

An Assessment of Awareness, Usage Pattern and Adoption of 3G Mobile Services in Botswana

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Abstract—3G mobile services are new in Botswana and were launched during 2008. This study focused on Botswana's users' usage pattern, awareness and adoption of 3G mobile services amongst university students. A structured questionnaire was administered and the results (n=66) indicate high (98%) saturation level in terms of usage of mobile phones compared to several countries while the 3G mobile service usage rate was found to be low (8%) in comparison to other parts of the world. While the perception of respondents towards its usage, ease of use and intention to use was highly motivating, the respondents reported that they would not be influenced by peer usage. In addition, they were found to be sensitive to price and were not willing to use 3G service if they were expensive. The study also found that security of 3G services and usefulness of the service was the dominating factors in the adoption of these services in Botswana. TV and friends were the dominating awareness media for 3G related information. The findings have future implications for the marketing strategy by the operators and security aspects of 3G mobile services in Botswana. The paper also discusses the future direction of research.

Index Terms—Awareness, adoption, Botswana, 3G mobile service, usage pattern.

I. INTRODUCTION

The analog cellular technology generation was the first in mobile technology, followed by the digital generation. Today, 3G, "third generation", has a wider bandwidth allowing for higher transmission rates and is intended for applications, which provide diversified video and audio services to the customers, apart from basic voice-centric services. 3G networks have potential transfer speeds of up to 3 Mbps. Services offered by this technology can be divided into four main categories: mobile transaction services (such as mobile banking and shopping), mobile information services (news and traffic information) mobile entertainment services (such as mobile games and mobile videos), and mobile messaging services (such as SMS and video call) [1, 2, and 3]. Many studies have investigated the user acceptance and success factor of mobile services in general, and 3G in particular. Despite the wide range of value added services provided by 3G, consumer usage of this technology remains low [4]. Countries such as South Korea, Taiwan and Indonesia, where mobile technology usage, in general, is higher than 70%, 3G technology users are below 30%. Japan, being the exception, has a record high of 80% 3G users, out of the 84.1% of

mobile users. However, there are no studies dealing with the awareness, adoption and usage of 3G mobile services in Botswana.

Botswana is Africa's one of the wealthiest nations with a thriving economy mainly based on diamond mining and tourism. The three mobile operators in the country introduced the 3G technology, beginning with Mascom Wireless (August 2008), Orange Botswana (July 2009) and Be Mobile in 2010. Coverage of the networks are concentrated in the country's two largest cities, Gaborone and Francistown. The recent introduction of 3G mobile services has motivated this study.

II. LITERATURE REVIEW

3G services are a recent development. The literature on various aspects on 3G is scattered and sketchy. There has been research on current usage, adoption and factors that affect usage in various countries, while some authors have presented their views regarding the future of 3G and its potential. Tanguturi and Harmonizes [5] present the evolutionary migration path from second to third generation systems.

Japan was the first in the world to adopt 3G services in 2001. 3G mobile phone diffusion in Japan could be classified in terms of technological innovations, marketing strategies and competition policy of mobile phone operators [6].

Research from Asia Pacific region by Mingles [7], suggests that Mobile Internet use is expanding in the region. Contrary to the above Bowman, Carlson, Molina-Castillo, and Walden [8] indicate that the use of mobile services other than basic mobile telephony is lagging behind and the high expectations that were voices when 3G was introduced have failed to materialize in Finland. According to Gruber and Koutroumpis [9], the rationale for the differences regarding adoption in various countries could be per capita income, urbanization and Internet/Broadband penetration, as well as regulation that positively affect diffusion across all generations of mobile technologies.

Pagan [10] analyses determinants of adoption of third generation mobile multimedia services and concludes that "Price" ranked third after "usefulness" and "ease of use". Chatziagapis [11] infer that mobile services may promise revenue growth for the operators, but the factors of usefulness, security and especially the price of the mobile services have to be considered seriously in order for future adoption to accomplish in the Greek market. Several other researchers Pagan [10], Indrawati et al [11] have also found price as a determinant factor for 3G mobile services adoption. Kim [12] identified services like video calling, global

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roaming and upgrade services via the mobile multimedia Internet for attracting mobile phone subscribers.

Gerstheimer and Lupp [13] suggest 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. While Kuo and Yu [14] from a study in Taiwan propose that 3G telecom operators not only have to serve as network system and spectrum provider, but also have to develop into a "service-focused" instead of "Technique-focused". Further, 3G telecom operators should place their focus on "creating" 3G services instead of "enhancing" already existing 2G or 2.5G services. Some operators are provided with 2G and 2.5 G services on a 3G network system, so the consumers are unable to take full benefits and convenience brought by the 3G system. Studies from Indonesia Indrawati, Murugesan and Raman [11] confirm the above, Bohlin [15] on the future of mobile communications system in the EU, indicate that a broader base of mobile -broadband literate users needs to be developed for European growth and competitiveness.

Dunnewijk and Hutten [16] find liberalization of the telecom markets in Europe drove new entrants to the market and curbed excessive pricing. However, in recent years the lack of challenging service is the main cause for the wavering development of newer generation of mobile telecommunication services. The future of mobile telephony is expected to rely on mobile services [17].

Although the main highlight of 3G services are high speed data transmission, entertainment 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. Income affordability, mobile network coverage, high subscription charges and telecommunication infrastructure to support all these activities classified with regard to findings is difficult for developing or even some developed countries in the world [6].

The mobile voice service market is nearly saturated in many nations for example Russia, Brazil, Taiwan etc. and ARPU (Average Revenue per Customer) is decreasing every year (Müller -Veerse, [1]; Mackenzie and O'Loughlin, [18]. With this background, this study was conducted.

III. PURPOSE OF THIS STUDY AND METHODOLOGY

Literature suggests that there is great deal of research on adoption of mobile phones and mobile related services. This ranges from mobile Internet services [19], mobile device features and services [20], mobile value added services [4], usage of mobile applications [11, and 21] and mobile data service usage [22]. Although, some mobile services such as SMS, ring tones, icons and logos either have been adopted on a large scale or at least have been tried by a majority of users [17], advanced services such as MMS, Mobile TV etc. have not yet found ways into the everyday lives of consumers. A growing field of research supports that cultural background influences the adoption of technology [23, and 24]. Abu [6] advices that future studies are required to perform a quantitative analysis on which technological innovations and policies are valid, considering the country's unique

characteristics of geographical coverage, population, topography, and income level. However, there are few studies in Africa especially in the Southern African context, where per capita income as well as mobile penetration is very high. Factors of adoption specific to Botswana need to be explored in relation to 3G.

In view of the above, this study aimed at assessing the awareness and usage (penetration rate) of new 3G mobile services, perceived ease of use, perceived usefulness, behavioral intention to use, social influence, attitude towards 3G mobile services in Botswana. A structured questionnaire was designed to collect data; questionnaire also captured the demographic profile of the respondents.

IV. DATA COLLECTION AND ANALYSIS

125 Faculty of Science students in first year of the graduation participated in the study, by completing the questionnaire. 66 questionnaires were found valid. The reason for selecting students was that more than 90% of the students have a good financial status, which was enhanced by the sponsorship by the government. Therefore, every student was able to afford a cell phone.

65% respondents were male and more than 70% of them were in the age group of 20-25 years, which was the target age. Further 98% of the respondents were using mobile phones; this indicates saturation level in penetration of usage of mobile phone. It is possible that some of them were subscribers of more than one telecom operator.

Regardless of the high level of mobile penetration, only 62% of the respondents were aware of 3G mobile services in Botswana. Out of the 62%, 8% of the respondents were using 3G mobile services. This was relatively low as compared to other countries. Further comparison is made in the discussion section. Data revealed that less than 50% (43%) respondents were willing to change to 3G mobile handsets, suggesting low potential for growth in 3G mobile services in the Botswana market.

Table I indicates that the most used service was that of SMS (62%), followed by 38% of respondents using offline services, such as calendar, calculator, offline games. Internet usage and downloading, listening of music is used by over 30% (33% and 36% respectively) of respondents. Ring tones and offline services were occasionally used by 38% of respondents, 32% respondents occasionally play/download games while less than 3% of the same watch/download videos.

Over 40% of the respondents have never used the MMS service while Mobile email services have not been used by over 50%. Also the service with highest unawareness rate was MMS.

The data in Table II confirms the low usage of 3G mobile services as found earlier. It is worth noting that majority of respondents had never used the 3G mobile service (above 40%).

It is evident from the table III that security of the system was extremely important, followed by speed of data transfer and usefulness of the service. Surprisingly, price was not the dominating factor as only 36% of the respondents found it extremely useful

TABLE I: CURRENT USAGE OF VARIOUS FACILITIES BY RESPONDENTS

Existing Mobile Services	I don't know the service	I never used the service	occasionally	upto 5 times per month	6-20 times per month	over 20 times per month
Short Message Service (SMS)	5%	0%	15%	2%	15%	62%
MMS (Multimedia Message Service)	11%	44%	32%	2%	2%	3%
Mobile e-mail	6%	52%	20%	3%	3%	11%
Ring tones	0%	17%	38%	8%	5%	30%
Listening/downloading music	6%	12%	18%	9%	14%	36%
Watching/downloading movie/video	9%	26%	27%	6%	6%	18%
Playing/downloading online games	6%	30%	32%	8%	6%	12%
Internet	5%	21%	21%	6%	9%	33%
Offline Services (i.e., calendar, calculator, offline games, etc)	2%	3%	38%	11%	6%	38%

TABLE II: USAGE OF 3G MOBILE SERVICES

Usage of new mobile services	I don't know the service	I never used the service	Occasionally used	Used upto 5 times per month	Used 6-20 times per month	Used over 20 times per month
Mobile TV	17%	48%	23%	3%	0%	0%
Video calls	12%	62%	14%	0%	2%	0%
Wireless voice telephony	32%	41%	11%	2%	3%	2%
Multimedia instant messaging	15%	53%	12%	2%	2%	3%

TABLE III: FACTORS IN THE USAGE OF 3G SERVICES

How important are the following factors for using new 3G mobile services?	Extremely important	Very important	Important	Neither important nor Unimportant	Unimportant
Price	36%	17%	27%	5%	15%
speed of data connection/transfer	58%	30%	12%	0%	0%
screen size of the mobile device	26%	33%	32%	5%	5%
complexity involved	27%	21%	32%	15%	5%
Security	71%	22%	6%	0%	2%
usefulness of the service	56%	24%	14%	3%	3%

Given the low rate of usage of 3G Internet services in Botswana, the data was further analyzed for Perceived Usefulness of 3G services, Perceived ease of Use and Attitude toward usage. The findings are that, although, the mobile usage was low (8%) but the respondent's perception towards its usage, ease of use and intention to use were highly motivating. More than 50% felt that 3G can enhance effectiveness and productivity, while 57% agreed that the 3G mobile service were easy to use. 50% of respondents showed positive attitude towards the usage of mobile services, while the respondents were sensitive to price and were not willing to use 3G service if they were expensive. From our earlier findings despite security being rated higher than price, the second factor remains significant issue for usage. Two most important Medias for getting awareness on the 3G Internet was found to be TV and friends. The respondents reported

that they will not be influenced by peer usage

V. DISCUSSION

The study revealed almost saturation of mobile phone usage (98%) in the respondents. This subscription rate is much higher than many countries, for example China (63.4%), India (59.33%), United States (91.0%), Nigeria (50.3%), Japan (84.1%), Indonesia (73.1%), South Korea (97.2%), and South Africa (82.9%). However, it is lower than countries like Russia (147.3%), Brazil (103.5%), and Taiwan (110.6%). Given the low population of Botswana, the 98% saturation of mobile phone seems to be higher in southern African countries. Future study on the factors affecting saturation rate in Botswana can be done.

Although the study found high 62% awareness of 3G, low usage (8%) of 3G mobile services was also concluded. 3G usage in Botswana is lower compared to Japan (80%), Taiwan (28.5%), South Korea (14%) while comparable to Europe (11%) and Indonesia (8.2%). The high cost of 3G services or low congestion in the network in Botswana could also support low usage. Another reason for low usage rate of 3G services in Botswana could be that this being a small country, most of the users studied are not spending time in commutation or public transport compared to other bigger countries and hence do not feel the need of the facilities provided by 3G which is 'anytime' and 'anywhere' connectivity. Various researchers have suggested ways to improve the low usage of 3G mobile services and factors that affect such usage. For example Kuo and Yu [14] suggest that 3G telecommunication operators face huge challenges on their way to success and they can only survive if only they develop into "service -focused" instead of "technique-focused" business models. Future studies could be taken in Botswana telecommunication market to find suitable strategies for fast diffusion of 3G mobile services.

The finding, that of the SMS being the only service adopted by majority of Botswana's mobile users, is in line with other studies for example Press wire, Little and Report [25]. MMS usage remains low in Botswana market. Though European market has also not adopted multimedia messaging to large extent, due to various reasons such as pricing policy and relatively complex usage but Asians have eagerly adopted this service [26]. In relation to security, being the highest concern factor for usage in Botswana, finding of Bohlin, et al [15] suggest that phones need to be turned into secure communication devices to enable them to be used for authentication and avoid risks to privacy. Accordingly, the operators in Botswana would have to consider this aspect.

Literature suggests that pricing of the 3G services is one of the biggest challenges facing telecommunication companies [27] [28] but this study reveals that for Botswana's subscribers price is not one of the main criteria for choosing this technology.

VI. LIMITATIONS OF THE STUDY

Faculty of Science students residing in the capital city were used as the sample and therefore, the results needs to be tested on larger group comprising of respondents from all other areas and cities.

VII. CONCLUSION AND FUTURE RESEARCH

The study reveals insights into the usage and adoption of 3G mobile services in Botswana. The study findings are in line with other markets and several other studies and have implications for marketing strategy in Botswana market.

The highest concern factor for the users of 3G in Botswana is Security, the follow up studies could examine this factor to investigate the context (for example intrusion, collection or transfer of personal information, security features of the phone etc.) that is relevant for these users. Further studies should concentrate on country specific characteristics or

culture specific characteristics to explain the adoption of 3G in Botswana. In addition, the current and future prospects of individual services like mobile Commerce, mobile Internet, mobile advertising etc should be examined in depth in light of 3G. However, 3G technology poses a challenge for the operators who have to develop innovative business models for increasing subscribers of 3G. From business point of view, telecommunication policies for exploitation of cost and performance of 3G networks need to be addressed.

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REFERENCES

- [1] F. Müller-Veese, "Mobile Commerce Report" Durlacher Research Ltd. Available [http:// www.durlacher.com/downloads/mcomreport.pdf](http://www.durlacher.com/downloads/mcomreport.pdf) 1999
- [2] U. Varshney, R.Vetter, "Mobile commerce: framework, applications and networking support," *Mobile Networks and Application*, vol. 7 (3), pp. 185-198, 2002
- [3] C.Coursaris, K.Hassanein, and M. Head, "M-commerce in Canada: an interaction framework for wireless privacy," *Canadian Journal of Administrative Sciences*, vol. 20 (1), pp. 54-73, 2003
- [4] Y. F. Kuo, and 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
- [5] V.P. Tangaturi, and F.Harmantzis, "Migration to 3G Wireless Broadband internet and Real Options: The Case of an Operator in India", *Deutsche Bank Research* 2006
- [6] S.T. Abu, "Empirical analysis of global diffusion of 3G mobile phones: a cross-cultural review," *Discussion Paper No. AIDP0906*. Graduate School of Applied Informatics, University of Hyogo, Japan 2010
- [7] M.Minges, "Is the Internet mobile? Measurements from the Asia-Pacific region," *Telecommunications Policy*, vol. 29. pp.113-125, 2005
- [8] 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
- [9] H.Gruber, and P. Koutroumpis, "Mobile communications: diffusion facts and prospects," *Communications and Strategies*, Jan 1, 2010
- [10] M. Pagani, "Determinants of Adoption of Third Generation Mobile Multimedia Services," *Journal of Interactive Marketing*, Vol. 18(3), pp. 46-59. Summer 2004 [Online] Available <http://www.interscience.wiley.com>
- [11] Indrawati, S. Murugesan, and M. A Raman "New Conceptual Model of Mobile Multimedia Services (MMS) and 3G Network Adoption in Indonesia," *International Journal of Information Science and Management Special Issue January / June, 2010*
- [12] Y. Kim, "Estimation of consumer preferences on new telecommunications services: IMT-2000 service in Korea" *Information Economics and Policy*, vol.17. pp.73-84, Jan 2005
- [13] O. Gerstheimer and C. Lupp, "Needs versus technology—the challenge to design", *Journal of Business Research*, vol. 57 (12), pp. 1391-1396, December 2004.
- [14] Y-F Kuo, and C.-W Yu, "3g Telecommunication Operators' Challenges and Roles: A Perspective of Mobile Commerce Value Chain," *Technovation*, vol. 26 (12), 1347-56, 2006
- [15] E. Bohlin, J-C Burgelman, C. Rodriguez, "The Future of Mobile Communications in the EU", *Telematics and Informatics*, vol. 24 (3) pp. 238-242, 2007
- [16] T. Dunnewij and S.Hultén, "A brief history of mobile communication in Europe," *Telematics and Informatics*, vol. 24 (3), pp.164-79, 2007
- [17] C. Carlsson, J. Carlsson, K. Hyvönen, J. Puhakainen and P. Walden, "Adoption of Mobile Devices/Services – Searching for Answers with the UTAUT", in *Proc. of the 39th Hawaii International Conference on System Sciences, HICSS*, 2006

- [18] M. MacKenzie, and M.A. O'Loughlin, "WAP Market Strategies. Ovum" [Online] <http://www.ovum.com>
- [19] P. Jiang "Consumer Adoption of Mobile Internet Services: An Exploratory Study," *Journal of Promotion Management*, vol. 15 (3), pp. 418-454, 2009
- [20] A. A.Economides, and A. Grousopoulou, "Students' thoughts about the importance and costs of their mobile devices' features and services," *Telematics and Informatics*, vol. 26 (1), pp. 57-84, 2009
- [21] H. Verkasalo, C. López-Nicolás, F. J. Molina-Castillo, H. Bouwman: "Analysis of users and non-users of smartphone applications," *Telematics and Informatics*, vol. 27(3): pp. 242-255, 2010
- [22] J. Harno, "Impact of 3G and beyond technology development and pricing on mobile data service provisioning, usage and diffusion," *Telematics and informatics*, vol. 27 (3), pp. 269-282, August 2010.
- [23] P. Norris, "Digital Divide: Civic Engagement, Information Poverty and the Internet in Democratic Societies," Cambridge University Press, New York 2001
- [24] D. P. Ford, C. E.Connelly, and D. B. Meister, "Information systems research and hofstede's culture's consequences: an uneasy and incomplete partnership," *IEEE Transactions on Engineering Management* 50 (1) pp. 8-25, 2003
- [25] M2 Presswire, A. D. Little and E. Report Predicts Continued Revenue Growth for European Mobile Operators, Available from: www.presswire.net/
- [26] L. Sigurdson, and P. Ericsson, "New services in 3G- new business models for streaming and video," *International Journal of Mobile Communications*, vol. 1 (1/2), pp. 15-34, 2003
- [27] F. Buellingen, and M. Woerter, "Development perspectives, firm strategies and applications in mobile commerce," *Journal of Business Research*, vol. 57 (12), pp. 1402-1408, 2004
- [28] C. J. Fenton, J. G. O. Moss, D. W. Lock, R. Bloomfield, J. F.Fisher, D.M. Pratt, A. Brookland, and J. Gil, "3G trials and developments," *BT Technology Journal*, vol. 19 (1), pp. 127-137, 2001

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