

Exploring the Determinants of Third Generation (3G) Mobile Technology Adoption among University Students

¹Daniel Opoku, ²Isaac Nyarko Adu

¹Lecturer, Department of Information systems, Zenith University College, Accra, Ghana

²Lecturer, Department of Business Education, University of Education, Winneba, Ghana

¹d.opoku@zenithuniversitycollege.org, ²inadu@uew.edu.gh

ABSTRACT

This study examined the factors influencing 3G adoption among university students in Ghana. A questionnaire regarding the use of 3G services was developed and distributed among university students. The data was analysed using factor analysis and multiple regression. Among the determinants used for the study, it was found that performance expectancy, effort expectancy, social influence, variety of services significantly influence 3G adoption, whereas the cost of service was found to be statistically insignificant. Also, with respect to gender differences on these factors, effort expectancy and social influence were found to have a major influence on female 3G technology adoption than males, whereas performance expectancy and a variety of services were also found to have a major influence on males than females. The gender difference in cost of services was seen to be statistically insignificant. The findings will serve as a guide for telecommunication companies in the deployment of similar technologies in the future.

Keywords: *Telecommunication, 3G technology, network operators, 3G mobile services, technology adoption, 3G adoption.*

1. INTRODUCTION

Mobile phone usage has been on the increase in both developed and developing countries [33]. The cost of buying a mobile phone has rapidly declined and this has enabled quite a number of people to gain access to their personal phones [61]. Studies have shown that the number of individuals accessing the internet through the mobile phones is getting closer to those accessing the internet through their personal computers [5, 61]. A report by the International Telecommunication Union [24] indicates that the number of mobile cellular subscribers has reached 7 billion, which forms about 95.5% of global penetration [24]. Moreover, the mobile penetration in the developing world now is 90.2 percent, however, there is still potential for growth, particularly in Africa, which has the lowest mobile penetration worldwide at 69.3 percent [24]. This rise has stirred a host of opportunities for new voice and data services and products driven by new mobile technologies.

Technology adoption has been of interest to both researchers and practitioners in emerging economies like those in Africa, but with less focus on third generation (3G) technology [21, 17]. Comparatively, studies on 3G mobile services are few in developing countries than those in developed countries [37, 50]. In Africa, some few studies have also been conducted. For example, Garg and Garg [7] conducted a study on usage patterns and adoption of 3G mobile services in Botswana. The authors found the price, security and usefulness of services as factors which can increase consumers' usage intention.

These findings are not too far from that of Ramburn and Van Belle [18]. Ramburn and Van Belle [18] investigated the adoption and usage of 3G data services in South Africa and Mauritius. The authors found that cost/price, wider range of services, awareness (knowledge ability) and reliability of the services data services were the key determinants of adoption and usage.

In Ghana, some few studies [e. g 43] have been conducted on technology adoption, but not on 3G adoption or usage. The number of 3G subscribers in Ghana is relatively low compared to the number of mobile phone users [24]. Again, despite Ghana's market size and potential, the country is a relatively late mover in mobile technology adoption and usage (e.g. 3G Technology) when compared to other developed countries like Canada, Australia and United Kingdom [2, 28, 51] and some other African countries like Botswana and South Africa [7, 18].

To the best of the authors' knowledge, 3G issues have not been widely addressed in Africa as it has been widely studied in advance countries. Although, mobile services like video, audio, and multimedia messaging has increased thanks to the advances in wireless technology and 3G networks, the adoption rate by consumers differs depending on the development levels of countries [54].

Against this backdrop, the current study differs from preceding studies in the following aspects; (1) there is no any previous studies on the use of 3G mobile services by Ghanaian university students. We explicitly examined the use of 3G services by Ghanaian students; (2) there are very few previous studies regarding gender differences specifically with 3G mobile services.

Although, some of these studies found gender differences in technology adoption, others did not find any gender differences. Several researchers have concurred that the gender gap between technology usages had narrowed significantly in the high schools age group or college age group as well as the general population [3].

Generally, contrast between genders had disappeared. On the other hand, some gender contrasts had been found in attitudes towards technology usage like internet, mobile phones and computer usage [3, 39]. A few studies have reported that males usually have

<http://www.cisjournal.org>

significant positive attitude towards technology usage than females [39, 49]. It is therefore imperative to investigate the gender difference in the use of 3G mobile technology services as well. The rest of the paper is divided into four sections. Section one focuses on a literature review and development of hypotheses whilst section two presents the methodology. Section three focuses on the analysis and findings of the study.

Discussions and implications are presented in the last section.

2. LITERATURE REVIEW

A number of developing countries are still at an early stage with regard to 3G services adoption. Agarwal et al. [35] presented that the potentialities of mobile service application are driving most firms to spend huge amounts of money on these technologies. However, 3G telecom operators received returns on investment only if the technology is accepted by the consumers or the market [59]. Hence, a study of growing 3G markets will provide a good understanding and insights to promote the uptake and appropriate use of the technology and its related services for both consumers and MNOs [4]. Drawing from information systems literature, Abu [51] conducted a study on technological innovations of 3G mobile phone diffusion in Japan. The study identifies specific technological innovations which have been developing in the Japanese mobile phone market to the betterment of services and advancing to 4G. In accordance with the estimated results, technological innovations in entertainment, e-payment, and high speed data services are crucial and are found significantly in all aspects of the 3G diffusion. The author recommended that further studies are required to perform a quantitative analysis on which technological innovations and policies are valid, considering the characteristics like geographical coverage, population and income level. Ida and Kuroda [53] estimated the demand for mobile phone services in Japan. The authors compared both 2G and 3G mobile phones for major carriers to examine whether 3G was a substitute for 2G. They presented that in the case of one of their networks (NTT DOCOMO), 3G was a substitute for 2G.

They also showed that the price elasticity did not differ between 2G and 3G. However, the authors recommended that further studies are required to understand adoption patterns by consumers.

Pagani [34] analysed the determinants of adoption of third generation mobile multimedia services and found that "Price" ranked third after "usefulness" and "ease of use". The author recommended that further studies are required to develop a deeper understanding of the dynamic influences of 3G mobile technology adoptions, refining measurement of the core determinants used in the model, as well as understanding the organizational outcomes associated with new technology use. Garg and Garg [7] presented that audio, video and other mobile services work well when they are run through 3G technology. Findings in their study depict that

perceive usefulness, ease of use and intention to use 3G mobile services by respondents was seen as highly motivating factors. Moreover, the respondents were found to be sensitive to price and were not willing to use 3G services if they were expensive. The authors gave a recommendation that further studies should concentrate on countries specific characteristics to explain the adoption of 3G. Kuo and Yu [64] conducted a study in Taiwan. The authors proposed that 3G telecom operators not only have to serve as a network system and spectrum provider, but also have to develop more services to enhance consumers' adoption and usage instead of focusing more on the technology aspect. In addition, the operators should also create more services instead of enhancing already existing 2G or 2.5G services.

However, Gerstheimer and Lupp [41] opined that customers' needs must be taken into account in the strategic product development stage resulting in minimizing risk in the research and development process and leading to faster time to market.

Bowman et al. [48] found that the use of mobile services as compared to the mobile telephony is lagging behind and the high expectations that were voiced when 3G was introduced have failed to materialize in Finland. A study by JunWu and JunLing [62] developed 3G electronic banking application with the J2ME SATSA API. The study presented that 3G applications work effectively on 3G network. However, improving the quality of 3G Networks can enable more application developers to develop more applications for consumers to use. The authors also found that 3G networks provide more security which encouraged more content developers to develop more content for consumers. Wu et al. [65] adopted the Unified Theory of Acceptance and Use of technology (UTAUT) model to study 3G adoption in Taiwan. The authors indicated in a study that telecom companies should adjust their corporate strategies and tactics for providing customer-oriented 3G services to both existing and potential customers. They further added that the overall 3G market can be expanded as well as achieve a win-win situation for the 3G industry and their consumers. They gave a recommendation that researchers should investigate 3G technology adoption using different factors from various technology adoption studies.

According to Kuo and Yen [64], 3G technology provides value-added services which include: mobile Internet access; both intranet and extranet access; customized infotainment; multimedia message service (MMS); location-based services; simple voice service; and rich voice service to meet the various needs of consumers. Although the main highlight of 3G services are high speed data transmission, entertainment, information sharing, and e-payment in Japan; developing countries in Asia, Africa or even some parts of US suffer from lack of infrastructure to support these objectives [7].

Garg and Garg [7] categories 3G services in four main categories: mobile information services; mobile

<http://www.cisjournal.org>

transaction services; mobile messaging services; and mobile entertainment. The authors do not actually explain these categories. However, one lucrative service that 3G technology enhances is the entertainment services, where individuals download caller ringtones, videos and audio at a very high network speed. Consumers can also download games onto their mobile phones or play it online with 3G networks. Heinonen and Andersson [30] opined that the deployment of 3G technology has also increased how information travels from place to place. They argued that 3G technology speeds up information delivery and consumers are being provided with the basic information required. This service saves consumers time and helps

them to find information very easily without visiting their network providers [64].

The above literature shows that 3G studies have not been given adequate consideration in the context of developing countries. It can also be seen from the literature that 3G studies are lacking in most African countries including Ghana. Table 1 provides a summary of the key recommendations and gaps in selected literature on 3G technology.

Table 1: Summary of literature

Author	Focus of the Deployment, Adoption	Title of research	Theory/Factors/ Model Used	Recommendations and Gaps for future study	Country
Lestideau et al. [55]	Deployments	“Towards automated software component configuration and deployment”	Deployment component model	Recommend researchers to test and validate the framework in different environments	France
Pagani [34]	Adoption	“Determinants of adoption of third generation mobile multimedia services”	TAM with additional factors like Price and Speed Of Use	Further studies are required to develop a deeper understanding of the dynamic influences of 3G mobile technology adoptions.	Italy
Hall et al. [46]	Deployments	“A Cooperative Approach to Support Software Deployment Using the Software Dock”	Deployable Software Description (DSD) Format	Further studies are required to investigate security issues and role of administrator in software deployments	USA
Kuo and Yu [64]	Adoption	“Towards an understanding of the behavioral intention to use 3G mobile value-added services”	Technology Acceptance Model (TAM)	Future studies could make an in-depth investigation when consumers have a higher level of involvement in 3G value-added services to acquire more objective arguments	Taiwan
Bowman et al. [48]	Adoption	“Barriers and drivers in the adoption of current and future mobile services”	Relative advantage, compatibility, complexity, triability and observability perceived risk, perceived usefulness and perceived ease of use	Further studies are required to investigate socio-demographic variables (gender, age, income, occupation and education) to see how it affect adoption intentions	Finland
Wu et al. [65]	Adoption	“The use of unified theory of acceptance and use of technology to confer the behavioral model of 3G mobile telecommunication users”	Unified Theory of Acceptance and Use of technology (UTAUT)	Further studies should review different factors from different models/theory to study 3G adoption	Taiwan
Ida and Kuroda [53]	Services	“The demand for mobile phone services”	No model/theory	Further studies are required to understand	Japan

http://www.cisjournal.org

				adoption patterns by consumers	
Abu [51]	Diffusion	“Technological innovations of 3G mobile phone diffusion”	GDP and charges, competition policies, and technological innovations	Further studies are required to perform a quantitative analysis on which technological innovations and policies are valid	Japan
Garg and Garg [7]	Adoption	“An Assessment of Awareness, Usage Patterns and Adoption of 3G Mobile Services”	Perceive Usefulness, Ease of Use And Intention To Use	Further studies should concentrate on countries specific characteristics to explain the adoption of 3G	Botswana
Ramburn and Van Belle [18]	Adoption and Usage	“Use and adoption of Mobile Data Services in Africa: An Empirical Study in Mauritius and South Africa”	TAM by incorporating with social influence and price	Further studies should explore the model in another discipline, since findings may not be the same as other developing countries.	South Africa and Mauritius
JunWu and JunLing [62]	Implementation and adoption	“Electronic banking application with the J2ME SATSA API”	Generic Connection Framework	3G security issues need critical attention	China

3. FACTORS AFFECTING THE ADOPTION OF 3G SERVICES

Past studies have proposed and examined various technology adoption models to understand the factors that influence users to accept technology. Some Studies (e.g.

Rogers [12]) have used adoption-oriented measures of innovation, where adoption is typically defined as the physical acquisition of an innovation.

Again, the technology acceptance model (TAM) has been a dominant model in most technology adoption studies [4, 37, 61]. However, TAM has been criticized for lack of consideration of other socio-economic variables that may influence technology adoption [26, 52].

The literature has shown that the Technology Acceptance Model (TAM) is one of the most commonly applied models to study information technology adoption [37, 61]. Most researchers incorporate the TAM model with other constructs to study a particular phenomenon.

However, one main criticism of the TAM model is the fact that TAM has been “over studied” by users without making significant contributions to the IT field [61]. TAM has been seen as an old model for use in Information Technology studies [54]. Researchers should therefore rely on new models rather than previous models which have been seen to predict only 40% of User’s technology acceptance [22, 52]. Review of related studies has shown that models that have been used and confirmed in most research studies differ from one another which have all been verified in each field and grouped respectively [58].

However, models/theories derived from other models/theories have a very high explanation power

compared to the individual models [22, 26]. Venkatesh et al. [58] developed the Unified Theory of Acceptance and Use of Technology (UTAUT) model to consolidate previous TAM related studies. Empirical results of the UTAUT model show that it accounts for 70% of variance in the usage intention, which make it supersede other antecedent models of UTAUT [22]. Since the UTAUT model is an integration of other models and has been confirmed as more effective than any other technology acceptance framework, it was used as the theoretical foundation of this study. Moreover, the research takes into account individuals’ desire and behaviour intention as a nucleus, so using factors from the UTAUT model will help to explain individuals’ intentions towards adopting 3G mobile technology. Important factors which could play an important role in consumers’ 3G adoption decision, such as a variety of services and cost of services are also incorporated [50, 59]. Hence, the study used performance expectancy, effort expectancy, social influence, variety of services and cost services to study 3G technology adoption. However, the trend that gender can control once behaviour implies that the influence of performance expectancy, effort expectancy, social influence, variety of services, cost of service and usage intentions may be moderated by gender, and such an influence is hypothesized to be stronger for male students than for females or female students than for male students.

Performance expectancy

Venkatesh et al. [58] defined performance expectancy as the degree to which individuals believe that using any information system can improve his or her job performance Taylor and Todd [52] adopted the UTAUT model in studying information technology usage and found that performance expectancy was a strong predictor of intention to use technology. Venkatesh et al. [58] findings confirmed those of Taylor and Todd [52].

<http://www.cisjournal.org>

Jayasuriya [67] study on computer education and training of health staff also found performance expectancy as a predictor of individual behavioral intention to use a computer. Wu et al. [49] also conducted a study on 3G technology using the UTAUT model and found performance expectancy to be a key determinant in influencing behavioral intention. They further added that users will like to use a particular technology if it will help increase their work performance. This result was supported by Li and Jin [66]. Hence, considering 3G mobile technology implementation in Ghana, performance Expectancy is considered as an influential factor directly affecting the acceptance of the technology.

H1: Performance expectancy will have a positive effect on behavioral intention to adopt 3G mobile services.

Effort expectancy

These determinants consist of other sub-determinants like perceived ease of use, complexity and ease of use. Effort expectancy is the degree to which individuals believe that using a particular technology will let him or her free from effort [58]. Obviously, individuals will like to use a technology when they find it very easy to use. According to Lai et al. [6] effort expectancy plays a similar role to perceived ease of use found in TAM, complexity in Model of PC Utilization and ease of use in IDT. Other researchers have also seen effort expectancy as a very important determinant [40]. Xu [63] study on mobile users in China found that the ease of using the mobile technology positively affects use attitude. This result was also seen in Moon and Kim's [29] study. Wei et al. [54] also argued that users may find technology to be useful if that technology will help them to apply less force. As recent studies have seen the importance of this determinant, it will also be relevant when studying 3G adoption in Ghana. Hence, considering 3G mobile technology implementation in Ghana, performance Expectancy is considered as an influential factor directly affecting the acceptance of the technology.

H2: Effort expectancy will have a positive effect on behavioral intention to adopt 3G mobile services.

Social influence

Social influence is the degree to which an individual perceives that the person who is important to him or her thinks that he or she should use the new system. This determinant deals with the notion that the individual's behaviour is influenced by the way in which they believe others will view them as a result of using any new technology. Other studies have found this construct to be important in technology adoption [31, 56]. The construct has also been found to have significant influence on the intention to adopt 3G technology [4]. Hence, this construct will be relevant in technology adoption like 3G.

H3: Social influence will have a positive effect on behavioral intention to adopt 3G mobile services.

Variety of services

Varieties of services are also considered as a major determinant that influences behavioral intention to adopt technology. 3G mobile technologies provide a wide variety of video, audio as well as data services [50]. 3G technology has an advantage over the current mobile technology (1G and 2G) due to its high internet speed.

According to Agarwal et al. [35], a large variety of 3G services can lift the consumer intention to use the technology. Pagani [34] found that a different variety of service is an important determinant of perceived usefulness. Hence, applications such as video contents, audio, mobile games, location based services, and data services on mobile phones should be used to draw consumers [60].

H4: Variety of services will have a positive effect on behavioral intention to adopt 3G mobile services.

Cost of services

One factor that hinders consumer adoption is cost. Cost has become a barrier hindering consumers to adopt and use 3G technology [27, 35]. Moreover, according to Teng et al. [59], when a consumer or user intends to adopt a new technology, he or she will conduct a cost benefit evaluation before making a purchase choice.

However, if he or she realizes that the cost of the technology outweighs its benefits, the purchase intention may be reduced or suspended until the price is perceived as acceptable. When this occurs, it may have a negative effect on adoption behaviour. Chong et al. [61] also depicted that in terms of 3G technologies, the cost may involve purchasing 3G enabled mobile handsets, as well as the subscriptions of 3G services. Mardikyan et al. [50] conducted a study on behavioral intention towards the use of 3G technology in Malaysia. The authors found that price of purchasing 3G services affects individuals negatively. Price, in their study, was seen to have a statistically insignificant effect on users' intention to use the services. This result contradicts the study by Chong et al. [4, 61] who saw the cost of 3G services to have a significant influence on individual intention. In this study, the cost of services is defined as all kinds of expenses which users should pay for using 3G services.

H5: Cost of service will have a positive effect on behavioral intention to adopt 3G mobile services.

Gender

However, most research studies have given less attention on looking at how gender difference influence technology adoptions like that of 3G technology. Most studies on technology adoption classify users or individuals as "one piece". With this classification, it will be difficult to know if technology adoption influences male users more than females or female users more than males. Very few studies have paid attention to gender influence on the use of technology (e.g. In the studies like Gefen and Straub [8]; Wahid [15]; Venkatesh and Morris

<http://www.cisjournal.org>

[57] etc). Moreover, most of these studies are not current. Some research studies have found that men and women tend to adopt, use and understand language in different dimensions [8]. Tannen [10] cited in his study that men tend to use discourse to handle problems and situations while women use it to show sympathy. Moreover, the variety of services that a particular technology offers can also influence gender differences in adoption [15]. Wahid [15] study on internet adoption among men and women found out that women are influenced by service types like chatting and sending SMS while men like downloading software's and seeking job vacancy. Gefen and Straub [8] achieved a quantitative study on gender difference in perception and use of email. They adopted TAM model (perceived usefulness and perceived ease of use). The results of their study indicated that women did perceive a higher value for Perceived Usefulness than men, and men did also perceive a higher value of ease of use than woman. Literature from information systems indicates that men technology usage is influenced by perceived usefulness while women technology usage is influenced by perceived ease of use [53]. However, men are found to be more achievement and task oriented than women. Venkatesh and Morris [53] found out that perceived ease of use on women is stronger than that of men and perceived usefulness on men are also stronger than women. Mazman et al. [47] opined that it is necessary for researchers to look at determinants that can influence gender differences in technology adoption. Based on the above review, the hypotheses are summarized as follows:

H6a: The relationship between effort expectancy and intention to use 3G services is stronger for females than for males.

H6b: The relationship between performance expectancy and intention to use 3G services is stronger for males than for females.

H6c: The relationship between social influence and intention to use 3G services is stronger for females than for males.

H6d: The relationship between variety of services and intention to use 3G services is stronger for males than for females.

H6e: The relationship between cost of services and intention to use 3G services is stronger for females than for males?

Behavioral intention

The behavioral intention has been considered as a sub-determinant to influence the actual use of a system. Behavioral intentions are a "function of an individual's attitude toward the behaviour and subjective norms surrounding the performance of the behaviour" [20].

Venkatesh et al. [58] revealed from the UTAUT model that behavioral intention has a significant influence

on technology usage. Several researchers have seen the importance of consumers' behavioral intention on technology usage [34, 49]. Wu et al. [65] confirmed that 3G mobile communication service has a positive influence towards consumers' use behaviour. The study adopts behavioral intention as a dependent variable and as individuals' intention to use 3G services.

4. METHODOLOGY

This study used the survey as the research design. This was to enable the test of the hypotheses and provide a basis to generalize the findings. The sample consisted of university students who use 3G technology.

As noted by Mardikyan et al. [50], the increase of education level has influenced more people to use some technologies and has become part of their daily lifestyle.

The authors further added that as individuals go higher in academic life, they tend to learn different means and ways to enhance their learning. Besides, students are technology savvy. The sample was selected using purposive sampling technique. In all there were 250 respondents. The survey questionnaire was pre-tested with 15 3G users, and three university doctors, who are management information systems (MIS) lecturers and whose main research areas are in this field. The study independent variables were adapted from Venkatesh et al. [44], Chong et al. [61] and Mardikyan et al. [50]; and the dependent variable from Venkatesh et al. [58]. The demographic variables were measured in terms of gender, age, educational level and income level. The independent variables were measured on a five-point Likert Scale ranging from 1 (strongly disagree) to 5 (strongly agree). A total of 20 items were used to measure the variables (excluding the demographic variables).

5. DATA ANALYSIS AND RESULTS

Out of the two hundred and fifty (250) questionnaires administered, 21 of them had to be discarded due to inadequacies leaving the researcher with two hundred and twenty nine (229) questionnaires for the study. Malhotra and Birks [36] indicated that a sample like this is good for data analysis since about 92% of the administered questionnaires were retrieved. Respondents for the survey have been profiled according to their gender, age, educational qualifications and income levels.

Out of the two hundred and fifty (229) valid questionnaires obtained, one hundred and twenty three (123) were from males whilst one hundred and six (106) were females representing 53.7% and 46.3% respectively.

The sexes were done to ensure that the study was not skewed to any particular gender and to include views from both sexes so as to present a fair demographic result.

It is fair to say that the ratio of men to women in this study is not biased and therefore does not affect the responses in any significant way. The results also show

<http://www.cisjournal.org>

that the majority (56.3%) of the respondents were within the ages of 18 – 24, followed by those within the range of 25 – 30 (23.6%) and 31– 35 (14.8%). The lowest (5.2%) number of respondents fell above 35 years. This could be an indication that the majority of 3G users belongs to the youth class [39]. With respect to the educational or academic levels of the respondents who took part in the study, the majority (67.7%) of them was undergraduate students (see table 2)

Table 2: Demographic profiles

Demographic profiles	Frequency	Percentages
Gender		
Male	123	53.7
Female	106	46.3
Age		
18-24 years	129	56.3
25-30 years	54	23.6
31-35 years	34	14.8
Above 35	12	5.2
Highest Educational Level		
Diploma	19	8.3
Bachelor's Degree	155	67.7
Master's Degree	55	24.0

5.1 Exploratory factor analysis

Prior to the extraction of factors, the Bartlett test of Sphericity (Appox: Chi-square= 2401.920, df= 171, sig. 0.000) and the KMO measure of sampling adequacy (Value of 0.826) (table 3) confirmed that there was a significant correlation among the variables to warrant the application of exploratory factor analysis. The KMO overall statistic of 0.826 for the variables used in the study

gives an indication that there is a higher possibility that there exists an inter-correlation between the variables thereby making them sensible for analysis. The variable loadings in exploratory factor analysis are considered high if they are all 0.8 or greater [49] but this is unlikely to occur in real data. Hair et al. [21] posit that ideally variables should have loadings greater than 0.5 to be retained for analysis. However, more common magnitudes in the social sciences are low to moderate variable loadings of above 0.40. If an item has a loading of less than 0.40, it may either not be related to the other items, or may suggest an additional factor that should be explored. Hair et al. [21] asserted that researchers may consider why that item was included in the data and decide whether to drop it or add similar items for future research. However, it is worthy to note that these numbers are essentially correlation coefficients, and therefore the magnitude of the loadings can be understood similarly.

The loadings used in the analysis are all high, which indicates that the extracted components represent the variables well. From the Cronbach's alpha coefficient results, it is clear that all the scales for the independent variables exceeded the conventional acceptable 0.7, and thus proved to be reliable for multiple regression analysis [21]. Similarly, the reliability of the scales used for the dependent variables was also assessed and found to be reliable. All the variables have high loadings and loaded perfectly on the dependent variable with a very good Cronbach's alpha of 0.870. This is an indication that the statements used for the dependent variable form a complete structure in describing individual behavioral intention to use 3G technology services. The Cronbach's alpha values are presented in table 4.

Table 3: KMO and bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.826
Bartlett's Test of Sphericity	Approx. Chi-Square	2401.920
	Df	171
	Sig.	.000

Table 4: Reliability of scales –variables

Construct/Factors	Items	Loadings	Cronbach's alpha
Performance Expectancy (PE)	PE1	0.913	0.871
	PE2	0.821	
	PE3	0.769	
Effort Expectancy (EE)	EE1	0.905	0.857
	EE2	0.789	
	EE3	0.763	
	EE4	0.763	
Social Influence (SI)	SI1	0.840	0.704
	SI2	0.815	
	SI3	0.816	
	VS1	0.843	0.799
	VS2	0.820	

http://www.cisjournal.org

Variety of Services (VS)	VS3	0.741	0.805
	VS4	0.766	
Cost of Services (CS)	CS1	0.891	0.870
	CS2	0.847	
	CS3	0.775	
Behavioral Intention (BI)	BI1	0.871	0.870
	BI2	0.851	
	BI3	0.743	

5.2 Multiple regression analysis

A multiple regression was used to analyse the relationship between behavioral intention and its predictors. This was done to extract the independent variables that can better explain the dependent variable: in other words, to investigate the significant variables that affect the individual behavioral intention to use 3G mobile services. Behavioral intention was used as the dependent variable whilst the independent variables were represented by performance expectancy, effort expectancy, social influence, variety of services and cost of services. Table 5 presents a summary of the multiple regression least squares results for the dependent and independent variables. The results indicate that there is a strong and significant reliability between variables used for the model to represent behavioral intention and its drivers ($F = 21.086$, Prob. F -stats < 0.05). Some research scholars have argued that the model reaches statistical significance if the $\text{Sig} < .05$ (e.g. Hair et al. [25]). In the present study the $\text{Sig} = .000$ of the F -statistics depicts that the model is statistically significant. The R Square value = 0.697 indicates a considerably strong relationship between the dependent and independent variables of the regression model. In other words the independent variables explain the variance in 3G technology adoption by 69.7%.

Also, from the regression analysis output, effort expectancy was found to have the greatest influence on behavioral intention ($\beta = 0.287$, $t = 5.511$, $p = 0.000$, < 0.05). This means that 3G technology users in Ghana consider whether the technology will be easy to

understand, easy to use, easy to operate and helps them to be skillful before deciding to adopt and use it. The next strongest contributor to behavioral intention is performance expectancy ($\beta = 0.284$, $t = 4.982$, $p = 0.000$, < 0.05), implying that consumers have some characteristics using a particular technology, whether the technology will be useful in their work or job, whether it will help them to accomplish their work more quickly as well as improving their productivity before deciding to adopt it. The third factor that drives consumers to use 3G technology is social influences ($\beta = 0.185$, $t = 4.495$, $p = 0.000$, < 0.05), which was also found to be statistically significant. This reveals the extent to which family members, friends or any individual can influence one's intention to use technology. The variety of services are the next factor which followed suit as the fourth factor ($\beta = 0.024$, $t = 5.582$, $p = 0.001$, < 0.05). This might also be an indication that 3G technology users are driven by the speed of the technology (if it saves time), if the technology providers provide excellent service, etc. Moreover, the variety of

services offered by 3G technology had a significant influence on behavioral intention. This means that consumers adopt 3G technology because of the services the technology offer. Finally, the cost of service was the last factor considered for the behavioral intention of 3G technology in Ghana ($\beta = -0.085$, $t = -2.637$, $p = 0.317$, < 0.05). Price was also found to be statistically insignificant. Perhaps the respondents think that 3G services are expensive.

Table 5: Multiple regression summary

Variables	Beta	Std. Error	t	Prob.
(Constant)	1.549	.327	4.736	.000
Performance Expectancy	.284	.057	4.982	.000
Effort Expectancy	.287	.052	5.511	.000
Social Influence	.185	.041	4.495	.000
Variety of Services	.224	.040	3.582	.001
Cost of 3G Services	-.085	.032	-2.637	.317
R-Square	.696			
Adjusted R-Square	.644			
Standard Error	.721			
F-Statistics	16.337			
Significant F	0.000			

a. **Dependent Variable: Behavioral Intention**

http://www.cisjournal.org

5.3 Independent sample T-test

The independent sample t-test was used to determine if there is a statistical significant difference in gender in each of the independent variables. As summarized in table 6, the mean values of effort expectancy and social influence of the females were higher than that of the males. This is an indication that effort expectancy and social influence have a major influence on female 3G technology adoption than males,

whereas performance expectancy and a variety of services were also found to have a major influence on males than females. However, gender difference in cost of services was seen to be statistically insignificant. This is an indication that both males and females find 3G technology usage as expensive. However, male perceived the cost to be higher than females.

Table 6: Independent sample T-test

Variables	Gender	Mean	Std. Deviation	t-value	P	Male versus Female
Performance Expectancy	Male	4.11	0.598	3.022	0.00**	M>F
	Female	3.85	0.617			
Effort Expectancy	Male	3.09	0.527	2.931	0.01*	F>M
	Female	4.89	0.447			
Social Influence	Male	3.18	0.793	2.856	0.03*	F>M
	Female	3.97	0.689			
Variety of Services	Male	4.78	0.472	2.107	0.06*	M>F
	Female	4.18	0.505			
Cost of 3G services	Male	2.64	0.844	-1.302	0.21	M>F
	Female	2.15	0.988			

* $p < .05$, ** $p < .01$.

6. DISCUSSIONS AND CONCLUSIONS

This study examined the factors influencing the adoption of 3G technology. The findings of the study revealed that whilst performance expectancy, effort expectancy, social influence, variety of services were significantly influence 3G adoption, the cost of services was not. This means hypotheses H1, H2, H3 and H4 are supported whilst H5 is rejected. Also, with respect to gender differences on these factors, Ha, Hb, Hc and Hd are supported whilst He is rejected. The gender difference in cost of services was seen to be statistically insignificant.

These findings suggest that boosting the four constructs can simultaneously increase students' intentions to use 3G mobile services.

Performance expectancy was found to have a significant influence on individuals' behavioral intention to use 3G technology. This result was also confirmed by studies conducted by Ong et al. [27] and Fadare et al. [40]. According to Venkatesh et al. [58], performance expectancy is the degree to which an individual believes that using any information system can improve his or her job performance. In 3G mobile technology services, the practicability of the system is still the major influential factor for users to adopt a technological service; and a system that is easy to operate or control is the important basic ability for the use of 3G technology services. This is confirmed by Wu et al. [65] who found that if consumers are able to use 3G technology devices, then using the 3G

technology service will be easy. Moreover, if different types of 3G services can help consumers solve their problems on time and can satisfy their requirements, their perceived usefulness will increase. So, deploying 3G technology should come with additional services to meet the real needs of users.

With respect to gender differences on performance expectancy, it was realised that the impact of performance expectancy on intentions to use 3G services among men was found to be higher than that of women.

The significantly higher mean of performance expectancy for males compared to females indicates that men tend to use technology when they find out that the technology will help them increase their work performance. This finding was confirmed by Venkatesh and Davis [56]. They spend time to understand how the technology works and apply it in their field. Wahid [15] opined that men are more technologically inclined than women since they spend much time in understanding how any new technology works and perform. This has made the males to have a more positive attitude than women in terms of technology usage [4].

The study also found that effort expectancy plays a significant role in influencing a consumer's decision to adopt 3G technology. It plays a similar role to perceived ease of use which has been used in most studies [43]. Yan [47] confirmed in his study that ease of use of a particular technology can positively affect use attitude. When users feel that 3G services are complicated, they have no

<http://www.cisjournal.org>

willingness to use a variety of 3G services. However, if 3G services are operated simply and users pay for less time and energy using the services, then it will improve the variety and rate of using 3G services. This is confirmed by Wei et al. [54] who found that, if consumers have experience and awareness of mobile technologies, they will not find it difficult to use mobile commerce or 3G applications. This was also confirmed by Fadare et al. [40] in their study on behavioral intention for mobile learning on 3G mobile internet technology. Kuo and Yen [64] also confirmed the direct and significant relationships between perceived ease of use and a user's intention to adopt a technology. However, impact of effort expectancy on intention to use 3G services among women is higher than that of men. According to Wahid [15], women adopt and use a particular technology when they find the characteristics of the technology to be attractive and easy to use. Bebetos and Antoniou [4] presented that most women don't spend much time in understanding how a particular technology works, they are attracted by the characteristic of the technology more than the usage.

Hence, it is not obvious that men use technology more than females [43]. Similarly, social influence also plays an important role in 3G adoption. Social influence was noted to have a significant positive influence on individual intention to use 3G technology on the Ghanaian environment. This is supported by past study such as those conducted by Venkatesh and Davis [56]. The use of 3G is able to enhance a person's social status as well as image among the Ghanaian consumers [4]. The mobile phone is no longer just viewed as a communication tool, but it is also viewed as a fashion item as well as trends among youth. Therefore, 3G phones being latest in terms of technology compared to other 2G mobile phones, will enhance one's image among their peers, and as a result improve the willingness of using 3G. Most peers influence their friends to use technology when they find the technology to be useful. Some users think that being not able to use 3G mobile technology service is really a kind of falling behind the technology, as confirmed by Mardikyan et al. [50]. Consequently, the behaviors and manners of the family or friends around the consumers would all influence the consumers' desire to use 3G technology services. This was confirmed in Chong et al. [4]. According to Wei et al. [54], besides friends and family, mass media such as television, radio and internet also influence the decision to adopt 3G technology services. As, 3G mobile phones are seen to have more advanced features compared to 2G mobile phones. This will enhance one's image among their peers and may improve his or her perceived usefulness of using 3G services. The Ghana market is now dominated by smart phones that perform more advance applications. Network operators, especially MTN and Vodafone are now selling 3G mobile phones at a very cheap price to attract consumers in order to keep them in their network. All these are forms of influence on the consumers. The impact of social influence was seen to have significant impact on gender difference, where females were influenced more to use 3G services than males.

Variety of services was also found to be statistically significant on behavioral intention to use 3G services. 3G provides a wide variety of audio, video and data services to consumers. The larger the range of services is, the more powerful the technology.

Accordingly, a greater variety of services can add more value to its consumers [53]. This was also confirmed by Pagani [34] who indicated that a different variety of services is an important determinant of technology adoption. 3G technology has also given way to application developers to develop more software applications to enhance consumer usage [7]. From this study, consumers' use of 3G technology was attracted by the kind of services the technology offers to them, for example, Both MTN and Vodafone provide internet services to consumers. Ghanaian consumers are found by downloading audios, videos and applications to their mobile phones using the internet service provided to them by their network operators. Due to 3G technology which has an enhanced consumers' internet speed, most of them now used applications such as Whatsapp, Facebook, YouTube and other social media applications. However, with respect to gender difference on a variety of services, it was seen to have statistically significant. But however, this result indicates that men preferred to use more 3G services than women.

Some studies [example 37, 61] have found cost of services as one of the factors that contribute to 3G technology adoption. Contrary to these extant studies, this current study found that the cost of services is statistically insignificant with respect to an individual's intention to use 3G technology services. Many researchers have shown that cost is an important factor which impedes the consumer adoption of 3G services [27, 35]. Jin and Li [66] confirmed in their study that if consumers perceived that the cost of telecommunications services outweighs their expectation, they will reduce their variety of services and the rate of using such services. This was also confirmed by Teng et al. [59]. Cost on gender differences were also seen to be statistically insignificant. This is an indication that both men and women perceived that 3G services as expensive to use. However, male perceived the cost of 3G services to be higher than females looking at the mean difference. MNO's must attract more people to use 3G networks by taking many marketing strategies and improving the ratio of quality and price by constantly enriching pricing models to reduce the perceived cost. Agarwal et al. [35] found that the high cost of a particular technology service can discourage the use of that service.

7. IMPLICATIONS AND LIMITATIONS

This study has some practical implications. Mobile network operators need to draw attention to the benefits of 3G services which may be effective in convincing people to adopt the services. Operators may attract more people with different promotions, discounts and advertisements, which will increase consumers' intention to purchase 3G services and consequently end up with more adoptions [29]. Network operators should

<http://www.cisjournal.org>

not focus only on getting the largest share of the market to generate revenue, but rather improve and expand upon their 3G network service to stay more competitive. Some of the limitations of this study are that it relied on only the youth market specifically students. Therefore, for future studies should expand the scope of the sample to cover a larger segment of the telecommunication market. Again, future studies may test other variables that can influence gender in adoption of 3G mobile technology.

REFERENCES

- [1] A. B. Costello, J. W. Osborne, "Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. Practical Assessment, Research and Evaluation, Vol.10, No.7, 2005.
- [2] A. Bohlin, "Diffusion of new technology generations in mobile communications", *Information Economics and Policy*, Vol.22, pp.51–60, 2010.
- [3] A. Economides, A. Grousopoulou, "Use of mobile phones by male and female Greek students". *International Journal of Mobile Communications (IJMC)*, Vol. 6, No. 6, pp. 729-749, 2008
- [4] A. Y. Chong, N. Darmawan, K. B. Ooi, B. Lin, "Adoption of 3G services among Malaysian consumers: An empirical analysis", *International Journal of Mobile Communications* Vol. 8, pp. 129–149, 2010.
- [5] B. Ankar, "Adoption drivers and intents in the mobile electronic marketplace: Survey findings" *Journal of Systems and Information Technology*, Vol. 6 No. 2, pp. 1 – 18, 2002.
- [6] D. C. F. Lai, I. K., Lai, E. Jordan, "An Extended Utaut Model For The Study Of Negative User Adoption Behaviors Of Mobile Commerce". *International Conference on Electronic Business, Macau*, (pp. 721-727), 2007.
- [7] D. Garg, A. K. Garg, "An assessment of awareness, usage pattern and adoption of 3G mobile services in Botswana", *International Journal of Computer Theory and Engineering*, Vol. 3 No.4, pp. 547-551. 2011.
- [8] D. Gefen, D.W Straub, "Gender differences in the perception and use of e-mail: An extension to the technology acceptance model". *MIS quarterly*, pp.389-400, 1997.
- [9] D. R. Compeau, C. A. Higgins, "Application of social cognitive theory to training for computer skills", *Information Systems Research*, Vol. 6 No.2, pp. 118-142, 1995.
- [10] D. Tannen, "You Just Don't Understand: Women and Men in Conversation, Ballantine, NY", 1990.
- [11] E. Bebetos, P. Antoniou, "Gender Differences On Attitudes, Computer Use And Physical Activity Among Greek University Students". *The Turkish Online Journal Of Educational Technology – Tojet*, 8(2), 663, 2009.
- [12] E. M. Rogers, "Diffusion of innovations" (4th ed.), New York: Free Press, 1995.
- [13] F. D. Davis, P.R. Warshaw, "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace," *Journal of Applied Social Psychology*, Vol. 22 No.14, pp. 1111-1132,1992.
- [14] F. D. Davis, R. P. Bagozzi, P. R. Warshaw, "User Acceptance of Computer Technology: A Comparison of Two Theoretical Models", *Management Science*, Vol. 35, pp. 982-1003., 1989.
- [15] F. Wahid, "Using technology adoption model to analyse internet adoption and use among men and women in Indonesia". *EJISDC*, 32(6), 1-8, 2007.
- [16] G. Moore, I. Benbasat, "Development of an Instrument to Measure the Perception of Adopting an Information Technology Innovation", *Information Systems Research*, Vol. 2 No.3, pp. 192-222,1991.
- [17] H. O. Awa, S. C. Eze, J. E. Urieto, B. J. Inyang, (2011), "Upper echelon theory (UET) a major determinant of information technology (IT) adoption by SMEs in Nigeria", *Journal of Systems and Information Technology*, Vol. 13 No.2, pp. 144-162, 2011.
- [18] H. Ramburn, J. P. Van Belle, "Use and Adoption of Mobile data services in Africa: An Emprical study in Mauritius and South Africa", *International Journal of e-Education, e-Business, e-Management and e-Learning*, Vol. 1, pp. 28-34, 2011.
- [19] H. Bouwman, C. Carlsson, F.J. Molina-Castillo, and P. Walden, "Trends in Mobile Services in Finland 2004-2006 From Ringtones to Mobile Internet," *Info* Vol. 10(2), pp. 75-92, 2008
- [20] I. Ajzen, "The Theory of Planned Behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No.2, pp. 179-211, 1991.
- [21] I. Apulu, A. Latham, R, "Factors affecting the effective utilization and adoption of sophisticated ICT solutions: Case studies of SMEs in Lagos, Nigeria", *Journal of Systems and Information Technology*, Vol. 13 No. 2, pp. 125-143, 2011.

<http://www.cisjournal.org>

- [22] I. D. Muraina, W. Osman, A. Ahmad, "Efficacy of UTAUT Model in Continuation of Usage of Broadband in the Rural Areas of Northern Region of Malaysia". Rural ICT Development (RICTD) International Conference 2013, Malacca, Malaysia, pp.25 – 27, 2013.
- [23] I. S. Dugal, K. Bangstad, "Drivers of 3G Adoption" Retrieved December 12, 2012, from wikininvest: <http://www.wikininvest.com/concept/3G>
- [24] International Telecommunication Union. "Key statistics highlights: ITU data release February 2013," Retrieved from [http://www.itu.int/ITU-D/ict/statistics\(21/10/14\)](http://www.itu.int/ITU-D/ict/statistics(21/10/14))
- [25] J. F. Hair, W. C. Black, B. J. Babin, R. E. Anderson, "Multivariate data analysis (7th ed.). Englewood Cliffs: Prentice Hall ", 2010.
- [26] J. T. Marchewka, C. Liu, K. Kostiwa, "An Application of the UTAUT Model", Communications of the IIMA, Vol. 94 No.7, pp. 93–104, 2007.
- [27] J. W. Ong, Y. S. Poong, T. H. Ng, "3G Services Adoption among University Students: Diffusion of Innovation Theory", Communications of the IBIMA, Vol. 3, pp. 114-121, 2008.
- [28] J. Xia "The third generation mobile (3G) policy and deployment in China: Current status, challenges, and prospects", Telecommunications Policy, Vol. 35, pp. 51–63, 2011.
- [29] J.W. Moon, Y. G. Kim, "Extending the TAM for a world-wide-web context", Information Management, Vol. 38 No.4, pp. 217-230, 2001.
- [30] K. Heinonen, P. Andersson, "Swedish mobile market: Consumer perceptions of mobile services". Communications & Strategies, 49, 151-171, 2003.
- [31] K. Sharma, D. Kumar, "User Acceptance of Desktop Based Computer Software Using UTAUT Model and addition of New Moderators", International Journal of Computer Science and Engineering Technology, Vol. 3 No. 10, pp. 509-515, 2012.
- [32] M. Fishbein, I. Ajzen, "Belief, Attitude, Intention and Behaviour: An Introduction to Theory and Research, Reading, Mass: Addison-Wesley", 1975.
- [33] M. Head, N. Ziolkowski, "Understanding Student Attitudes of Mobile Phone Features: Rethinking Adoption Through Conjoint, Cluster and SEM Analyses", Computers in Human Behavior, Vol. 28 No.6, pp. 2331-2339, 2012.
- [34] M. Pagani, "Determinants of Adoption of third generation mobile multimedia service". Journal of interactive marketing, Vol. 18 No.3, pp. 46-59, 2004.
- [35] N. K. Agarwal, Z. Wang, Y. Xu, D. C. Poo, "Factors Affecting 3G Adoption: An Empirical Study," Proceeding of the 11th Pacific-Asia Conference on Information Systems, 4-6 July, Auckland, New Zealand, 256-270, 2007.
- [36] N. K. Malhotra, D. F. Birks, "Marketing Research: An Applied Orientation (3rd ed.). Essex, UK": Pearson Education International/Prentice Hall, 2007.
- [37] N. Suki, "Subscribers' intention towards using 3G mobile services", Journal of Economics and Behavioral Studies, Vol. 2 No.2, pp. 67-75, 2011.
- [38] National Communication Authority (NCA), "Cellular/Mobile Voice Market Share". Retrieved August 2014: <http://www.nca.org.gh/50/101/Market-Share-Statistics.html> Mobile share statistics.
- [39] O. Birgina, B. Çokerb, H. Çatlioglu, "Investigation of first year pre-service teachers' computer and internet uses in terms of gender" Procedia Social and Behavioral Sciences, vol. 2. Pp.1588–1592, 2010.
- [40] O. G. Fadare, O. H. Babatunde, D. T. Akomolafe, O. O. Lawal, "Behavioral Intention for Mobile Learning on 3G Mobile Internet Technology in South-West Part of Nigeria". World Journal of Engineering and Pure and Applied Sciences, Vol. 1 No.2, pp. 19-28, 2011.
- [41] O. Gerstheimer, C. Lupp, " Needs versus technology: the challenge to design". Journal of Business Research, 57 (12), 1391-1396, 2004.
- [42] P. A. Dabholkar, R. P. Bagozzi, "An attitudinal model of technology based self-service: moderating effects of consumer traits and situational factors", Academy of Marketing Science, Vol. 30 No.3, pp. 184-201, 2002.
- [43] R. Boateng, "Enhancing Micro Trading Capabilities through Mobile Phones: The Case of Women Traders in Ghana, International Federation for Information Processing (IFIP) Working Group, Vol. 20 No.1, pp. 2-8, 2010.
- [44] R. Jayasuriya, "Determinants of microcomputer technology use: implications for education and training of health staff", International Journal of Medical Informatics, Vol. 50, pp. 187-194, 1998.

<http://www.cisjournal.org>

- [45] R. L. Thompson, C. A. Higgins, J. M. Howell, "Personal Computing: Toward a Conceptual Model of Utilization", *MIS Quarterly*. Vol. 15 No. 1, pp. 125-143, 1991.
- [46] R. S. Hall, D., Heimbigner, A. L. Wolf, "A Cooperative Approach to Support Software Deployment Using the Software Dock", 2005.
- [47] S. G. Mazman, Y. Usluel, V. Çevik, "Social Influence in the Adoption Process and Usage of Innovation: Gender Differences". *International Journal of Human and Social Sciences* 4(12), 2009.
- [48] S. K. Bowman, V. Rolland, J. Betschinger, K. A. Kinsey, G. Emery, J.A. Knoblich, "The tumor suppressors Brat and Numb regulate transit-amplifying neuroblast lineages in *Drosophila*". *Dev. Cell*, 14(4), 535-546, 2008.
- [49] S. L. Wong, A. Hanafi, "Gender Differences in Attitudes towards Information Technology among Malaysian Student Teachers: A Case Study at University Putra Malaysia". *Educational Technology & Society*, 10 (2), 158-169, 2007.
- [50] S. Mardikyan, B. Beşiroğlu, G. Uzmaya, "Behavioral Intention Towards The Use of 3G Technology", *IBIMA Publishing. Communications Of The IBIMA*, Vol 10 pp., 1-10, 2012.
- [51] S. T. Abu, "Technological innovations and 3G mobile phone diffusion: Lessons learned from Japan", *Telematics and Informatics*, Vol. 27, pp. 418-432, 2010.
- [52] S. Taylor, P. Todd, "Understanding Information Technology Usage: A Test of Competing Models", *Information Systems Research*, Vol. 6 No. 2, pp. 144-176, 1995.
- [53] T. Ida, T. Kuroda, "Discrete Choice Model Analysis of Demand for Mobile Telephone Service in Japan," *Empirical Economics* vol.36.1: 65-80, 2009.
- [54] T. T. Wei, G. Marthandan, A. Y. Chong, K. B. Ooi, S. Arumugam, "What drives Malaysian m-commerce adoption? An empirical analysis", *Industrial Management and Data Systems*, Vol. 109, pp. 370-388, 2009.
- [55] V. Lestideau, N. Belkhatir, P.Y. Cunin, "Towards automated software component configuration and deployment". *PDTSD'02*. Orlando, Florida, USA. July, 2002
- [56] V. Venkatesh, F. D. Davis, "A theoretical extension of the technology acceptance model: four longitudinal field studies", *Management Science*, Vol. 46 No. 2, pp. 186-204, 2002.
- [57] V. Venkatesh, M. G. Morris, "Why men don't ever to stop for direction? Gender, Social influence and the role in Technology acceptance and Usage behaviour". *MIS Quarterly*, 24(1), 115-139, 2000.
- [58] V. Venkatesh, M. Morris, G. Davis, F. Davis, "User acceptance of information technology: toward a unified view". *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478, 2003.
- [59] W. C., Teng, H. P. Lu, H. J. Yu, "Exploring the mass adoption of third generation (3G) mobile phones in Taiwan", *Telecommunications Policy*, Vol. 33, pp. 628-641, 2009.
- [60] W. Lehr, L. W. McKnight, "Wireless internet access: 3G vs. WiFi?" *Telecommunications Policy*, Vol. 27, pp. 351-370, 2003.
- [61] Y. Chong, K. B. Ooi, B. Lin, H. Bao, "An empirical analysis of the determinants of 3G adoption in China", *Computers in Human Behavior*, Vol. 28, pp. 360-369, 2012.
- [62] X. JunWu, L. JunLing, "Develop 3G Application with the J2ME SATSA API" *Physics Procedia*, 25, 651 - 658, 2012.
- [63] Y. Xu, "Mobile Data Communications in China", *Communications of the ACM*, 46, 12, 2003, 80-85
- [64] Y. F. Kuo, S. N. Yen, "Towards an understanding of the behavioral intention to use 3g mobile value-added services", *Computers in Human Behavior*, Vol. 25, pp. 103-110, 2009.
- [65] Y. L. Wu, Y. H. Tao, P.C. Yang, "Using UTAT to explore the behavior of 3G mobile Communication Users", *Journal of Statistics and Management Systems*, Vol. 11 No. 5, pp. 919-949, 2008.
- [66] Y.S. Jin, Z. H. Li, "A use-diffusion model of 3G services in China", *African Journal of Business Management*, Vol.5 No.27, pp. 11168-11177, 2011.
- [67] R. Jayasuriya, "Determinants of microcomputer technology use: implications for education and training of health staff". *International Journal of Medical Informatics*, 50, 187-194., 1998.

AUTHORS' PROFILES

Daniel Opoku is a lecturer at the Zenith University College, Ghana. He holds BSc Computer Science and Statistics degree; and MPhil in Management information systems (MIS). His main research interests are Electronic Business, mobile technologies, social media and internet application in Business. He can be reached at: Department of information systems, Zenith University College, Accra, Ghana.



<http://www.cisjournal.org>

Isaac Nyarko Adu is a lecturer at the Department of Business Education, University of Education, Winneba. He had his undergraduate degree in Information studies and MPhil in Human Resource Management all at the University of Ghana, Legon. His research interest lies in the application of computers to Business, Human resource information systems and technology adoption. You can contact him at: University of Education, Winneba, Department of Business Education.