Modification of DOI theory – the case of mobile phones in rural Papua New Guinea

Joseph Kim Suwamaru

Abstract

A PNG study on mobile phones witnessed that the Diffusion of Innovation (DOI) theory was shaped by factors other than the much popularised requirements of diversified communication channels. Under normal conditions, diversity in communication channels persistently informs the knowledge-persuasion-decision-implementation-confirmation stages of the DOI theory. In the PNG study, existing felt needs of citizens, more than any other factor, shaped the merging of the knowledge-persuasion stages while the implementation-confirmation stages were significantly eclipsed by consequences of mobile phone usage. Usually, the five stages require time and other resources to communicate an innovation, idea or practice in the diffusion process, but not so for the diffusion of mobile phones in rural PNG. Analysed quantitative and qualitative evidence confirmed that, for the diffusion of mobile phones, citizens' existing felt needs stimulated a faster than normal diffusion process whereby certain stages merged beyond recognition. This paper discusses the shaping of the DOI theory in a modified form for the case of mobile phones in rural PNG.

Keywords: diffusion of innovation theory, communication channels, social system, knowledge-persuasion-decision-implementation-confirmation stages, time, adopter categories, innovation and diffusion rate, mobile phones

Introduction

Diffusion of Innovation (DOI) theory is an established and tested theory applied in diverse fields to gain illumination concerning the process where information about an idea, practice or object is communicated through various channels across members of a social system over time (Rogers 2003). The word '*innovation'* concerns an idea, practice or an object which may be perceived as new by members of a social system. The essential elements in the DOI theory include the innovation, communication channels, social system and the aspect of time (Rogers 2003). Within these, citizens in a social system may attain knowledge about an innovation which they consider in order to take a decision on whether to accept or reject an innovation. Since individual decision making depends on one's perceived attributes of the innovation, there are categories of adopters with specifically identifiable adoption traits.

Antecedents refer to existing conditions or felt needs which may be consequential to a specific business environment or even legislative, policy and regulatory conditions. In some cases antecedents could even be brought about

by legislative structures. Prior to 2007, for mobile phones in Papua New Guinea (PNG), the antecedents culminated due to over protection of Telikom through legal and policy structures. Prior to the freer market, the protected monopoly operator lacked any motivation to be customer responsive with a limited telecommunication network which sought predatory tariffs. This protected environment gave rise to the persistent felt needs for communication among the citizens. Prior to competition in PNG, citizens were inundated with communication needs which the monopoly operator could not satisfy.

> The B-mobile phone service is limited to urban areas. The present ratio of telephone access to the rural people is an appalling one telephone per 10,000 (Mobiha 2005).

This paper argues that the endemic existing felt needs formed the antecedent which drove citizens to adopt rather than reject mobile phones in a short space of time. The crux of this piece is that the antecedents formed the primary drivers in the decision and adoption process with mobile phones in PNG. This trend was also confirmed by both quantitative and qualitative data.

> *If only we had mobile phones earlier than now, things would have been better. We used to think that these phones only belonged to office workers because they only existed in government and company offices. We never imagined that one day we would be owners of our very own mobile phones. Telikom's public payphones were always out of order and we would stand in queues for the whole day, but now we have our own mobile phones. Our mobile phones are reliable unlike those Telikom public payphones.* (#AN 111)

When parsing the foregoing, one senses the existing felt needs among the populace vis-à-vis the demand to enjoy communication services. Also the expression draws a comparison between limitations from Telikom supplied phones and the flexibility of owning a personal mobile handset acquired in a freer mobile market. Other evidence is used in this piece attesting the overarching felt needs which compressed the knowledge-persuasion-decision-implementation-confirmation stages during the adoption process of mobile phones. It certainly would have been different for other technological innovations, such as the transistor radio, television set, a computer or even a hand held calculator. The compression of stages was ignited by the significant felt needs which polarized the adopter categories concerning mobile phone diffusion across PNG. Existing felt needs manifested as endemic denial of the right to communicate within and between communities across PNG.

> *Our company has been waiting for a new line connection for four months. Every day we ring Telikom or physically visit their business office to follow up and every day we are told the job has been given to the technician and we are on the priority list, yet no technician comes to connect the line.* (#01PC)

In July 2007, as soon as Digicel opened for business, the asserted polarized adopter categories were witnessed as citizens moved *en mass* to the newer, bigger and extensive network; one that enabled greater communication reach. Uptake of mobile phones at the global layer could be connected with standardization efforts in ICTs, while at societal layer DOI theory illuminates deeper understanding (Manivannan 2008).

Methodology

Using mixed methods, the findings eclipse the adoption indicators of mobile phones from an earlier investigation concerning aspects of mobile phones on socioeconomic development in PNG (Suwamaru 2013). With mixed methods methodology, convenience sampling was used across regions of PNG, because of transportation challenges but ensured representativeness through culture, geography, age, gender and socioeconomic aspects of the respondents in PNG. Such a representative sample through convenience sampling is visible throughout this paper via the generated graphs.

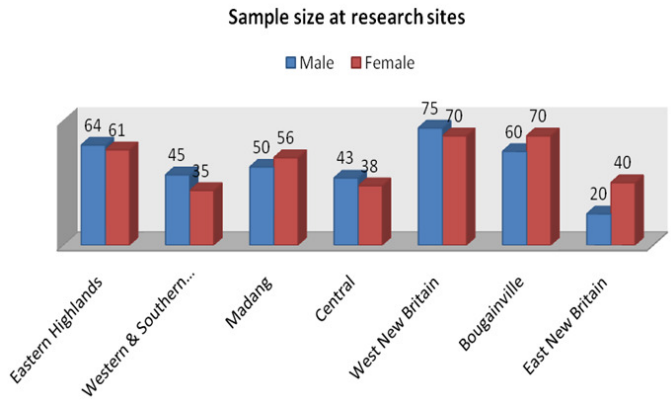

Figure 1: Sample size per research site across PNG (Suwamaru 2013)

Applying convenience sampling, rural villages in eight provinces representing the Highlands, Coastal and Islands regions of PNG were included (Figure 1). It can be seen that the samples in all provinces have fairly equal gender representation. Other socio-demographic parameters are easily identifiable throughout this piece in the various generated graphs.

Objectives

This paper argues that DOI theory for the case of mobile phones in rural PNG was characterized by a faster than normal diffusion process, even if only 'word of mouth' was the main communication medium. The usual and popularised requirements are that, diversified communication channels are used to promote the diffusion process. The point is that diverse communication channels are required to ensure that an innovation is promoted for adoption (Roman 2004).

This paper argues that even under limited communication channels, mobile phones received immediate adoption by citizens in rural PNG. The typical stages involved in the diffusion process from knowledge through to implementation and confirmation were eclipsed by existing felt needs among citizens in rural PNG. This is against the backdrop of cultural diversity where many society members have never used any form of modern electronic communication devices (Watson 2011). In all this, the adopter categorization seemed polarized across PNG, overshadowed by what Narokobi (1983) described as communal living and sharing practices that are typical in Melanesia.

Secondly this paper massages the DOI theory and observes that insofar as consequences are concerned, there are nuances in outcomes that do not fully comply with conventional constructs. This is particularly so with the usual notion that innovations posing adverse consequences are usually discontinued (Rogers 2003). In the diffusion of mobile phones, during the sustenance phase in the diffusion process, regardless of unanticipated adverse consequences, there was no evidence of citizens discontinuing earlier decisions to adopt. It then follows that customary obligations including the need to be in touch with tribal members are more important than any identified adverse consequences.

Finally, this paper concludes that citizens' need for communications compounded by harsh geographical terrains and dilapidated infrastructure, gave way to fast adoption rates of mobile phones. Diffusion of mobile phones in PNG viewed through the DOI theory gave a new meaning to the communication processes involved for citizens' adoption or rejection and the subsequent considerations.

Origins of diffusion of innovations theory

Diffusion studies trace their origins to Europe where a French lawyer, Gabriel Tarde's laws of imitation attempted to identify society trends by synthesizing the number of legal cases processed by the courts (Rogers 2003). Tarde's use of the word 'imitation' is what is commonly called diffusion in the present form of the DOI theory. In 1962, Rogers used DOI theory to study corn seedlings adoption and rejection trends by farmers in rural Iowa in the United States. Since then diffusion enquiries have been established in many continents and have been applied in diverse fields such as business marketing and health practices including ICTs (Roman 2004).

In a study to reduce illnesses in a Peruvian village, the practice of boiling water before drinking was introduced (Rogers 2003). Here the 'innovation' is the practice of boiling water before drinking to improve health conditions of peasants. The innovation was introduced in Los Molinas over two years and only eleven houses out of two hundred peasants adopted the practice. The lack of adoption was attributed to the innovation being incongruent with culturally held beliefs associating hot food with illness. Reflecting on the research on mobile phones in PNG, the identified reasons for cases of lack of adoption of mobile phones were costs related with handsets but even then, some citizens

received used phones from working relatives (Watson 2011). Working relatives after having bought newer versions of mobile phones handed down their used handsets to friends or relatives in the villages. The practice of handing down used handsets also added momentum to the diffusion process of mobile phones.

Popular DOI theory asserts that most innovations diffuse slowly in the eyes of inventors and technologists who create innovations and promote them to others (Rogers, 2003). In 1600, the British Navy had more sailors killed by scurvy than warfare, accidents or other causes. In pursuit to find a cure, an English sea captain Lancaster conducted experiments which identified the effectiveness of lemon juice as a cure. The results were so convincing that it was expected of the authorities to endorse lemon juice as a tested cure for scurvy. Alas, it was only after many years and higher statistics of more sailors' death and only after another well-known physician replicated the earlier tests and reconfirmed its effectiveness that lemon juice was finally recommended (Rogers 2003).

The slowness in the diffusion of lemon juice in this case was due to other competing remedies because each remedy had its advocates or promoters. Captain Lancaster was not a well-known physician, so it took another well-known physician (champion or agent) to promote lemon juice for adoption. It was only then that the adoption and use of lemon juice led to the eradication of scurvy. The point here is that even though an idea (innovation) may be more advantageous than an existing option or economically beneficial, it still requires champions or agents of change to promote it for widespread adoption and use. For the case of mobile phones, the diffusion was fast requiring few champions if any, due to the existing felt needs for communication. Against the backdrop of limitations in communication technologies at the time, mobile phones required few champions to gain critical mass for sustained diffusion.

Some examples of champions or agents of change include popular and influential professionals. Sometimes there are local advertisements on the media featuring successful sportspeople to promote a product or an innovation. The engagement of well-known and influential professionals displays an illusion of trust, reliability and even success associated with the innovation (Greengard 2008). It is also important to know that not all innovations or ideas require the same level of promotional effort in order to achieve adoption and use status. This was certainly true for mobile phones in rural PNG.

Regarding the diffusion of mobile phones in PNG, the determining factors shaping the immediate uptake were not necessarily concerning trust, reliability and success. The determining factors were predominantly existent felt needs among citizens which were a culmination of past non-utilitarian policy and regulatory instruments. These antiquated policy instruments shaped the limitations in communication services denying services to citizens prior to 2007, which in turn built a critical mass in felt needs among the populace. Ultimately this scale of critical mass flowed on to the immediate adoption of mobile phones by community members across PNG (Figure 2).

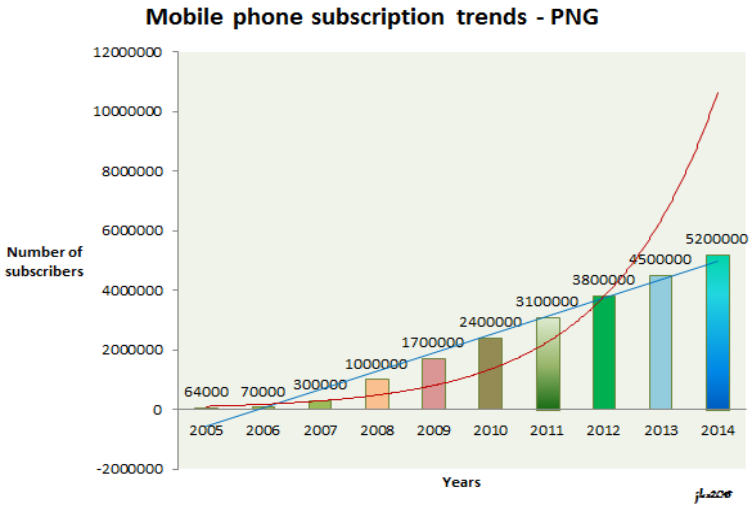

Figure 2: Mobile phone adoption trend in PNG (Suwamaru 2015)

Overview of generally accepted DOI theory

The generally accepted DOI theory is illustrated in the following diagram (Figure 3) and has specific elements which can be described in a definition form as 'the communication of an innovation or idea through various communication channels across members of a social system over time' (Rogers 2003).

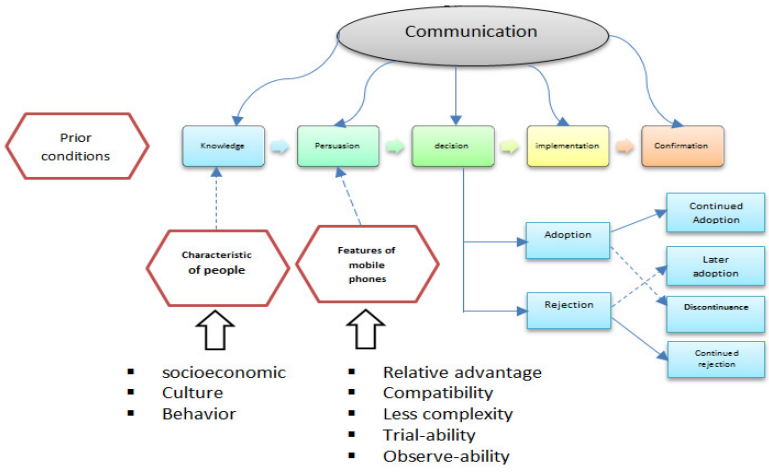

Figure 3: Popularized DOI theory (Adapted from Rogers 2003)

In the context of this paper the concept of time is important as it benchmarks the rate of adoption of an innovation, in this case mobile phones. Expressed in another way, the survey findings discovered that mobile phones diffused across

members of PNG communities within a short time. The first week in the freer mobile phone market witnessed three hundred and fifteen thousand (315,000) new subscribers connected to the mobile communication network. This is an astonishing sixty nine per cent (69%) increase in total subscriptions for PNG in just three weeks – it became the fastest growing network in the Asia Pacific region (Stanley 2008).

The DOI Theory (Figure 3) consists of a five stage diffusion process where various features of mobile phones are identified and assessed for the intended purposes by citizens across PNG. In this respect, the re-emergence of DOI theory in PNG as manifested with mobile phones, witnessed a noticeable compression of the five stage diffusion process. Under these conditions, the time requirements between knowledge-persuasion-decision-implementation-confirmation stages collapsed especially in the first three stages (knowledge-persuasion-decision). In this sense, the recurrence of the DOI theory manifested a much faster adoption/diffusion rate of mobile phones in comparison to similar technology diffusion processes, necessarily compressing the five stages.

Consider for example, the limited diffusion of the Dvorak keyboard which is much faster than the 'QWERTY' keyboard and a more efficient alternative (Rogers 2003). Although the Dvorak keyboard has great potential for typing characters, it failed to diffuse and people all over the world today still use the slower 'QWERTY' keyboard. In contrast to the diffusion of mobile phones in PNG, one can easily make a statement that the 'QWERTY' keyboard serves its purposes sufficiently thereby mitigating any felt needs for any alternative. The same is definitely not true in the case of mobile phones in PNG. With mobile phones, it is asserted that prior conditions (antecedents) promoted a critical mass for faster and sustained adoption ably supplemented by the characteristics of citizens and the features of mobile phones. The synergy of the critical mass and the faster adoption necessarily reduced the five stages as discussed in a later section.

Superior technological innovations do not necessarily enjoy diffusion among members of a social system (Rogers 2003). It is asserted that this statement may be true if and only if there are current popular, cost effective and compatible alternative technologies fulfilling citizens' intended purposes. For mobile phones, acceptance may also be attributed to the portability and mobility features (Greengard 2008). This is expected in PNG where distant transportation challenges abound, hence the portability and mobility features find easy acceptance. It is easy to carry one's mobile phone underneath the armpit, bilum, shirt or trousers pocket while on the move. Added to these, mobile phone adoption has freed citizens from the past communication limitations experienced during the monopoly in PNG.

Using Figure 3, it is further asserted that while communication of innovation through various communication channels informs the five stages consisting of knowledge, persuasion, decision, implementation and confirmation, the other elements concerning antecedents (prior conditions), characteristics of citizens

and the features of an innovation are important determining factors. The re-emerged DOI theory showed the compression of the five stages in response to the scale and level of the diffusion deeply shaped by prior conditions and the features of mobile phones. As noted earlier, the major factor concerning prior conditions is the limited communications network of the monopoly operator in PNG. A related aspect is that, regardless of notable differences in socioeconomic characteristic of the people, the scale and scope vis-à-vis the diffusion of mobile phones among citizens has been fast. This implies that apart from variations in costs, higher brands of mobile phones may be beyond the reach of ordinary citizens but cheaper brands are easily afforded. In this, citizens have some degree of choice in selecting mobile phone brands that are affordable, thus contributing to the diffusion process.

The communication channels were not diversified enough at every stage of the diffusion process as popularly thought because citizens in rural areas predominantly use 'word of mouth' communications among fellow citizens some who made regular trips to towns. There are roadside billboards in major towns and on highways but in rural areas the predominant means of communication is through verbal mode. Nevertheless, there are other driving forces in the diffusion process which mean that the oral nature of citizens merely supplemented the knowledge-persuasion-decision-implementation-confirmation stages. Specifically, the existing felt needs for communication among citizens together with the attributes of mobile phones led to immediate adoption. The following sections present the primary data that were harvested which support the modification of DOI theory in PNG.

Diffusion of mobile phones - rural PNG

This section shows the reduction of the five stage diffusion process with the support of primary data. As noted earlier, under normal circumstances, the diffusion process involves knowledge-persuasion-decision-implementation-confirmation distinct stages reinforced by constant communication. The polarised graphs in this piece show that there was little persuasive effort required for citizens to adopt mobile phones, hence the invisibility of the persuasion stage (Figure 4). Also the confirmation stage (Figure 3) was replaced by consequences stage (Figure 4) as citizens experienced diverse aspects of mobile phone usages. Aspects of mobile phone usages involved direct and indirect consequences, both anticipated and unanticipated (Figure 4). An example of indirect and unanticipated consequence was reported by Poiya (2013):

> Aspects of mobile phone usage can be deadly like what happened in Mt Hagen, Western Highlands province, when a young woman was brutally mutilated and murdered an hour after she has met a 'phone friend'. (Poiya, 2013)

This reported tragedy is an example of indirect and unanticipated consequence of mobile phone use. Other consequences relate to direct and anticipated

consequences such as the abandoning of Telikom's fixed landline use in preference to portable mobile phones (Suwamaru 2014).

When we compare the original DOI theory (Figure 3) with its modified version with mobile phones (Figure 4), we notice the differences just described. The differences will become pronounced as we progress the discussions with supporting evidence in this piece.

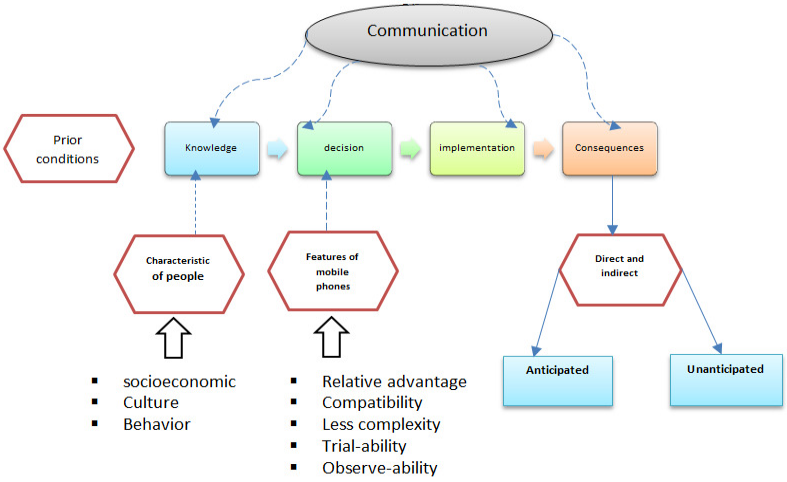

Figure 4: Invisible persuasion stage with dotted lines indicating limited communication channels.

As seen in all the graphs in this paper, many citizens needed no persuasion to adopt mobile phones due to other influential factors in the diffusion process. The persuasion stage was therefore invisible (Figure 4) because many citizens made the immediate decision to adopt and use mobile phones for the things they have reason to value (Suwamaru 2013). The influential forces shaped the diffusion process such that the model mutated where knowledge-persuasion-decision stages merged followed by immediate adoption and then the implementation and confirmation stages were overshadowed by consequences of mobile phone usage. The research on mobile phones showed that knowledge-persuasion-decision stages merged due to the predominant factors identified earlier. Moreover, the characteristic of the people encapsulating socio-economic, culture and behaviour aspects became largely secondary parameters in the diffusion process of mobile phones in PNG. This argument is supported by the provided graphs in this paper which all point to higher ownership of mobile phones according to age, education, region and gender. This offers adequate evidence to prove that characteristics of citizens in PNG were outweighed by perceived attributes of mobile phones. The perceived attributes are discussed in the next section.

Features of mobile phones

In particular, the conveniences of mobility, portability and compactness of mobile phones with diverse features supporting multi-purpose capabilities were found to be major determinants in the diffusion process. For example in many PNG villages, even the added feature of torch functionality in the mobile phone offers the opportunity to provide light in areas lacking electricity, while others include music player, camera and calculator options. While having multipurpose capabilities, mobile phones are less complex devices which can be operated even by a typical villager in PNG. This is yet another factor that led to immediate adoption of mobile phones which is clearly shown by the various graphs vis-à-vis ownership in this piece.

> *Mobile phones have given some power to citizens in PNG. For example it is also allowing citizens to freely exchange music which has affected the local music industry because studios make less money. People buy a music copy and distribute it freely denying the rightful owner the opportunity to sell their music for profit.* (#331)

Here is an example of an unanticipated use of mobile phones by some citizens in PNG, which negatively impacted on another business activity's profit objective. While the original intentions of mobile phones were to enable instantaneous, anytime and anywhere communications, an array of unanticipated aspects were identified. According to the DOI theory whether an innovation or idea gets adopted is very much dictated by its attributes (Rogers 2003). Regarding the relative advantage of mobile phones over existing communication modes, there is definitely little doubt of this, as is shown by the collection of evidence throughout this paper. The mobile phones' capabilities are also compatible with peoples' interaction needs. As shown in the graphs, these two attributes were noted as important drivers in the diffusion of mobile phones in PNG.

The attributes of trial-ability and observe-ability are natural modus operandi in many PNG villages, where citizens may borrow others phones to trial and even observe. Citizens in PNG communities tend to use word of mouth to spread experiences about what they have witnessed or experienced. Based on these experiences, citizens may then acquire individual handsets for their own use. Mobile phones are easily observable as people make and receive calls in public spaces. In a subtle sense, the trial-ability aspect is also synonymous with the simplicity of mobile phones. Citizens could easily borrow a mobile phone from a friend or relative to explore various features and options to acquire an experience. Together with the other factors discussed earlier, these attributes of mobile phones were among the important drivers in the diffusion process. The following set of graphs clearly shows high diffusion of mobile phones across PNG.

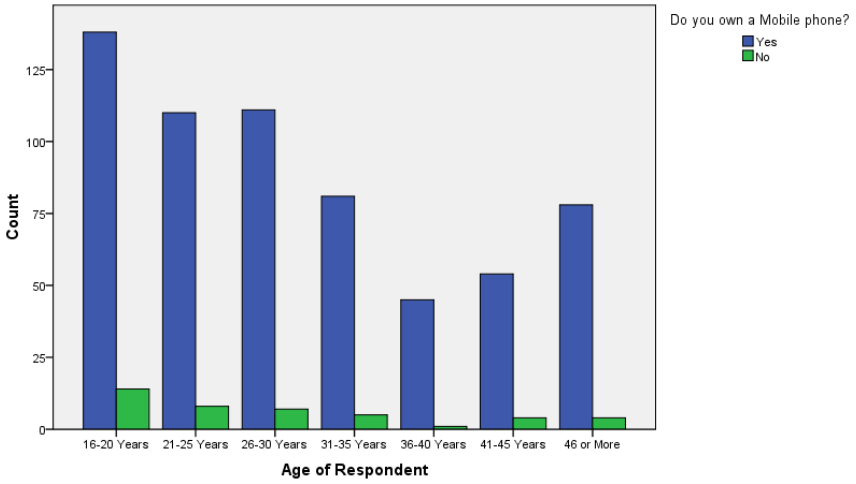

Figure 5: Mobile phone adoption across age groups N= 727 (Suwamaru 2013).

As shown, mobile phone adoption across different age groups shows near widespread acceptance (Figure 5). The diffusion process of mobile phones into rural areas shown in this graph occurred within a short space of one year from commencement of freer market in mid July 2007 when the survey commenced. Relative to each age group, it is easy to see that the ratio between mobile phone adopters (blue) and non-adopters (green) and is more than ninety per cent across age groups.

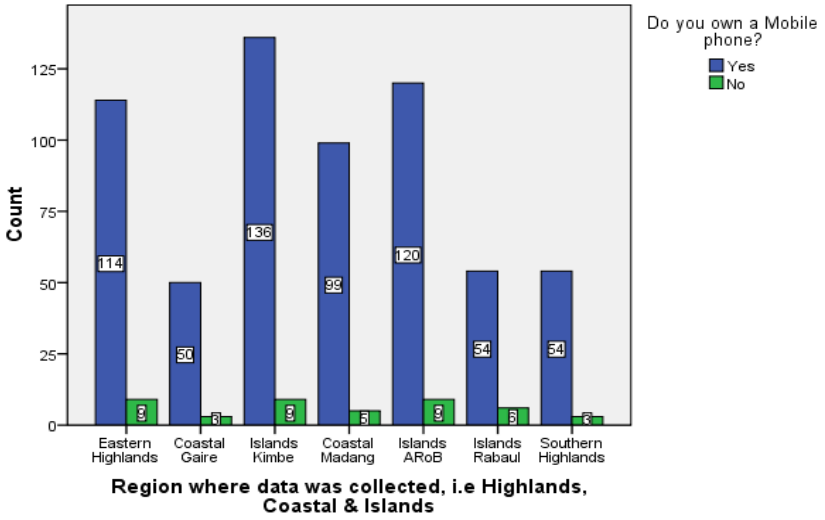

Figure 6: Mobile phone adoption across PNG, N= 727 (Suwamaru 2013)

Regarding mobile phone adoption across provinces, the evidence (more than ninety-five per cent) clearly shows that community members from across the provinces adopted these pervasive devices. While commentators may speculate that ownership is a sign of privilege within communities (Pakakota (2008), evidence suggests it to be a rather indispensable device. The following account confirms the necessity of mobile phones in rural areas of PNG:

> *When the first villager brought the mobile phone, we immediately went and bought ours in town. Other villagers received mobile phones from relatives working in town because it was important to keep in touch with issues happening in the village. Some village trade stores started selling the flex-cards and soon it was all over and popular. Villagers with relatives in faraway places were happier because they were up to date with each other's welfare. The mobile phones enabled it. (# 221)*

Parsing through the foregoing, there are two aspects. The first being the implicit word of mouth communication process among villagers when the first villager brought a mobile phone to their community. This sends a signal that for mobile phone adoption among villagers, word of mouth, rather than the often emphasized diverse channels of communication was responsible in the diffusion process. This in itself is another differentiating aspect. The other aspect relates to beneficial uses of mobile phone as perceived by the villagers and these too promoted the adoption process.

The following graph (Figure 7) shows ownership figures across gender groups which also signals near one hundred per cent adoption among those surveyed.

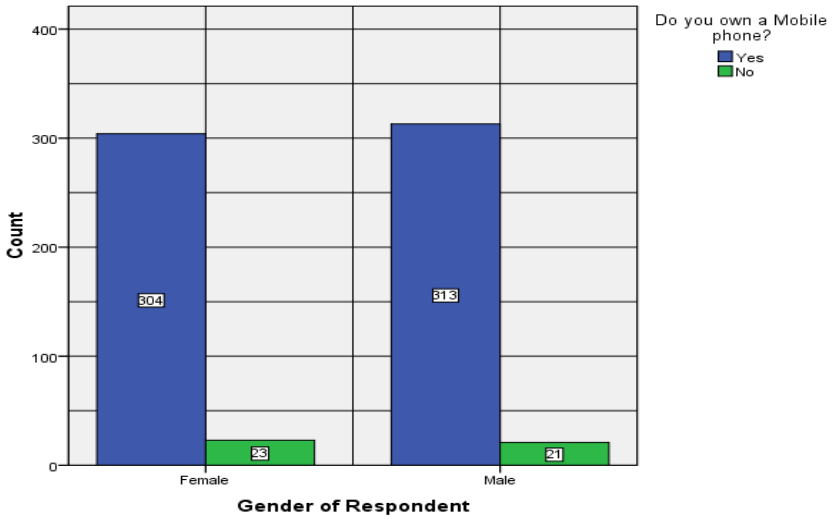

Figure 7: Mobile phone adoption across gender groups N=727 (Suwamaru 2013)

This implies that the diffusion process would have occurred at a much faster rate even across gender lines, due to the existing felt needs and other perceived advantageous aspects. Others claimed that mobile phones gave them the freedom to renew or establish new connections with relatives or friends who lived far from villages.

What is clear from the above figure is that ownership between males and females is equitable due to the generally positive perceptions but more so due to the attributes of mobile phones which citizens harness to accomplish things they value. These higher diffusion rates among gender groups also show that the usually time consuming stages in the diffusion process were shortened in the case of mobile phones. Recalling that transistor radios in rural PNG villages were not as pervasive as mobile phones, one can imagine that the higher and faster adoption of mobile phones imply their sine quo non status. Needless to say that, this is evidently the shortening of the usually protracted time and resource consuming diffusion process experienced in other innovations, ideas or practices (Roman 2004).

The following graph (Figure 8) shows the frequency of occurrence concerning SMS messaging among regions of PNG where the survey was undertaken. If we take SMS messaging as an innovation or new idea or practice, we can easily see that its adoption is slightly lower than that of the mobile phones. Simply said, not all mobile phone owners use the SMS mode of communication. There could be a number of explanations for this assertion, for example, illiteracy could be one likely explanation. We see that non-adoption of SMS messaging (blue) is noticeable, although we can also see that there are many people in PNG who use SMS messaging.

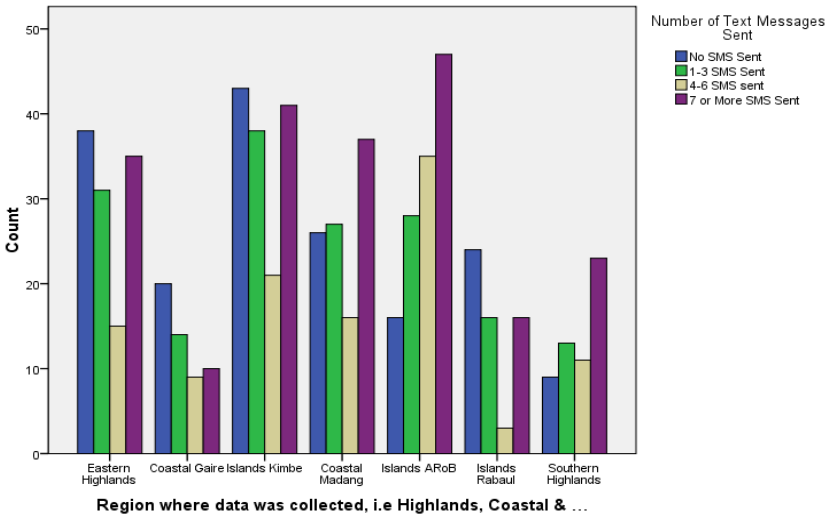

Figure 8: SMS usage across PNG N=727 (Suwamaru 2013)

Mitigating factors concerning the use of SMS messaging may be reasons such as illiteracy or the simple preference towards voice calls. Others could be that people simply just like to hear the voices of those with whom they are communicating. Albeit, with reservations, we can then say that the adoption of SMS messaging practice in PNG is not be as prevalent as the diffusion of mobile phones.

The next figure (Figure 9) shows mobile phone ownership by people with different levels of schooling. We can see that even people with no formal education still adopted mobile phones, relative to those that didn't. While the picture is not too conclusive, it can also be argued that overall, there are non-adopters (green) across the education level spectrum. Hence, generally speaking non-adopters although small in number exist across the education continuum.

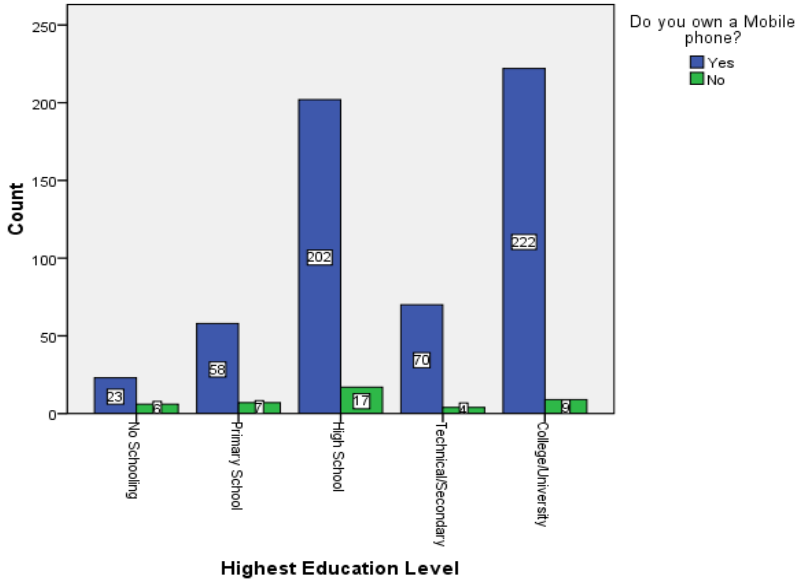

Figure 9: Mobile phone adoption and education level of respondents (Suwamaru 2013)

But the crux of the issue in the foregoing figure concerns generally higher adoption levels of mobile phones across the education levels of citizens. Said another way, regardless of education levels of citizens, the adoption level of mobile phones among citizens is high. Summarily, the evidence presented up to this point, shows that citizens became aware of the availability of mobile phones and immediately decided to acquire and use them. The possibility of confirming the decision to adopt or reject according to normal DOI theory was negligible because of citizens' felt existing needs to communicate within and between distant locations. This can be well understood using the modified DOI theory (Figure 10) which consists of only the knowledge-adoption-consequences stages largely shaped by prior conditions and perceived attributes

of mobile phones irrespective of the characteristic of citizens. Notwithstanding the diversified aspects of mobile phone usages, continued adoption rather than discontinuance/rejection was apparent.

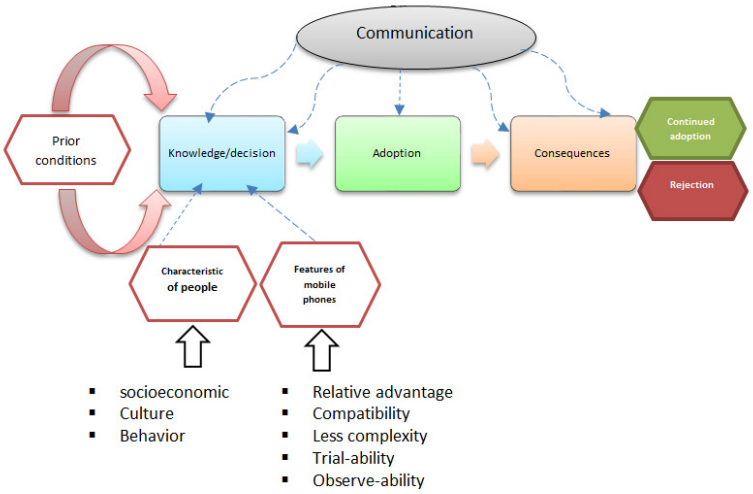

Figure 10: Modified DOI theory with only three stages.

Stimulating the immediate adoption of mobile phones in rural PNG were the existing felt needs for communications and the perceived attributes of mobile phones. Supplemented by the characterised of citizens, these elements are shown to the left of the above diagram (Figure 10). These elements energised the dilution of the knowledge-persuasion-decision distinct stages and the eclipsing of implementation-confirmation stages by the consequences stage (Figure 10). This gave rise to the modified DOI theory discussed in this paper. The reason for the unprecedented pervasiveness of mobile phones in PNG can be summarised with the modified DOI theory as it shaped the diffusion process among citizens in rural PNG. So much so that there was no requirement for persistent promotion of the innovation through diverse channels of communications as normally required. Otherwise the diffusion process with mobile phones would have taken many more years because under normal circumstances, each stages takes time, as the various actors play roles in communicating the innovation (Rogers 2003).

Conclusion

The popular DOI theory coined in 1962 by Everett Rogers contains five distinct stages viz. knowledge-persuasion-decision-implementation-confirmation, which have to be persistently informed through diverse communication channels to promote the diffusion of an innovation. Under normal circumstances, the communication efforts required for each stage consumes time, money and effort to promote the diffusion and adoption processes. Also there are perceived attributes of the innovation which determine its scale of diffusion among members of a social system over time.

The modified DOI theory experienced the overlapping of the five distinct stages beyond visibility with the merging of knowledge-persuasion-decision stages promoting immediate adoption, while implementation-confirmation stages were overshadowed by consequential aspects of mobile phone usage. Consequences are either anticipated or unanticipated (direct or indirect) which emerged as rural PNG citizens grappled with this pervasive device. The most influential factor leading to the fast diffusion of mobile phones are antecedents such as existing felt needs to communicate between distant locations culminating from prior limitations imposed by the former monopoly service provider.

The antecedents complemented by the portability, mobility and utility aspect of mobile phones added to the shrinking of the five stages, forming the three staged modified DOI theory. The shrinking of the five stages led to the immediate and sustained diffusion of mobile phones. Moreover, even under lack of diversified communication channels to inform the five stages, the diffusion process showed no signs of slowing. These are interesting findings in comparison to other technologies such the transistor radio, television, facsimile or even the computer in rural PNG. Finally, despite the diverse and dichotomous aspects of mobile phone usage, sustained adoption persisted.

References

Greengard, S. (2008). Upwardly mobile. Communications of the ACM, 25(11), 17-19.

Manivannan, M. (2008). Globalization of technology - Imagine the possibilities socio-economic, political and cultural implications and thought leadership. Paper presented at the IAJC-IJME International Conference, Nashville, Tennessee.

Narokobi, B. (1983). Life and leadership in Melanesia. Suva: Institute of Pacific Studies.

Pakakota, C. (2008). Telecommunication revolution: Controversial ICT policy unravels the digital era In B. Gomez (Ed.), 2008 Papua New Guinea year book (pp. 139 - 145). Port Moresby: The National & Cassowary books.

Poiya, F. (2013). Mobile phone use leads to killing, Mt Hagen, Post Courier, p. 5.

Rogers, E. M. (2003). *Diffussion of innovations* (5th ed.). New York: Simon & Schuster.

Stanley, L. (2008). A Review of the Development of Information and Communication Technology Law and Policy in Papua New Guinea, PNG update, Madang.

Suwamaru, J. K. (2015). Aspects of mobile phone usage for socioeconomic development in Papua New Guinea, ANU press <http://www.ips.cap.anu.edu.au/ssgm>, viewed 18/09/2015.

Suwamaru, J. K. (2015). Aspects of mobile phone usages in Papua New Guinea: a socioeconomic perspective, DWU research journal pp1-16, Madang.

Suwamaru, J. K. (2015). Status quo and emerging challenges in information and communication tecchnology for Papua New Guinea, ANU press <http://www.ips.cap.anu.edu.au/ssgm>, viewed 12/4/2015.

Suwamaru, J. K. (2014). Impact of mobile phone usage in in Papua New Guinea, ANU press, <http://www.ips.cap.anu.edu.au/ssgm>, viewed 12/9/2014.

Suwamaru, J.K (2013). ICT initiatives in Papua New Guinea: Impact of mobile phones on socio-economic development. Unpublished PhD thesis. Divine Word University.

Watson, A. H. A. (2011). The mobile phone: The new communication drum of Papua New Guinea. Unpublished Unpublished PhD thesis. Queensland University of Technology, Brisbane.

Author

Joseph Kim Suwamaru (PhD) is from Siwai in South Bougainville. He earned his PhD for research on ICT in PNG and a Masters in Engineering Science (MEngSc) from Queensland University of Technology (QUT). Joseph also earned the Master of Business Administration (MBA) award from Divine Word University (DWU). He was formerly a senior lecturer at DWU Information Systems Department teaching structured and object-oriented programming and has been a visiting fellow at ANU. Joseph now serves as a director of PNG DATACO, a state owned enterprise. jkim@pngdataco.com or pengtel@hotmail.com.