. This question was completed by all respondents.

Question 4: Students' degree level

The respondents were asked to indicate their degree level. The results for question 4 are illustrated in Table 4.4

**Table 4.4**

**Distribution of students by degree level**

| | Frequency | Percent |
|---|---|---|
| Undergraduate | 345 | 89.6 |
| Post-graduate | 40 | 10.4 |
| Total | 385 | 100.0 |

Source: Own calculations

The largest percentage of respondents of the study sample is **89.6%** indicating that more users of mobile phones are undergraduates than **10.4%** of the sample which indicates post-graduates. This response indicates that the study sample was dominated by undergraduates as they are a majority of students on campus. This question was completed by all respondents.

Question 5: mobile phone type

The respondents were asked to indicate the current type of mobile phone they are using. The results for question 5 are illustrated in Table 4.5

**Table 4.5**

**Mobile phone type distribution**

| | Frequency | Percent |
|---|---|---|
| Smartphone | 219 | 56.9 |
| Regular phone | 166 | 43.1 |
| Total | 385 | 100.0 |

Source: Own calculations

The largest percentage of respondents of the study sample is **56.88%** indicates that there are more uses of smartphones then the **43.12%** who are regular cellular phone users. This result indicates that the majority of students are moving towards owning a smartphone rather than a regular cellular phone. This is to be expected since the price of the product is decreasing and a wide variety of models becoming available.

### 4.3.2 Testing of the main hypotheses of the study.

**Section B**

**The main hypotheses are as follows:**

**Alternative hypothesis ($H_1$):** students consider that their mobile phones are useful tools for academic learning.

**Null hypothesis ($H_0$):** students consider that their mobile phones are not useful learning tools.

Objective 1 may be assessed by testing the above hypothesis.

The study's main objectives are:

- **Objective 1:** To determine whether mobile phones have a positive impact on students' academic learning by assessing the students' opinions and experiences. To further determine whether their opinions are associated with:
    - the type of phone
    - the gender of the student

- **Objective 2:** To determine the most preferred environment in which students use the mobile phone to support learning activities, and hence the most preferred time that students use mobile phones for learning.
- **Objective 3:** To determine which features students regard as contributing significantly towards the learning process. To further determine whether students regard some features as more important than other features.
- **Objective 4:** to determine the most preferred mobile phone type for students' learning.

**Table 4.6**

**Analysis of results on section B statements**

| | **SECTION B: Statement** | **P-value** | **Decision** | **95% Confidence Interval for Median (Bootstrap method)** | |
|---|---|---|---|---|---|
| **1** | Mobile phones are useful tools for student learning | 0.000 | Supports objective 1 of the study. Students consider that their mobile phones are useful for their learning. Rejecting $H_{0.}$ | 4.00 | 5.00 |
| **2** | Smartphones are as good as PDAs in the classroom environment | 0.000 | Supports objective 1 of the study. Students consider that their mobile phones are useful for their learning. Rejecting $H_0$ | 4.00 | 4.00 |
| **3** | Mobile phones are distracting for students during lectures/ learning | 0.000 | Supports objective 2 of the study. Students consider that a mobile phone is distracting during lectures, but the mobile phone is useful when they need it for learning. Rejecting $H_0$ | 4.00 | 4.00 |

| | | | | | |
|---|---|---|---|---|---|
| **4** | Smartphone access to the internet enriches students' learning experience | 0.000 | Supports objective 1 of the study. Students consider that their mobile phones are useful for their learning. Rejecting $H_0$ | 5.00 | 5.00 |
| **5** | Smartphone technology has brought about advancements in students' learning setting | 0.000 | Supports objective 1 of the study. Students consider that their mobile phones are useful for their learning. Rejecting $H_0$ | 5.00 | 5.00 |

Source: Own calculations

Since the p-values are 0.000 for all the hypotheses, we conclude that the medians are significantly higher than 3, i.e., more than 50% of the students "agree" and "strongly agree" with the statements. The 95% confidence intervals support this conclusion, since none of the intervals include 3.

To investigate objective 1 the analysis of statement B1 is addressed. Since data is skewed a non-parametric test (median test / Wilcoxon's signed rank test) was used to analysis data. To determine whether objective 1 is reached, two hypotheses are constructed and tested. The hypotheses are:

$H_0$ : median rank < = 3 vs.

$H_1$ : median rank > 3

The results show that the median rank assigned to statement B1 is significantly higher than 3, i.e. students consider that mobile phones have a positive impact on their learning. This is concluded from the p-value of 0.000. A 95% confidence interval for the rank is (4.00, 5.00) using a bootstrap method (see the above table). This interval supports the students' opinion that the mobile phones are useful tools for their academic learning, because the rank assigned corresponds to "agree" and "strongly agree". The study confirms the alternative hypothesis.

**Objective 1**

Further analysis was performed using an association test (Chi-square test). This is done to determine whether there is a significant association between the students' opinion regarding statement B1 and the type of the mobile phone the student uses and the gender of the student. To determine whether the objectives are reached, the following hypotheses are tested:

They are:

a) $H_0$ : no significant association between mobile phone type and the students' opinion of statement B1. vs.

$H_1$ : significant association between phone type and the students' opinion of statement B1.

**and**

b) $H_0$ : no significant association between the gender of the student and the students' opinion of statement B1. vs.

$H_1$ : significant association between the gender of the student and the students' opinion of statement B1.

The results for the two association tests:

**Table 4.7**

**Results on whether mobile phones are useful tools for students' learning**

| | **TEST RESULT:** Mobile phones are useful tools for students' learning | Pearson Chi-Square | df | P-value (2-sided) |
|---|---|---|---|---|
| a | Phone Type | 5.840 | 4 | .211 |
| b | Gender | 3.986[a] | 4 | .408 |

Source: Own Calculations

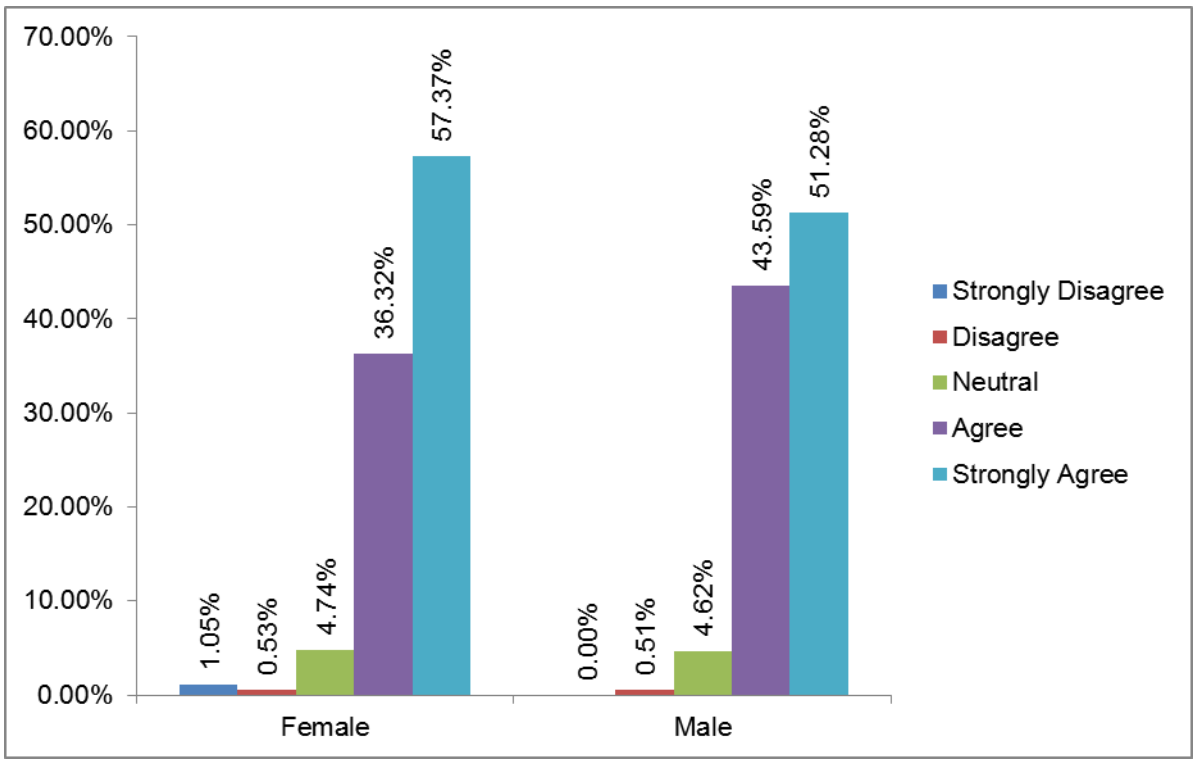
Both the p-values are greater than 0.05, hence there is no significant association between students' opinion of statement B1 and the gender of the student and the mobile phone type, at the 5% level of significance.

**Table 4.7**

| | | Strongly Disagree | | Disagree | | Neutral | | Agree | | Strongly Agree | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Gender | Female | 2 | 1.05% | 1 | 0.53% | 9 | 4.74% | 69 | 36.32% | 109 | 57.37% | 190 |
| | Male | 0 | 0.00% | 1 | 0.51% | 9 | 4.62% | 85 | 43.59% | 100 | 51.28% | 195 |

Source: Own Calculations

**Graph 4.7**




The association test indicates that both gender's responded similarly to statement B1. Students consider that mobile phones are useful for students' academic learning regardless of the mobile phone type and gender of the students.

To investigate objective 2 the analysis of statement B3 is addressed. Since data is skewed a non-parametric test (median test / Wilcoxon's signed rank test) was used to analyse data. To determine whether objective 3 is reached, two hypotheses are constructed and tested. The hypotheses are:

$H_0$ : median rank < = 3 vs.

$H_1$ : median rank > 3

The result shows that the median rank assigned to statement B3 is significantly higher than 3, i.e. students consider that mobile phones are distracting during lectures. They felt this is not the right environment to use the mobile phone but it is a useful tool for learning. The right time is when they need the mobile phone for learning but not during lectures. This is concluded from the p-value of 0.000. A 95% confidence interval for the rank is 4.00, 4.00 (adapted from the table above) using a bootstrap method. This interval supports the conclusion that mobile phones are distracting during lectures. The right environment is when a student needs the mobile phone for learning outside the classroom slots (see objective 1) because the ranks assigned correspond to "agree" and "strongly agree". The study confirms the alternative hypothesis.

**Objective 2**

Further analysis was performed using an association test (Chi-square test). This is done to determine whether there is a significant association between the students' opinion regarding statement B3 and the type of mobile phone the student uses and the gender of the student. To determine whether the objectives are reached, our hypotheses are constructed and tested:

They are:

a) $H_0$ : no significant association between mobile phone type and the students' opinion of statement B3.

$H_1$ : significant association between mobile phone type and students' opinion of statement B3.

**and**

b) $H_0$ : no significant association between the gender of the student and the students' opinion of statement B3.

$H_1$ : significant association between the gender of the student and the students' opinion of statement B3.

The results for the two association tests:

**Table 4.8**

**Results on whether mobile phones are distracting for students during lectures/learning**

| **TEST RESULT:** Mobile phones are distracting for students during lectures/learning | | Pearson Chi-Square | df | P-value (2-sided) |
|---|---|---|---|---|
| a | Gender | 6.964[a] | 4 | .138 |
| b | Phone Type | 1.106[a] | 4 | .893 |

Source: Own calculations

Both p-values are greater than 0.05, hence there is no significant association between students' opinion of statement B3 and gender of the student and the mobile phone type at 5% level of significance.

**Section C**

**Objective 3**

To investigate objective 3 the analysis of the mobile phone capabilities are addressed. Since data is skewed a (median test / Friedman test) non-parametric ANOVA test was used to analysis data. To determine whether these objectives are reached, two hypotheses are constructed and tested. The hypotheses are:

$H_0$ : no significant difference between the ranks of the capabilities vs.

$H_1$ : significant difference between two or more of the ranks of the capabilities.

The result shows that there is no significant difference between the median ranks of the capabilities at the 5% level of significance, hence the null hypothesis is rejected (see table 4.9). Each mobile phone capability p-value is 0.000. A 95% confidence interval since all average ranks intervals of (4.00, 5.00) are greater than 3. These average intervals are generated using the bootstrap method. The average ranks interval supports the conclusion that students' regarded the ability of each mobile phone capability to enhance their learning as all ranks are assigned to correspond to good / excellent. Some capabilities have higher average ranks than others but these differences are not practically significant.

**Table 4.9**

**Results analysis on section C mobile phone capabilities to enhance mobile learning**

| | |
|---|---|
| **Test statistic** | 18.055 |
| **Df** | 11 |
| **P-value** | .080 |

Source: Own calculations

Since the p-value is 0.080 (and exceeds 0.050) we conclude that there is no significant difference between the median ranks of the different capabilities, at the 5% level of significance. This decision is supported by the results for the individual hypothesis tests as summarized in the table below. The test used is **Wilcoxon's** (as described above).

**Table 4.10**

**Analysis of results on section C statements**

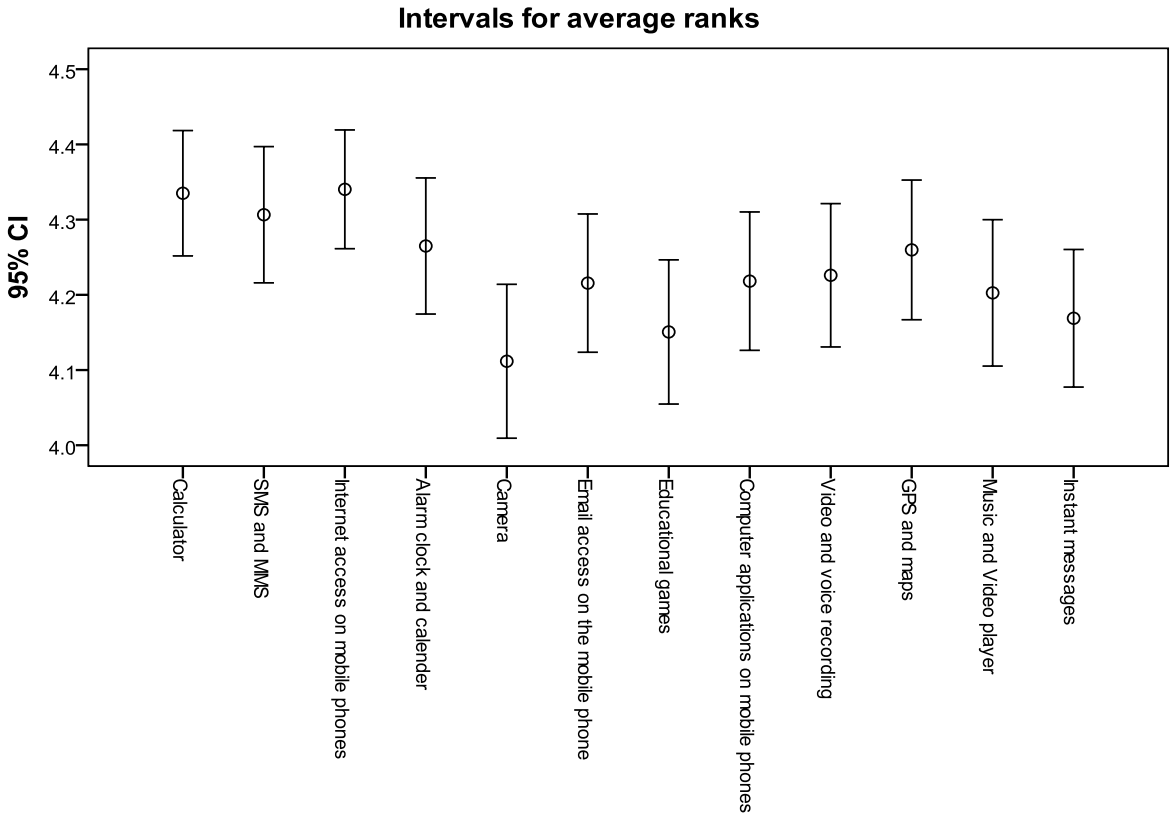
| | **SECTION C: Statement** | **P-value** | **Decision** | **95% Confidence Interval for Median (Bootstrap method)** | |
|---|---|---|---|---|---|
| **1** | Calculator | 0.000 | Supports objective 3 Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **2** | SMS and MMS | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **3** | Internet access on mobile phones | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis | 4.00 | 5.00 |
| **4** | Alarm clock and calendar | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **5** | Camera | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis | 4.00 | 5.00 |

| | | | | | |
|---|---|---|---|---|---|
| **6** | Email access on the mobile phone | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis | 4.00 | 5.00 |
| **7** | Educational games | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis | 4.00 | 5.00 |
| **8** | Computer applications on mobile phones | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **9** | Video and voice recording | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **10** | GPS and maps | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **11** | Music and Video player | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |
| **12** | Instant messages | 0.000 | Supports objective 3. Students consider their mobile phone capabilities enhanced their learning. Rejects the null hypothesis. | 4.00 | 5.00 |

Source: Own calculations

Since the p-values are all 0.000 we conclude that the median ranks are all significantly greater than 3, i.e., more than 50% of the students regard the ability of the phone capabilities to enhance their learning as good/ excellent. The 95% confidence intervals support the decisions, since all intervals are greater than 3.

**The following graph represents the mobile phone capabilities by plotting the average ranks combined with a 95% confidence interval. The intervals are generated using a bootstrap method.**




From the graph it is obvious that some capabilities have higher average rankings than others, although not practically significant, for example the first three capabilities.

**Objective 3 (Gender)**

Further analysis was performed using an association test (Chi-square test). This is done to determine whether there is a significant association between the students' opinion regarding the ability of each mobile phone capability to enhance their learning as good / excellent, and the student gender. This result supports the students' opinion that their mobile phone capabilities are useful functions for academic learning. This result is not statistically significant. To determine whether objectives are reached, the following hypotheses are constructed and tested:

They are:

$H_0$ : no significant association between gender of the student and the students' opinion of each mobile phone capability to enhance learning as good / excellent.

$H_1$ : significant association between gender of the student and the students' opinion of each mobile phone capability to enhance learning as good / excellent.

The results for the association test:

**Table 4.11**

**The results on the relationship between students' gender and each mobile phone capabilities**

| **TEST RESULT**: Gender | | Pearson Chi-Square | df | P-value (2-sided) |
|---|---|---|---|---|
| C2.1 | Calculator | 4.056[a] | 4 | .398 |
| C2.2 | SMS and MMS | .418[a] | 4 | .981 |
| C2.3 | Internet access | 1.260[a] | 3 | .739 |
| C2.4 | Alarm clock and calendar | 2.182[a] | 4 | .702 |
| C2.5 | Camera | 3.770[a] | 4 | .438 |
| C2.6 | Email access | 7.691[a] | 4 | .104 |
| C2.7 | Educational games | 7.852[a] | 4 | .097 |
| C2.8 | Computer applications | 1.761[a] | 4 | .780 |
| C2.9 | Video and voice recording | .429[a] | 4 | .980 |
| C2.10 | GPS and maps | 3.158[a] | 4 | .532 |
| C2.11 | Music and video player | 3.043[a] | 4 | .551 |
| C2.12 | Instant messages | 3.156[a] | 4 | .532 |

Source: Own calculations

All p-values are greater than 0.05, hence there are no significant associations between gender and each of the mobile phone capabilities (at the 5% level of significance), i.e., the students' opinions on mobile phone capabilities are independent of gender.

**The cross-tables of each mobile phone capability and the student gender are listed in the appendix C.**

**Objective 3 (mobile phone type)**

Further analysis was performed using an association test (Chi-square test). This is done to determine whether there is a significant association between the students' opinion regarding the ability of each mobile phone capability to enhance their learning as good / excellent and the student mobile phone type use. This result supports the students' opinion that regardless of the mobile phone type mobile phone capabilities are useful functions for learning. According to the test results, whether using the smartphone or a regular cellular phone, the opinion of students on mobile phones capabilities are independent of mobile phone type, understandably so, in that students' could have experience of both types of mobile phone. We assume that the regular cellular phone users' comment on the smartphone capabilities is based on the experience with the smartphone. This result is not statistically significant. To determine whether the objectives are reached, the following hypotheses are constructed and tested.

They are:

$H_0$ : no significant association between the mobile phone type and the students' opinion that regardless of the mobile phone type each mobile phone capability is regarded as a useful function for learning.

$H_1$ : significant association between the mobile phone type and the students' opinion that regardless of the mobile phone type each mobile phone capability is regarded as a useful function for learning.

The result for the association test:

**Table 4.12**

**The results on the relationship between students' mobile phone type and each mobile phone capabilities**

| **TEST RESULT:** Phone type | | Pearson Chi-Square | Df | P-value (2-sided) |
|---|---|---|---|---|
| C2.1 | Calculator | 2.627[a] | 4 | .622 |
| C2.2 | SMS and MMS | 3.771[a] | 4 | .438 |
| C2.3 | Internet access | 6.628[a] | 3 | .085 |
| C2.4 | Alarm clock and calendar | 4.498[a] | 4 | .343 |
| C2.5 | Camera | .665[a] | 4 | .956 |
| C2.6 | Email access | 6.967[a] | 4 | .138 |
| C2.7 | Educational games | 2.059[a] | 4 | .725 |
| C2.8 | Computer applications | 2.346[a] | 4 | .672 |
| C2.9 | Video and voice recording | 7.341[a] | 4 | .119 |
| C 2.10 | GPS and maps | 3.114[a] | 4 | .539 |
| C2.11 | Music and Video player | 5.169[a] | 4 | .270 |
| C2.12 | Instant messages | 1.652[a] | 4 | .799 |

Source: Own calculations

All the p-values are greater than 0.05, hence there is no significant association between the mobile phone type and each of the mobile phone capabilities at the 5% level of significance, i.e. the opinions on each of the mobile phone capabilities are independent of the mobile phone type.

**The cross-tables of each mobile phone capability and students' mobile phone type are listed in the appendix C.**

**Objective 4**

To investigate objective 4 the analysis of the users of the mobile phone type is addressed. A binomial test was used to determine whether there is a significant difference between the proportion of smartphone users and regular cellular phone users. (see table 4.5). To determine whether these objectives are reached, two hypotheses are constructed and tested. The hypotheses are:

$H_0$ : proportion of smartphone users is equal to the proportion of regular cellular phone users.

$H_1$ : proportion of smartphone users is not equal to the proportion of regular cellular phone users.

The binomial test result shows a p-value of 0.008 which indicates that there is a significant difference between the proportion of the smartphone users and regular cellular phone users at the 5% level of significance.

This result indicates that the study sample is concentrated on smartphone users rather than regular cellular phone users, but according to the association test results on mobile phone capabilities and mobile phone type users, regular cellular phones users commented on smartphone capabilities as enhancing for learning. The ownership and the use of smartphones is higher than the ownership and use of regular cellular phones. This result confirms the alternative hypothesis of the study.

The results of the binomial test are:

**Table 4.13**

**Results on the proportion of smartphone and regular cellular phone users**

| TEST RESULT | Category | N | Observed Prop. | Test Prop. | P-value (2-tailed) |
|---|---|---|---|---|---|
| Phone Type | Smartphone | 219 | .57 | .50 | .008 |
| | Regular phone | 166 | .43 | | |
| | | 385 | 1.00 | | |

Source: Own calculations

The p-value of 0.008 indicates that there is a significant difference between the proportion of the smartphone users and regular cellular phone users at the 5% level of significance.

## 4.4 Summary

In this chapter we provided the results that were recorded from the total sample where major findings were generated. The major findings revealed that students consider that their mobile phones are useful tools for learning. They further revealed that independent of the student gender and the student mobile phone type students' regarded their mobile phones as useful for their learning. The other findings students viewed the mobile phone as distracting during lectures, which informed the researcher that the environment where they are useful for learning is not in the classroom. The major findings supported the study main objectives on mobile phone use as a supporting tool for students' learning. For each study objectives 1, 2 and 3 hypotheses were constructed and tested by utilising a median test / Wilcoxon's test signed rank test. For the association test between the study factors a chi-square test was used. Objective 4 was reached and the hypotheses were formulated and tested using a binomial test. The findings obtained from the present work confirm the alternative hypothesis, which state that mobile phones have a positive impact on students' academic learning.

The following chapter is the last chapter which provided brief summary discussion on the major findings, objectives of the study and recommendations for future research.

# CHAPTER 5

# CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

## 5.1 Introduction

The initial chapters, 1, 2 and 3 of the research have been presented. Chapter 4 was the second-last that contributed to the research results and findings. Based on the findings and the results discussion, this final chapter presents a brief summary on the literature reviewed, problem statement, methodology and the major study findings. The research objectives are reviewed whether they were reached or not, on the results and findings discussed in Chapter 4. Lastly the recommendations for future research are presented.

## 5.2 Conclusions on the research issues

The current research issues are based on Chapter 2 the theoretical framework of the research and the literature reviewed.

### 5.2.1 Brief summary on the theoretical framework

The first part of the research issues is based on theories constructing the study's theoretical framework. The theory of consumer behaviour underpins the increases of ownership and the use of mobile phones by students at the university. The research results revealed that there are more users of smartphones than the regular cellular phone users while price of smartphones surpasses the price of the regular cellular phones. Students' consumer behaviour for smartphones ownership is greater than for regular cellular phones. According to Caverly et

al., (2009) students at the university have a wide range of demand for self-organization, and they can manage self-organization through the use of their mobile phones. Mobile learning is becoming more suitable for students, and exciting through the varied models of the mobile phone.

Through marketing research the mobile phone developments are spotted when they are useful and promote mobile learning. Sinisalo and Karjaluoto (2009) stated that the introduction of internet access on the mobile phone supports modern education. The discoveries of applications for mobile phones through marketing research have made it into students' learning space. The research findings revealed that students consider that these new mobile phones capabilities are useful functions for their learning regardless of the student mobile phone type and the gender of the student. Mobile phone capabilities were adapted to support and enhance learning activities anytime / anywhere (Eteokleous and Ktoridou, 2009).

The Unified Theory of Acceptance and Use of Technology (UTAUT) combines eight models of information technology use to reach a combined view of user acceptance of information technology. The use of mobile phones by students corresponds with the UTAUT theory.

### 5.2.2 Brief summary of the literature reviewed

The second part of the research issues is based on the literature reviewed for the study from journals, articles and books relating to the current study topic and the findings.

In the work of Nonyongo et al., (2005) based on the potential of mobile learning in South African universities students were used as the study sample. Their reflection on the study findings to facilitate distance learning found that students' mobile phones are useful tools to facilitate this mode of learning. For the current study findings students ranked the mobile

phone highly as a useful tool for their learning which indicates similarities between the two studies' findings.

The study findings of the work by Eteokleous and Ktoridou (2009) reveal that although participants have a general idea of mobile technologies and learning, there is a shortage of expertise to implement learning in the classroom using the students' mobile phones. These findings shed some light on the present study's findings that students consider that mobile phones as distracting during class.

The current study's findings on mobile phone capabilities indicate that students consider that their mobile phone capabilities are useful functions for their learning. Thornton and Houser's findings (2005), concur, in as much as students clearly stated that mobile phone capabilities such as e-mails and SMS involvement in students' learning aids the students to fulfil educational purposes.

### 5.3 Conclusion of the problem

The aim of this work is to assess the mobile phone's impact on student learning, i.e. whether the mobile phone is a useful tool for their learning or not at the University of Zululand. We have further determined whether mobile phone capabilities are useful functions for students. In Chapter 2 the presented literature has shed some light on the current study's findings. It has been further tested and analysed for consistency and significance in this study.

## 5.4 Conclusion on the methodology

A structured self-completion questionnaire was used to obtain quantitative data as the study used a descriptive research design. The development of the data collection instrument and sampling procedures were all presented in Chapter 3. The methodological approach for carrying out the research and its findings were presented in Chapters 3 and 4.

## 5.5 Conclusions on the major findings

In Chapter 4, the following major findings were discussed:

I. **To reach objective 1,** students "agree" and "strongly agree" to statement B1. The study findings revealed that students consider that mobile phones are useful for their learning regardless of the mobile phone type and the gender of the student.

II. **To attain objective 2,** students "agree" and "strongly agree" to statement B3. The study findings revealed that students consider that mobile phone use is distracting during lectures. They felt this is not the right environment to use the mobile phone, but it is a useful tool for their learning outside the classroom.

III. **To attain objective 3,** the higher than 3 average rank intervals on each mobile phone capability supported the students' opinion of the ability of each mobile phone capability to be useful for their learning independent of their gender and the mobile phone type.

IV. **To reach objective 4,** the proportion of smartphones and regular cellular phones users was analysed. The study findings revealed that the study sample dominated by smartphones users than the regular cellular phone users. Students regarded the smartphones as a useful tool for their learning. Even the regular cellular phone users

regarded the smartphones capabilities as useful functions for students' learning. According to students opinions a mobile phone as a Good Learning Tool (GLT).

## 5.6 Limitations

The study collected only quantitative data, which was analysed and presented in tables and charts. No qualitative data was collected. For the study sample only respondents from the University of Zululand main campus were selected excluding the R/ Bay campus students. A further limitation was the fact that students' from other universities were excluded. Only Black-African students of the University of Zululand made up the study sample aging from 18 to 36 years.

## 5.7 Research objectives

The study objectives are reviewed in relation to Chapter 4 findings to assess whether they were attained. The study's main objectives are as mentioned in Chapter 1:

- **Objective 1:** To determine whether mobile phones have a positive impact on students' academic learning by assessing the students' opinions and experiences. To further determine whether their opinions are associated with:
    - the type of phone
    - the gender of the student.
- **Objective 2:** To determine the most preferred environment for students to use the mobile phone to support learning activities, and hence the most preferred time that students use mobile phones for learning.

- **Objective 3:** To determine which features students regard as contributing significantly towards the learning process. To further determine whether students regard some features as more important than others.
- **Objective 4:** to determine the most preferred mobile phone type for students' learning.

Previewing the major findings in Chapter 4 the researcher was able to determine that mobile phones have a positive impact on students' learning. The students consider that their mobile phones are useful tools for their learning.

Testing of the hypothesis using the median test / Wilcoxon's signed rank test for statement B1, B3 and section C analysis in Chapter 4 allowed us to attain objectives 1, 2, and 3 of the study to reject the null hypothesis generated.

The association tests using the chi-square test revealed the findings that statement B1 and section C analysis on mobile phone capabilities for students' learning are independent of the student gender and the mobile phone type.

A binomial test was used to determine the largest proportion between the smartphone and regular cellular phone users to attain objective 4. The findings in Chapter 4 indicated that there are more smartphones users than the regular cellular phone users. This finding supports the student opinion that their mobile phones are useful tools for their learning.

### 5.8 Recommendations for further research

As the present study revealed that mobile phones are useful tools for students' learning, therefore the adoption of their mobile phones in learning is necessary in higher education institutions. Future research may lie on the investigation on guidelines and policies that are

needed for a successful adoption for mobile learning using the student mobile phone. For the study purpose mobile learning was defined as any type of learning using students' mobile phone. Since mobile phones are spreading rapidly and are becoming one of the efficient tools for self-management. For future research it is a necessity to examine their implications for the design of teaching and learning. Its is also necessary to describe in detail the advantages and disadvantages of using the students' mobile phone as a tool of delivering learning at higher education institutions.

At any tertiary organization the university management have to understand the integration of mobile learning at university as a new means of enriching students' engagement and self-organization in learning activities on campus (Thornton and Houser, 2005).

For the adoption of the advanced mobile technologies and services, there is a need for further research as most of the current technology acceptance models are based on research steered in organizational context. Furthermore, research is needed in mobile phones adoption in learning because of the levels of complexity and diversity encountered during their adoption (So, 2009).

Students should be able to learn on the move wherever they are. Their mobile phones are always with them, so they could be easily reminded of their educational activities any time and any where through the university's implementation of mobile learning practice on campus. This could be supported by the university staff by communicating learning-related activities to students via their mobile phones.

The other recommendations for future research would be on the mobile phone capability that could easily enhance our students-mobile learning. The investigation and the practice of using this capability should be practically investigated to test students' performance in using their mobile phones to enhance their learning. The practical investigation would indicate

whether students do better when using their mobile phones for learning or not. According Thornton and Houser (2005), Japanese students are now using the SMS function in English lessons for their understanding of the vocabulary. .

Further research analyses are needed on what plays a major role in the implementation of students' mobile phone in teaching and learning processes and to further determine the mobile phone applications suitable in higher education classroom.

As the content in which mobile phones can be useful for students' learning varies, future research work should explore on appropriate content for mobile phones technology for students' learning. In training educators to adopt and apply mobile phones in the context of teaching and learning in various contents and also through various activities supported by the students' mobile phone.

# APPENDICES

## APPENDIX A

## LETTER TO THE RESPONDENT

## UNIVERSITY OF ZULULAND

## FACULTY OF COMMERCE, ADMINISTRATION AND LAW (BUSINEES MANAGEMENT DEPARTMENT)

**Research participant information**

Dear participant

**M. Com Research Project**

**Title of the study:** Smartphones and regular cellular phones: Assessing their impact on students' learning at the University of Zululand (Main campus).

**Supervisor:** Prof Terry Contogiannis (Contact numbers – cell: 0829402345 work: 035 902 6381)

**Co-supervisor:** Mr A.J. Williams (Contact numbers –cell: 0724099583 work: 035 902 6120)

**Researcher:** Sello Mokoena (Contact Numbers – cell: 0796066831 work: 035 902 6758)

You are invited to participate in the research study that focuses on *Smartphones and regular cellular phones: Assessing their impact on students' learning at the University of Zululand.* For a Masters' degree in the Faculty Commerce, Administration and Law under the Department of Business Management.

The main aim of the study is to investigate the effect of students' mobile phones on their learning.

As you participate in this research project, the researcher intends to understand how useful the mobile phones for students' learning are. The research results could be useful as a contribution to mobile learning readership and developments of mobile learning practice on campus.

The study includes black-Africa students from the University of Zululand within the age range of 18 to 36, and these students meet the research parameters of the sample that is needed for the research.

It is completely voluntary to participate in this project. You may withdraw at anytime; we expect no benefits for the participant from participating in this research project. Your records as a participant will remain confidential and anonymous. If you encounter any difficulties with the study questionnaire do not hesitate to contact the researcher or my supervisor on the contact numbers given above.

Your will take approximately 10 to 15 minutes to complete the questionnaire. You should return the questionnaire when you are done.

Sincerely

Sello Mokoena

*The participant can have this page of the document*

**UNIVERSITY OF ZULULAND**

**FACULTY OF COMMERCE, ADMINISTRATION AND LAW (BUSINESS MANAGEMENT DEPARTMENT)**

**Participant consent form**

**M. Com Research Project**

**Title of the study:** Smartphones and regular cellular phones: Assessing their impact on students' learning at the University of Zululand (Main campus).

**Supervisor:** Prof Terry Contogiannis (Contact numbers – cell: 0829402343 work: 035 902 6381)

**Co-supervisor:** Mr A.J. Williams (Contact numbers –cell: 0724099583 work: 035 902 6120)

**Researcher:** Sello Mokoena (Contact Numbers – cell: 0796066831 work: 035 902 6758)

**Consent**

I_____

(full names of the participant) hereby declare that I understand the matters of this manuscript and the nature of the research project, and I agree to participate in this research project. This letter is separate from the study questionnaire for ethical review purposes, and it is not part of the study data to be analysed.

_____

Signature of the participant

## APPENDIX B

## QUESTIONNAIRE

**Researcher:** S Mokoena **Supervisor:** Terry Contogiannis **Co-Supervisor:** Mr A.J Williams **Research Officer:** Irrshad Kaseeram **Discipline:** Business Management

**Institution:** University of Zululand

Dear Sir / Madam

I am a student conducting research for a Masters degree in the Department of Business Management at the University of Zululand. The study research conducted is based on the students' opinion on whether their mobile phones are useful for their learning at the University of Zululand. Your participation in this research as a student will be highly appreciated.

Should you encounter any queries do not hesitate to contact the research, S Mokoena (0796066831 / 035 902 6758)

The study questionnaire is anonymous.

**Please kindly answer all questions**

**A QUESTIONNIARE ON USING MOBILE PHONES FOR LEARNING**

Section A – Biographical Information

1. Gender

2. Age Years

3. Faculty

4. Degree

5. Tick the box next to the type of mobile phone that describe your mobile phone best

Properties

Properties

**Section B – Learning Using Mobile Phones (m-Learning)**

| | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
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|---|---|---|---|---|---|
| addresses and telephone numbers, and for simple word processing and spreadsheet. | | | | | |

Section C – Mobile Phones- Capabilities Enhancing Students' Learning

| | Poor  Excellent | | | | |
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**Thank you very much for completing this questionnaire**

## APPENDIX C

## CROSS TABULATION TABLES

**Cross tabulation of statement B1 with gender and mobile phone type**

| CROSSTABULATION | | Mobile phones are useful tools for student learning | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | |
| Phone Type | Smartphone | 1 | 2 | 8 | 80 | 128 | 219 |
| | Regular phone | 1 | 0 | 10 | 74 | 81 | 166 |
| Total | | 2 | 2 | 18 | 154 | 209 | 385 |
| Gender | Female | 2 | 1 | 9 | 69 | 109 | 190 |
| | Male | 0 | 1 | 9 | 85 | 100 | 195 |
| Total | | 2 | 2 | 18 | 154 | 209 | 385 |

**Cross tabulation of statement B3 with gender and mobile phone type**

| | | Mobile phones are distracting for students during lectures/ learning | | | | | Total |
|---|---|---|---|---|---|---|---|
| | | Strongly Disagree | Disagree | Neutral | Agree | Strongly Agree | |
| Phone Type | Smartphone | 1 | 4 | 65 | 82 | 67 | 219 |
| | Regular phone | 0 | 3 | 54 | 59 | 50 | 166 |
| Total | | 1 | 7 | 119 | 141 | 117 | 385 |
| Gender | Female | 0 | 3 | 62 | 59 | 66 | 190 |
| | Male | 1 | 4 | 57 | 82 | 51 | 195 |
| Total | | 1 | 7 | 119 | 141 | 117 | 385 |

**Cross tables Section C and gender**

| | | Calculator | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | Total |
| Gender | Female | 3 | 1 | 27 | 51 | 108 | 190 |
| | Male | 1 | 2 | 30 | 66 | 96 | 195 |
| Total | | 4 | 3 | 57 | 117 | 204 | 385 |

| | | SMS and MMS | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 2 | 5 | 28 | 51 | 104 | 190 |
| | Male | 3 | 4 | 31 | 51 | 106 | 195 |
| Total | | 5 | 9 | 59 | 102 | 210 | 385 |

| | | Internet access on mobile phones | | | | Total |
|---|---|---|---|---|---|---|
| Gender | Female | 2 | 29 | 56 | 103 | 190 |
| | Male | 4 | 29 | 64 | 98 | 195 |
| Total | | 6 | 58 | 120 | 201 | 385 |

| | | Alarm clock and calendar | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 1 | 6 | 25 | 63 | 95 | 190 |
| | Male | 3 | 10 | 22 | 62 | 98 | 195 |
| Total | | 4 | 16 | 47 | 125 | 193 | 385 |

| | | Camera | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 5 | 10 | 39 | 53 | 83 | 190 |
| | Male | 6 | 4 | 34 | 57 | 94 | 195 |
| Total | | 11 | 14 | 73 | 110 | 177 | 385 |

| | | Email access on the mobile phone | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 6 | 5 | 24 | 64 | 91 | 190 |
| | Male | 0 | 7 | 33 | 64 | 91 | 195 |
| Total | | 6 | 12 | 57 | 128 | 182 | 385 |

| | | Educational games | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 4 | 7 | 37 | 64 | 78 | 190 |
| | Male | 2 | 12 | 21 | 66 | 94 | 195 |
| Total | | 6 | 19 | 58 | 130 | 172 | 385 |

**Conti…**

| | | Computer applications on mobile phones | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 3 | 7 | 31 | 59 | 90 | 190 |
| | Male | 3 | 3 | 32 | 62 | 95 | 195 |
| Total | | 6 | 10 | 63 | 121 | 185 | 385 |

| | | Video and voice recording | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 2 | 9 | 27 | 55 | 97 | 190 |
| | Male | 3 | 10 | 26 | 60 | 96 | 195 |
| Total | | 5 | 19 | 53 | 115 | 193 | 385 |

| | | GPS and maps | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 1 | 6 | 28 | 51 | 104 | 190 |
| | Male | 4 | 8 | 28 | 60 | 95 | 195 |
| Total | | 5 | 14 | 56 | 111 | 199 | 385 |

| | | Music and Video player | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 4 | 4 | 37 | 56 | 89 | 190 |
| | Male | 6 | 5 | 26 | 58 | 100 | 195 |
| Total | | 10 | 9 | 63 | 114 | 189 | 385 |

| | | Instant messages | | | | | Total |
|---|---|---|---|---|---|---|---|
| Gender | Female | 0 | 6 | 37 | 61 | 86 | 190 |
| | Male | 2 | 9 | 39 | 54 | 91 | 195 |
| Total | | 2 | 15 | 76 | 115 | 177 | 385 |

**Cross tables Section C and mobile phone type**

| | | Calculator | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | Total |
| Phone Type | Smartphone | 3 | 2 | 28 | 65 | 121 | 219 |
| | Regular phone | 1 | 1 | 29 | 52 | 83 | 166 |
| Total | | 4 | 3 | 57 | 117 | 204 | 385 |

| | | SMS and MMS | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 4 | 4 | 31 | 64 | 116 | 219 |
| | Regular phone | 1 | 5 | 28 | 38 | 94 | 166 |
| Total | | 5 | 9 | 59 | 102 | 210 | 385 |

| | | Internet access on mobile phones | | | | Total |
|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 1 | 28 | 69 | 121 | 219 |
| | Regular phone | 5 | 30 | 51 | 80 | 166 |
| Total | | 6 | 58 | 120 | 201 | 385 |

| | | Alarm clock and calender | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 2 | 8 | 25 | 64 | 120 | 219 |
| | Regular phone | 2 | 8 | 22 | 61 | 73 | 166 |
| Total | | 4 | 16 | 47 | 125 | 193 | 385 |

| | | Camera | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 7 | 9 | 40 | 63 | 100 | 219 |
| | Regular phone | 4 | 5 | 33 | 47 | 77 | 166 |
| Total | | 11 | 14 | 73 | 110 | 177 | 385 |

**Conti…**

| | | Email access on the mobile phone | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 3 | 4 | 34 | 82 | 96 | 219 |
| | Regular phone | 3 | 8 | 23 | 46 | 86 | 166 |
| Total | | 6 | 12 | 57 | 128 | 182 | 385 |

| | | Educational games | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 3 | 9 | 32 | 71 | 104 | 219 |
| | Regular phone | 3 | 10 | 26 | 59 | 68 | 166 |
| Total | | 6 | 19 | 58 | 130 | 172 | 385 |
| | | Computer applications on mobile phones | | | | | Total |
| Phone Type | Smartphone | 2 | 7 | 34 | 69 | 107 | 219 |
| | Regular phone | 4 | 3 | 29 | 52 | 78 | 166 |
| Total | | 6 | 10 | 63 | 121 | 185 | 385 |

| | | Video and voice recording | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 2 | 12 | 32 | 75 | 98 | 219 |
| | Regular phone | 3 | 7 | 21 | 40 | 95 | 166 |
| Total | | 5 | 19 | 53 | 115 | 193 | 385 |

| | | GPS and maps | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 4 | 8 | 33 | 68 | 106 | 219 |
| | Regular phone | 1 | 6 | 23 | 43 | 93 | 166 |
| Total | | 5 | 14 | 56 | 111 | 199 | 385 |

| | | Music and Video player | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 9 | 5 | 38 | 63 | 104 | 219 |
| | Regular phone | 1 | 4 | 25 | 51 | 85 | 166 |
| Total | | 10 | 9 | 63 | 114 | 189 | 385 |

| | | Instant messages | | | | | Total |
|---|---|---|---|---|---|---|---|
| Phone Type | Smartphone | 2 | 9 | 43 | 64 | 101 | 219 |
| | Regular phone | 0 | 6 | 33 | 51 | 76 | 166 |
| Total | | 2 | 15 | 76 | 115 | 177 | 385 |

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