

The relationship between smartphone applications usage and students' academic performance

Mark Dirikorigha Salvation

(Corresponding author), marksalvation214@gmail.com.

Faculty of Industrial Management,

Universiti Malaysia Pahang,

Kuantan, Lebuhraya Tun Razak, Gambang – 26300,

Pahang, Malaysia

Abstract

Since 2008, smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption. While some apps are used for entertainment and socializing purposes, others are used for reading current health information and making online purchases. However, a review of literature indicates that there are limited studies on the impact of smartphone application usage on students' grades and this motivated the conducting of this research so as to examine the role of smartphone applications usage on students' academic performance. A quantitative research approach was used and questionnaire was used to survey a sample of 200 respondents who were selected randomly. The data was analyzed using Statistical Package for Social Sciences version 20. On analyzing the data, all the hypotheses were supported indicating that there is a significant relationship between students' application usage and academic performance. This indicates that the type of smartphone applications and how they use it determine their level of knowledge and overall grade achievement. However, the impact is mediated by the amount of time spent using such as applications. This indicates that when more time is spent on using educational applications, there are more chances of enhancing level of knowledge and classroom achievement since it is used as a learning tool to search for information needed for assignments and test or examinations. However, when more time is spent on social applications, the academic competence and classroom achievement will reduce although the student may be good in social trend. The implication of this finding is that both parents and school authorities should regulate the students' use of smartphones and ensure that it is used for the right purpose so as to enhance the level of academic achievement.

Keywords: Smartphone applications usage, students' academic performance, time spent on smartphones, types of applications.

Introduction

The growth of smartphones use has been remarkable as Lane and Manner, (2011) indicate that over half a billion smartphones were purchased globally in 2011 with US having the highest penetration rate. Without exception, Malaysia has joined the countries who are currently riding in the wave of telecommunication evolution with an increase of 16 percent smartphone penetration rate in 2012 to 63 percent while the applications usage among people increases from 54 percent to 76 percent daily surfing the internet and using other applications by September, 2013 as reported by The Sun Daily, (2013). In a similar vein, the study of Böhmer, *et al.* (2011) opine that since 2008, the smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption. The examples of apps include; mobile application games, GPS which renders location-based services, social apps like Whatsup, WeChat, Viber and BBM, order-tracking, ticket purchase, newsfeed and mobile medical apps. This indicates that while some application are used for entertainment and socializing purposes, others are used for surfing the internet on latest research findings and making online purchases. However, there are limited studies done on the impact of smartphone application usage on students overall academic performance and this has motivated the conducting of this current study so as to better understand how time spent on smartphones applications can affect students' academic performance.

The Malaysian smartphone market has experienced a steady growth over the years and the sales of smartphones accounts for about 66 percent of consumers' electronic spending in the year 2010 (Osman, *et al.* 2011). From the total of 85% of Malaysians who are said to own mobile phones, 23% owns smartphones as reported by the Malaysia Telecommunication and Multimedia Commission. Given the growing interest and purchase of smartphones especially among young adults, many scholars have delved into the study of smartphone usage among users and its various impacts on the social and psychological development of the users

(Norris, 2007; Mothar, *et al* 2013). However, despite the high penetration rate of smartphones in Malaysia, a review academic studies indicates that there are limited studies which specifically focused on the impact of smartphone application usage on students' overall academic performance. For example, the studies of Chittaranjan, *et al.* (2011); Tossell, *et al.* (2012) opine that there are still far less empirical studies done adequate enough to understand users' behaviors on the smartphone applications usage among users and the academic effect. Driven by this, the current study intends to examine the role of smartphone applications usage on students' academic performance in terms of the classroom achievement, students' competence and the overall final grade point average.

The main purpose of this study is to determine the impact of smartphone application usage on students' academic performance in Malaysia. The study is significant for unraveling the role of smartphone applications usage on students' academic performance in terms classroom achievement, students' competence and the grade point average. This study has both practical and academic implications. Since understanding students' academic performance and the determinants is imperative given that the outcome is used as measure to predict the students' future performance, the findings of this study will help both parents and the governing bodies of higher institutions to know the role smartphone applications usage in the academic campus plays on their children and wards' final cumulative grade point average. Having known the impact of apps usage patterns on the students' academic performance, the findings of the study will help educators to implement appropriate policies that will enable the students to use the various smartphone applications to enhance their final cumulative grade point average. On the academic importance side, the findings of this study will provide some insights for future researchers who will like to extend this line of enquiry to other unit of analysis or settings. This indicates that this study will serve as a foundation for further researchers since the subject area largely remains much unexplored in the Malaysian context.

Literature review

Smartphones are mobile electronic devices that run advanced operating systems with options to install new applications, thereby providing the user with varied functionality including internet connectivity (Aviram, 2010; Oulasvirta, *et al.* 2011). However, another view defined smartphones as handheld personal computers which support the installation of new applications and equip with continuous network connectivity (Osman, *et al.* 2011; Thiraput, 2013). While the former definition is built on the premise that smartphone is an advanced form of cell phone with built-in applications that enables the use of diverse functions such as the ability to access the internet and play music and video, the latter definition considers smartphones as minicomputers designed to perform every functions modern day computers can achieve given the inclusion of additional software functions like e-mail and internet browser. However, there seems to be a consensus among the two claims and the common thread running through all the definitions is that smartphone is an advanced mobile electronic device which has a large touchscreen for direct finger input as its main *means of* interaction and an operating system capable of running downloaded applications, thereby performing most of the functions of a computer such as receiving input, processing and producing output and storage.

Smartphone applications are programs which are designed to be operated on smartphones which are installed after being downloaded from online application sales outlets (Lee, *et al.* 2012). However, another view defined smartphone applications as software applications that run on mobile phones and computers (Verkasalo, *et al.* 2010). While the former definition is built on the premise that smartphone applications are usually small specialized programs which are downloaded and installed into mobile devices, the former definition considers smartphone applications as a piece of software which can run on electronic devices such as smartphones. However, there seems to be an agreement among the two definitions and the common thread running through all the definitions is that smartphone applications are computer programmes designed to run on electronic devices such as smartphones, tablet computers and other mobile devices.

Since 2008, smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption (Böhmer, *et al.* 2011). The examples of apps include; mobile application games, GPS which renders location-based services, social apps like Whatsup, WeChat, Viber and BBM, order-tracking, ticket purchase, newsfeed and mobile medical apps. This indicates that while some apps are used for

entertainment and socializing purposes, others are used for reading current health information and making online purchases.

Differences in smartphone applications usage pattern among students

Although studies on the interaction between students' differences and app usage are scarce, there is evidence to believe that smartphone applications usage among students may vary significantly depending on their individual differences. According to this claim, personality traits may determine the type of smartphone applications used by student. In supporting this claim, the study of Lane and Manner, (2011) found that while introverted people are more likely to use texting applications when communicating with friends or family members, extroverted and more agreeable people are more likely to use call applications while placing less importance on text app. This indicates that social and psychological factors play significant role in the choice of smartphone application usage among students. In supporting this claim, the *Uses and Gratifications Theory* by Jay Blumler and Elihu Katz argues that people's differences causes smartphone users to seek out different applications and use them differently (Leung and Wei, 2000; Wei and Lo, 2006). According to this claim, the theory shows that the way smartphone users actively select and use applications depend on their social and psychological needs and gratification-seeking motives. However, another view seems to indicate otherwise. According to this latter claim, there is no clear evidence to support the claim of smartphone applications usage being influenced by the users' personality traits. This is because of the limited number of studies on the use of smartphone applications among students and concluding that individual differences is a contributing factor on app usage is yet to be established. In supporting this claim, Chittaranjan, *et al.* (2011) say the role of the smartphone in revealing a person's attitude and behavioral patterns is still unclear due to limited studies in this direction. According to this finding, it cannot be concluded that a smartphone apps usage pattern is determined by the users' socio-psychological traits since there are limited studies to support it.

Furthermore, there seems to be a further argument on the issue of smartphone application usage among students although there are limited studies available. According to one perspective, there is a gender difference in the smartphone application usage among students. Central to this claim is that while female students tend to use more social oriented applications such as WeChat and Facebook messenger for socializing purposes, male students prefer streaming contents and video games applications. This is because while female students are more communication and social oriented, male students are more assertive and competitive in nature. In supporting this claim, the study of Lenhart, *et al.*, (2010); Lee, *et al.* (2014) found that while male smartphone users tend to be more task-oriented in their application usage, female users are more people-oriented aimed at satisfying their social motives. According to this finding, female students value social functionality of the applications more than male students who often use more of applications for self-gratification. In supporting the foregoing claim, the study of Pawłowska and Potembska, (2012) found that female smartphone users use more social-oriented apps than male users for the purpose of gossiping and maintaining close personal relationships with friends and family members. However, another view seems to argue that there is no clear gender difference in the smartphone applications usage pattern among students. According to this latter perspective, a demographic characteristic such as gender is not a strong determinant of which application students may use at any point in time. In supporting this claim, the study of Economides and Grousopoulou, (2008) found that there is no statistically significant relationship between a user's gender and his or her preference for mobile phone application usage. According to this claim, gender is not a significant determining factor of which smartphone application to use by a student and for how long. Thus, it may be concluded here that there is a mixed and inconclusive findings on the relationship between gender difference and smartphone applications usage pattern among students.

Students' academic performance

Academic performance is a demonstration of competence that is measured through assessment Beckman, *et al.* (2006). However, another view defined academic performance as how well a student is accomplishing his or her tasks and studies (Amin, *et al.*, 2006). While the former definition indicates that the result of a student's performance (i.e. the grade point average) on tests reflect his or her academic performance and it is taken as an indicator of the student's competence after an educational phase, the latter definition claims that academic performance entails the extent to which a student has achieved his or her educational goals. However, Albanese, *et al.* (2008) defined academic performance as a demonstration of students' level of competence and mastery of

subjects through completion of multiple tests of competence in a particular domain of education. According to this claim, there are three essential elements of academic performance which include assessment, competence and performance. While assessment is a tool used by educators to determine student's level of knowledge, skills and learning, competence entails the possession of the necessary attributes such as knowledge, skills, abilities and attitudes. However, there seems to be a common ground on both claims and both definitions indicate that academic performance is the outcome of a student's education which is displayed through his or her level of knowledge, skills and attitudes.

Academic performance as shown in the grade point average is used by the governing bodies of higher institutions to determine which student is displaying the right level of competence as defined by the academic standards. Also, potential employers assess the final cumulative grade point average to determine which candidate is suitable for the job (Beckman, *et al.* 2006). This indicates that understanding students' academic performance and the determinants is imperative because the outcome can be used as measure to predict the students' future performance and be used as an outcome variable for educational research purposes.

The influence of smartphone applications usage pattern on students' grade point average

There are two views on the impact of smartphone applications usage on students' academic performance. On the one hand, studies portray the influence of smartphone usage on students' academic performance in a positive light. According to this optimistic view, smartphones can be used as effective learning tools which can enhance the students' grade point average. For example, map and weather applications serve as learning tools when it comes to learning subjects relating to geography. Also, students form chat groups on applications such as Whatsup and Viber to share ideas on group assignments and this can enhance the outcome of their team works and consequently the final grade point average. In supporting this claim, Krebs, (2012) reports that a recent study from North Carolina found that smartphones apps usage in the classroom can have a huge impact on students' classroom achievement. According to this study, test scores improved by 30% after smartphones were introduced to low-income students in the school. This is because the students saw the introduction of the smartphones as opportunity to learn new things by searching for latest technological innovations and new findings on various subject areas around the world and the knowledge gained helped to build mental warehouse of information required to achieve better grades. Similarly, the study of Griffith, and Liyanage, (2008); Bakon and Hassan, (2013) opine that apps such as instant messaging, wikis, discussion boards and other apps can complement what is taught in a conventional classroom setting, thereby enhancing students' competence on the subject matter. A further study on the impact of smartphone apps on students' education by Sarwar and Soomro, (2013) indicates that smartphone makes it easier for students and lecturers to collaborate for academic purposes. According to the study, smartphones can enable students to attend classes during sick leaves through their apps and keep up with their academic works rather than falling behind due to unanticipated circumstances. It can be concluded here that the right use of smartphone applications has the potency to improve students' overall grades because it makes communication easier and faster among students and lecturers which enhances effective flow of information and the sharing of ideas and knowledge among students.

However, while the above claims indicate a positive relationship between smartphone applications usage and students' grades, a competing view portrays the impact of smartphone applications usage on academic performance in a more negative light. According to this pessimistic claim, rather than improving overall grades of students, the use of smartphone applications tends to reduce their academic performance because most of the students only use social apps interacting with their friends and families. In supporting this claim, a study on the impact of Whatsapp Messenger usage on students' academic performance in tertiary institutions by Yeboah and Ewur, (2014) found that smartphone applications usage generated negative impact on the students' grades in Ghanaian universities instead of enhancing their academic performance given the instant internet connectivity. According to the study, most of the students spend much of their valuable time meant for study on social applications and this result to delay in completing their assignments, lack of reading for test and examinations, lack of concentration during lecture periods. The study further found that students' over reliance on social applications destroys their spellings and grammatical construction of sentences since many users of instant messengers tend to use abbreviations and informal expressions during chatting. This indicates that addiction to smartphone applications cause difficulties in balancing online activities (i.e. Whatsapp usage) and students' academic preparation and this reduces the overall cumulative grade point average of the students. Similarly, the

study of Simuforsa, (2013) opine that high level use of applications for social networking can cause students to lose focus on their academic tasks and this will negatively affect their academic outcomes. A further study by Ezemenaka, (2013) found that constant use of internet enabled phones in the classroom reduces students' level of concentration and consequently their academic performance. It can be concluded here that too much use of smartphone applications on non-academic related things can reduce students' academic competence and their overall grades.

Potential mediators of the relationship between application usage and academic performance

Although research on the relationship between students' smartphone application usage and academic performance is scant, there is evidence to believe that the impact of app usage on students' academic performance is determined by the particular type of application and the time spent on using such applications. Thus, this section discusses the potential mediators of the relationship between smartphone applications usage and students' academic performance.

Types of smartphone applications as a mediator

Although studies on the impact of smartphone applications usage on students' academic performance is scant especially in the Malaysian academic context, there is reason to believe that the type of app used on smartphones may determine the nature of activities the students may engage and this will in return determine the effect on their academic competence and grades.

For example, if students use more of social applications such as Facebook messenger, Viber and WeChat for socializing purposes instead, it may affect their grades negatively because much time meant for studies will be used on non-academic related things (Yeboah and Ewur, 2014). However, if students use their smartphones as learning tools to surf the internet and search for latest research findings on their area of specialization, it will enhance their level of competence in the subject and this will result to better grades. In supporting this claims, the study of Yeboah and Ewur, (2014) found that Ghanaian students' over reliance on social applications such as Whatsup does not only affect their spellings and grammatical construction of sentences since many users of instant messengers tend to use abbreviations and informal expressions during chatting, it also affects the students' grades because most of the students spend much of their valuable time meant for using academic related applications such as Google in researching for latest findings on their courses but wasting much time on socializing.

However, another view seems to offer a complicating perspective to the ongoing argument. According to this latter claim, there is no strong relationship between the type of smartphone application used and the students' academic performance. This indicates that whether a student use social applications or otherwise, it may not have significant effect on the grade point average of the students. In supporting this claim, the study of Prescott, *et al.* (2012) on the impact of smart mobile electronic devices use on the academic performance of pharmaceutical students indicates that there is no significant relationship between the type of applications used and the overall grades. According to this study, despite the high frequency of use and the perceived negative impact on learning claimed by researchers, the use of applications during class for both course-related and non-course-related purposes had no overall impact on academic performance in the study population. This claim indicates that the type of smartphone application used cannot determine the academic performance of the students but rather other intrinsic and extrinsic factors.

Time spent using smartphone applications as a mediator

Although studies on the time spent on smartphones among students are scant especially in the Malaysian academic context, there is evidence to believe that there is a notable variation in the duration of smartphone usage among students. This indicates that while some users spend less time on it, others spend considerable much more time. In supporting this claim, the study of Hingorani, *et al.* (2012) asset that access to social media sites, such as Facebook and Twitter and texting applications has captured the attention of many students and many of them spend a considerable amount of time utilizing smartphone applications. For example, a survey found that

young users of smartphone from the ages of 18 to 24 send an average of 109.5 messages daily which totals to over 3,200 texts every month. Similarly, a study found that over 60% of young adults admit to be highly addicted to their Smartphone in that they spent considerable time engaging in diverse activities (Sarwar and Soomro, 2013).

Having established earlier that some students use smartphone applications for socializing while others use it for academic purposes, time spent can determine how well students perform academically although there are limited studies to support this claim. For example, when smartphone applications are used for only socializing purposes and much time meant for studying is spent on non-academic related things, it will reduce the students' grades. But, if smartphone is used as a learning tool and much more time is spent on applications where students form chat and reading groups to exchange ideas and knowledge, it will improve their academic competence and subsequently their cumulative grade point average. Thus, it can be concluded here that time spent on smartphone applications can determine whether students' grades will improve or decline.

Theoretical framework

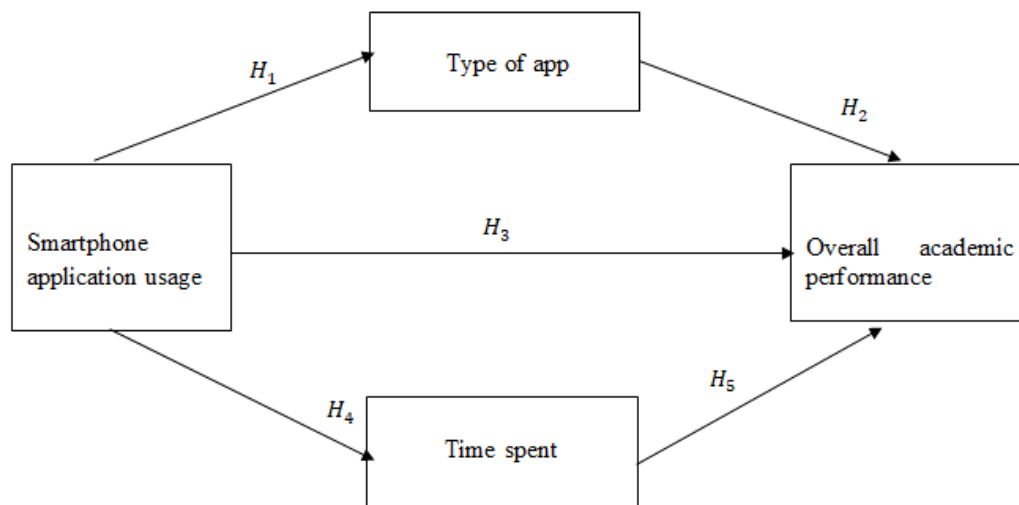
Bakon and Hassan, (2013) studied the perceived value of smartphone and its impact on deviant behaviour among Malaysian college students. The objective of the study was to determine the impact of smartphones on deviant behaviour and student's academic performance.

On the relationship between smartphone application usage and students' academic performance, the study found that the use of smartphones among students do not have a significant and positive effect on both the students' deviant behaviour and their academic performance. However, while this study provides some insights on the field of smartphone usage among in academic environment, the small sample size may affect the validity and reliability of the study because Fosgate, (2009) argues that the probability of a study yielding a statistically sound conclusion is determined by large sample size. Thus, the current study tends to address this limitation by increasing the sample size to widen the research context so as to ensure validity and the generalizability of the results.

Conceptual framework

This section highlights the conceptual framework of the current study. The structure of the framework is an extension of the study of Bakon and Hassan, (2013) and Figure 2.2 below shows the interrelationship between the variables. The framework indicates that smartphone application usage may influence students' cumulative grade point average. However, the framework shows that the level of effect will be determined by the particular type of application and the time spent on each application.

Figure 2.1: Conceptual framework of the study



Research methodology

Research approach

This study uses quantitative research approach. A quantitative research approach is known as a number-based research strategy which emphasizes the quantification in collecting and analysing data. A quantitative approach was selected for this study because it was the most feasible option given the objectives of the study. Besides, prior experienced scholars have used quantitative approach on similar topics believing that it is more objective and reliable in generating results that can be generalized beyond the sample size to the larger population. In supporting this claim, Collis and Hussey, (2009) opine that quantitative research approach studies tend to generate a more dependable results whose findings can be generalized because standardized questionnaires are used to collect objective data unlike the qualitative approach which is more exploratory.

However, while quantitative research approach study may produce a more liable results, it does not give room for detail analysis of issues given that it is a number-based study unlike qualitative studies that provides in-depth analysis and richness of data. In supporting this claim, Sukamolson, (1996) opine that qualitative studies offers more room for detail analysis of issues because it is more exploratory in nature since interview sessions are conducted which offers the chance for more probing questions to be asked unlike quantitative studies which uses standardized questionnaires.

Population and sample size analysis

The target population for this study undergraduate college students in Nilai who have smartphones or have used it before. This target population was selected based on findings on smartphone usage among Malaysians that majority of the users are young college students who use smartphones for various reasons ranging from socializing to reading local news and to surfing the internet for academic related information as suggested by The Sun Daily, (2013). Given the large population under consideration and the difficulty involved in including every subject, a sample of only 150 undergraduate students will be selected to represent the target population. The decision to select a sample of 150 respondents is based on budget and time considerations. Besides, the ease and convenience in collecting and analyzing small sample data determined the choice of the selected sample size. In supporting this claim, Bryman and Bell, (2011) opine that a manageable sample size should be selected to represent the population so as to reduce the budget and time involved in conducting large sample study.

However, considering a small sample size in a study can increase the statistical error and human bias during data collection which may compromise the findings and the generalizability of the study because a small sample

cannot provide adequate representation of the population. In supporting this claim, Fosgate, (2009) argues that the probability of a study yielding a statistically sound conclusion is determined by large sample size. To address this issue, the respondents were selected randomly so as to give every unit the chance of being included as the next section indicated.

Sampling technique

This study uses a simple random sampling technique during data collection. Simple random sampling technique was used because it gives every unit of the population an equal and independent chance of being selected and included in the study. In supporting this claim, Sekaran and Bougie, (2010) opine that simple random sampling data collection method ensures a higher generalizability of results because all elements in the population are considered and they have equal chance of being chosen and studied.

However, others argue that simple random sampling technique is not as simple as it may sound because a detail profile of the target respondents may be obtained prior to conducting the study in order to randomly select who to include in the study. Besides, others argue that simple random sampling technique is not as efficient as stratified sampling technique the population may not be divided into meaningful segments prior to selecting the subjects in proportion to their original numbers in the population (Bluman, 2001).

Data collection instrument

This study uses a questionnaire to collect the data. Questionnaire was selected because of the numerous advantages it has over interview or focus group discussion. For example, questionnaire can be used to collect a large amount of data within a short period of time and it gives the respondents the chance to answer the questions at their own convenient time. Also, the results generated from questionnaire may be more valid because it offers standardized questions for every subject. In supporting this claim, the study of White, (2005) opine that questionnaire instrument can be easily administered to collect a large data in a fast and more convenient way since respondents can answer at their convenience.

However, questionnaire has some limitations. For example, questionnaire does not provide room for the respondents to ask questions when they do not understand the issues involved. Besides, questionnaire does not make room for asking more probing and complex questions that may through more light on the issues and determinants unlike focus group discussion and interview session that may provide a better forum for detail discussion and data collection. In supporting this claim, the study of Lefever, *et al.* (2007) argues that questionnaire does not make room for clarification since standardized questions are provided for every subject.

Measurement of the variables

The questionnaire has five sections comprising of 25 questions and a multidimensional scale and ranking order are used to measure the main variables. The five-point likert scale anchors from “1” – strongly agree to “5” – strongly disagree. However, the measurement of the smartphone applications use variable was based on ranking order where subjects are asked to tick their preferred applications on the “Yes Column” while the others are indicated on the “No Column”. These measures are used because prior experienced scholars have also used similar measurements on similar studies. For example, while Pijpers, (2005) found the five-point Likert scales to be effective measures of certain constructs, Lee, *et al.* (2014) found ranking to be more feasible on certain issues.

Statistical tools used

Since the study uses quantitative approach, certain statistical tools will be used during data computation and analysis. For example, SPSS will be used to compute and analyze the data. Also, while tables and percentages will be used to analyze the responses of the data, Pearson correlation and Multi regression analysis will be used to test the hypotheses so as to determine which one is supported or rejected.

Pretest

Pretesting means determining the validity of the research instrument prior to conducting the main study. Given this, a sample of 20 respondents will be selected and given the questionnaire to know how well they may understand the questions. Based on the responses given, the questions may be modified if the need arises so as to ensure that the target respondents can easily understand and answer the questions accurately. Subsequently, the responses were computed and analyzed using Statistical Package for Social Sciences (SPSS) and the reliability of the data was tested and it was 0.87 indicating high reliability of the instrument.

Research assumptions

It is assumed in this study that the respondents will provide valid response to the questions. Also, it is assumed that the study will generate valid and reliable results whose findings can be generalized beyond the sample size to the larger population.

Data analysis and discussion

In the previous chapter, the methods and procedures used in conducting the study were discussed. However, this chapter focuses on analyzing the data collected. Thus, the following issues will be discussed: demographic profile of the respondents, smartphone application usage, type of smartphone applications, time spent using smartphone applications and overall academic performance. The chapter will conclude with a discussion of the hypotheses using Pearson correlation and Multi regression analysis.

Demographic profile of the respondents

Table 4.1 below shows the results from the respondents' demographic data. From the result, Nigerian respondents seem to dominate the sample followed by the Chinese. This is due to the growing number of Nigerian and Chinese students studying in either Nilai doing either degree or master programme. Also, the data is dominated by more male respondents because of more male undergraduate students in the study location. For example, a quick check on the undergraduate students' population in Nilai indicates that there are more males than female students and this reflects the Malaysian gender ratio which is 106 males to 100 females. However, the data from the age distribution indicates that over half of the respondents fall within the age bracket of 23-27 years old while only 21% of the respondents are within the age bracket of 28-33 years old. The reason why younger respondents dominate the sample is because there are more young students in the study location. This is because many students left high school quite early and moved straight to the university without wasting time. This indicates that many of the respondents did not bother to work and raise money after the secondary school education but they just proceed straight to start their degree programme. On the educational level, 71.5% of the respondents are degree students doing various forms of courses. The reason why degree students dominate the sample is because undergraduate students are more than master students and the reason is because more people tend to stop at the degree level and work for a while before proceeding with their post graduate programmes.

Table 4.1: Demographic profile of the respondents

Respondents' demographic variables		Number	Percentage (%)
Nationality	Nigerian	101	50.5
	Indian	17	8.5
	Chinese	34	17
	Malaysia	11	5.5
	Others	47	18.5
	Total	200	100
Gender	Female	92	46
	Male	108	54
	Total	200	100
Age range	18-22 years old	56	28
	23-27 years old	102	51
	28-33 years old	42	21
	Total	200	100
Educational level	Diploma	41	20.5
	Degree	143	71.5
	Masters	12	6
	Others	4	2
	Total	200	100

Discussion of the hypotheses results

Having done the descriptive analysis, the focus here will be discussing the results of the hypotheses using Pearson correlation and subsequently the Multi regression analysis and Table 4.2 below shows the results of the hypotheses.

Table 4.2 Results of the Pearson correlation test

		App usage	App type	Time spent	Academic performance
App usage	Pearson Correlation	1	.561**	.373**	.378**
	Sig. (2-tailed)		.000	.000	.000
	N	200	200	200	200
App type	Pearson Correlation	.561**	1	.581**	.402**
	Sig. (2-tailed)	.000		.000	.000
	N	200	200	200	200
Time spent	Pearson Correlation	.373**	.581**	1	.480**
	Sig. (2-tailed)	.000	.000		.000
	N	200	200	200	200
Academic performance	Pearson Correlation	.378**	.402**	.480**	1
	Sig. (2-tailed)	.000	.000	.000	
	N	200	200	200	200

Hypothesis 1: Smartphone usage depends on the type of application

The aim of this hypothesis is to determine how smartphone usage depend specific applications. The null and alternate hypotheses are stated below:

H_0 : Smartphone usage does not depend on specific type of application

H_a : Smartphone usage depends on specific type of application

Table 4.2 above shows that while the r value is 0.373, the p-value is 0.000 which is less than the confidence level and it shows that while the null hypothesis is rejected, while the alternate is accepted. Thus, it can be concluded here that smartphone usage among students depends on specific type of applications. This supports the

finding of Ezemenaka, (2013) that the type of app used on smartphones may determine the nature of activities the students may engage.

Hypothesis 2: Overall academic performance of students depends on the type of application used

The aim of this hypothesis is to determine how students' overall academic performance is determined by specific type of applications. The null and alternate hypotheses are stated below:

H_0 : Overall academic performance of students does not depend on the type of application used

H_a : Overall academic performance of students depends on the type of application used

Table 4.2 above shows that while the r value is 0.402, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This shows that there is a significant relationship between students' overall academic performance and specific types of smartphone applications. According to this claim, the improvement or decrease of students' level of competence and grades will depend on the type of application used. This supports the findings of Ezemenaka, (2013) that the level of knowledge achieved through smartphones will depend on the specific applications. This shows that while some applications especially the educational related ones may enhance level of knowledge obtained, others especially the non-educational applications may reduce the level of it because more time is spent on nonacademic related issues.

Hypothesis 3: There is a significant relationship between smartphone applications usage and students' overall academic performance

The aim of this hypothesis is to determine the relationship between smartphone applications usage and students' overall academic performance. The null and alternate hypotheses are stated below:

H_0 : There is no significant relationship between smartphone applications usage and students' overall academic performance

H_a : There is a significant relationship between smartphone applications usage and students' overall academic performance

Table 4.2 above shows that while the r value is 0.378, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This indicates there is a significant relationship between smartphone application usage and students' overall academic performance and this supports the findings of a recent study from North Carolina that smartphones apps usage in the classroom can have a huge impact on students' classroom achievement in that test scores improved by 30% after smartphones were introduced to low-income students in the school as report by Krebs, (2012).

Hypothesis 4: Time spent depends on smartphone application usage

The aim of this hypothesis is to determine how time mediates the relationship between application usage and academic performance. The null and alternate hypotheses are stated below:

H_0 : Time spent does not depend on smartphone application usage

H_a : Time spent depend on smartphone application usage

Table 4.2 above shows that while the r value is 0.373, the p-value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This shows that how much time spent on smartphones depends on specific applications. This indicates that students may spend more time on their favorite applications while spending lesser time on some other applications and this indicates that when their favorite applications are education based, it will improve their academic performance since more time is spent but when the favorite applications are social based, it will reduce the classroom achievement and overall final grades since time meant for studies is spent chatting and socializing. This support the findings on a study on the impact of Whatsapp Messenger usage on students' academic performance in tertiary institutions by Yeboah and Ewur, (2014) found that many students spend much of their valuable time meant for study on social applications and this result to delay in completing their assignments, lack of reading for test and examinations, lack of concentration during lecture periods.

Hypothesis 5: Time spent depends on academic performance

The aim of this hypothesis is to determine how time mediates the relationship between application usage and academic performance. The null and alternate hypotheses are stated below:

H_0 : Time spent does not depend on academic performance relationship

H_a : Time spent depend on academic performance relationship

Table 4.2 above shows that while the r value is 0.480, the p -value is 0.000 which is less than the confidence level of 5% and this shows that while the null hypothesis is rejected, while the alternate is accepted. This indicates that time spent mediates students' academic performance. According to this claim, when more time is spent on educational application, students' level of knowledge and grades will improve but when less time is spent, it will reduce the academic performance. This supports the findings of Mothar, *et al* (2013) that if smartphone is used as a learning tool and much more time is spent on applications where students form chat and reading groups to exchange ideas and knowledge, it will improve their academic competence and subsequently their cumulative grade point average. Thus, it can be concluded here that time spent on smartphone applications can determine whether students' grades will improve or decline.

Multi regression analysis

Table 4.4 below shows the results of the Multi Regression analysis and the results show that time spent on smartphone applications seem to have more impact on students' overall academic performance. This indicates that how well students' knowledge and competency as well as the classroom achievement will be determined by the time spent on using smartphone applications. This supports the findings of Mothar, *et al* (2013) that when students use smartphone as a learning tool and much more time is spent on applications where students form chat and reading groups to exchange ideas and knowledge, it will improve their academic competence and subsequently their cumulative grade point average and verse versa.

Table 4.3 Multi Regression analysis results

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
Overall academic performance	.968	.196		4.949	.000
Application usage	.281	.104	.198	2.698	.008
Type of application	.101	.101	.083	.997	.320
Time spent	.378	.079	.358	4.803	.000

4.7 Conclusion

Analysis of the results indicates that student's level of competence, classroom achievement and overall grades is influenced by application usage. According to this claim, when students choose educational applications and spend more time surfing the internet or sharing academic related ideas, experiences and information, it will help to build mental warehouse needed to achieve the best classroom and overall grades. However, results from the Multi Regression analysis indicates that time spent on smartphone applications has more effect on the application usage and academic performance relationship.

Overview of the main findings

On analyzing the data, it was found that there is a significant relationship between smartphone application usage and students' overall academic performance and this supports the findings of a recent study from North Carolina that smartphones apps usage in the classroom can have a huge impact on students' classroom achievement in that test scores improved by 30% after smartphones were introduced to low-income students in the school as report by Krebs, (2012). However, smartphone usage among students depends on specific type of applications and the time spent on using such applications. Thus, it was found that there is a significant relationship between students' overall academic performance and specific types of smartphone applications.

According to this claim, the improvement or decrease of students' level of competence and grades will depend on the type of application used. Also, time spent mediates students' academic performance. According to this claim, when more time is spent on educational application, students' level of knowledge and grades will improve but when less time is spent, it will reduce the academic performance. However, how much time spent on smartphones depends on specific applications. This indicates that students may spend more time on their favorite applications while spending lesser time on some other applications and this indicates that when their favorite applications are education based, it will improve their academic performance since more time is spent but when the favorite applications are social based, it will reduce the classroom achievement and overall final grades since time meant for studies is spent chatting and socializing. Furthermore, results from the Multi Regression analysis found that time spent on smartphone applications seem to have more impact on students' overall academic performance.

Managerial implications of the findings

The study found that the improvement or decrease of students' level of competence and grades will depend on the type of application used and the amount of time spent using such applications. The implication here is that both parents and school authorities should regulate the students' use of smartphones and ensure that it is used for the right purpose so as to enhance the level of academic achievement. This indicates that strict rules and regulations should be implemented on the type of applications to use and the amount of time to spend on using such applications. For example, students should be allowed to use only educational applications and strictly for the purpose of surfing the internet and finding academic related information needed for assignments, classroom preparation and tests or examinations. Also, students should only be allowed a certain amount of time using smartphone applications so as to have time for other school activities.

Recommendation for further studies

While the study offers some insights in the field of smartphone applications usage on academic performance, there are some limitations that further studies need to address. First, the study used a small sample size of only 200 in spite of the large study population and this may limit the generalizability of the findings. This is because small sample size may not guarantee enough representativeness of the population and this limit the ability of the findings to be applied beyond the sample size to the larger population. For example, the study of Fosgate, (2009) argues that the probability of a study to yield statistically sound conclusion depends on a large sample size. Secondly, the study was conducted among students from one location and this may limit the chances of applying the findings in other settings. This indicates that further studies need to be conducted using a larger sample size using students from diverse academic institutions across Malaysia.

Conclusion

Since 2008, smartphone application distribution rate has increased and there are hundreds of applications available today for users' consumption. While some apps are used for entertainment and socializing purposes, others are used for reading current health information and making online purchases. However, a review of literature indicates that there are limited studies on the impact of smartphone application usage on students' grades and this motivated the conducting of this research so as to examine the role of smartphone applications usage on students' academic performance. On analyzing the data, all the hypotheses were supported indicating that there is a significant relationship between students' application usage and academic performance. This indicates that the type of smartphone applications and how they use it determine their level of knowledge and overall grade achievement. However, the impact is mediated by the amount of time spent using such as applications. This indicates that when more time is spent on using educational applications, there are more chances of enhancing level of knowledge and classroom achievement since it is used as a learning tool to search for information needed for assignments and test or examinations. However, when more time is spent on social applications, the academic competence and classroom achievement will reduce although the student may be good in social trend. The implication of this finding indicates that the students ensure that they use smartphone for the right purpose so as to enhance the level of academic achievement.

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