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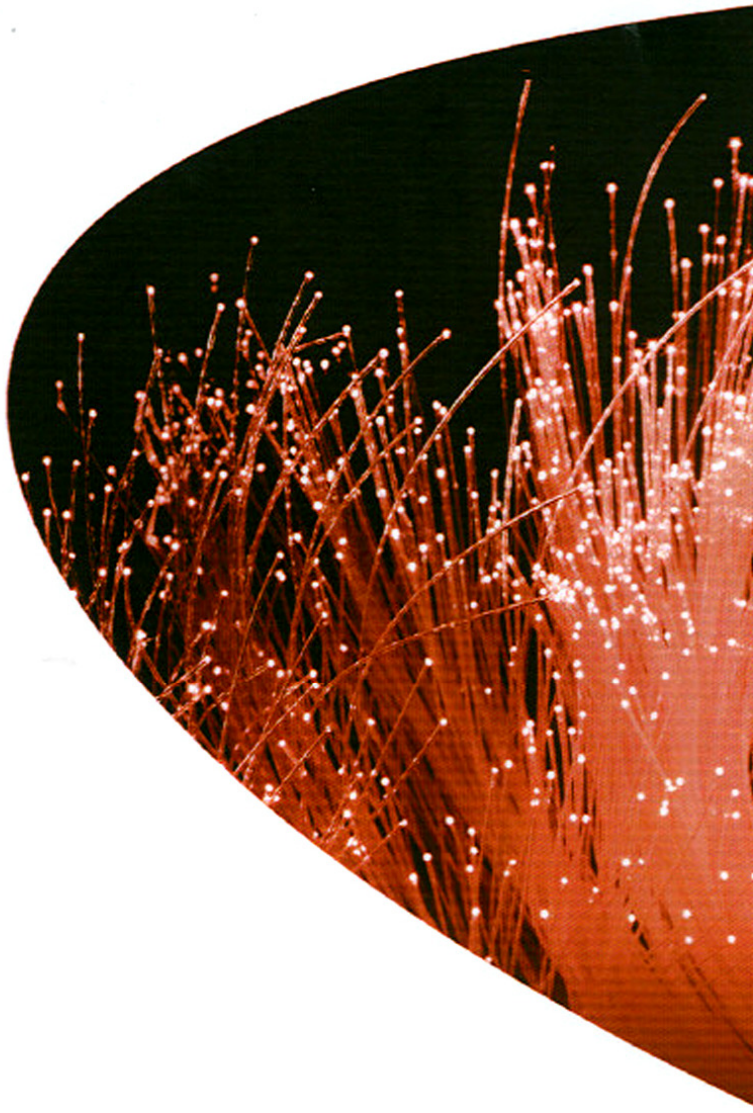

Network development: wireless applications for the next billion users

Guest Editors: Amy K. Mahan and William H. Melody

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From voice ubiquity to mobile broadband: challenges of technology transition among low-income Jamaicans

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Abstract

Purpose – *The purpose of this paper is to examine how the prevailing widespread and popular access to mobile phones among Jamaica's poor may be used to support the public policy goal of transitioning these users from mainly voice to more advanced applications, including m-government, personal educational growth and teleworking, via increased connectivity to mobile internet and other forms of broadband access.*

Design/methodology/approach – *The article analytically reports the findings of two national usage studies of low-income mobile respondents in Jamaica.*

Findings – *There is a prevailing positive disposition among Jamaicans of all social classes for the use of higher levels of work-related communications technologies, once these are priced in a manner that make them accessible. This is a strong foundation upon which to build crucial technology links to key business and economic opportunities. Mobiles are potential bridges for low-income users from their present voice-dominated usage to higher end applications such as further education, better access to public services and other more intensive work-related uses.*

Practical implications – *If made more accessible, mobile internet could help bridge information and education gaps experienced by the financially impoverished majority. More low-income people could be connected through such simplified protocol platforms as .Mobi and into wider use of M-services.*

Originality/value – *The empirical studies indicate for the first time that low income users of mobile phones are not just engaged in idle chatter but have a higher order economic and survival motivation in their patterns and uses of the mobile phone.*

Keywords *Mobile communication systems, Internet, Information literacy*
Paper type *Case study*

Introduction

The mobile phone has emerged as one of the most dynamic forms of ICTs in the twenty-first century. The rapid global spread and mobility of cellular telephony have challenged the growth rate of prior communications devices to become the technology of choice for people in most countries of the world. These increasingly versatile, miniaturized gadgets can be found in urban communities in the developed north as well as in underdeveloped regions in the south, even given continuing gaps in income and access.

In Jamaica, the mobile telephony quickly penetrated the so-called upper classes, through to the middle class, and more gradually down to the low-income groups. This pattern of diffusion has generated on-going analysis of the impact of the mobile phone on different social strata. These approaches range from the extremes of technological determinism which view innovations as being capable, by themselves, of transforming society, to techno-skeptics such as Postman (1993), to social determinists like McLuhan (1964) and DeKerckhove (1995) who view technology as socially defined extensions of human capacities with the potential of enabling a wide range of economic and social opportunities.

The mobile phone is emerging as a social enabler of opportunities by virtue of its mass accessibility, portability and range of applications. From this perspective, we embrace Ahonen's (2007) viewpoint that the mobile phone is conceivably the seventh mass media channel:

> Like the internet before it, today the phone can replicate everything the previous six mass media can do (Ahonen, 2007).

He cites seven distinct characteristics of the cell phone that are unavailable on the previous six media channels:

1. The phone is the first personal media.
2. The phone is permanently carried.
3. The phone is the first always on mass media.
4. The phone has a built-in payment mechanism.
5. The phone is a creative tool available always at the point of creative impulse.
6. Mobile has near perfect audience information.
7. Only mobile can capture the social context of media consumption.

Though intuitive and straightforward, these characteristics are useful markers of an innovation whose influence continues to expand globally. However, in identifying the many positive attributes of the mobile phone, one must not ignore some key constraints in the use of this technology. Even with more expensive personal digital assistant (PDA) versions, the small screen can be a constraint to viewing and processing large volumes of text or graphic data or to conduct sustained educational instruction. While its miniature character aids portability, it can also be a drawback in terms of the keyboard size, often used for texting. The Jamaican ethnographic study (Dunn, 2008) has shown that an absence of basic literacy can limit non-voice uses of the phone, although this is not a problem unique to mobiles. Further, as a small device, the mobile phone has proven to be easily lost, misplaced or stolen. For the poor, possession of the device does not equate with effective access, as it is often out of pre-paid credit.

Nevertheless, the cellular phone is part of a wider communications technology ecology, in which a number of opportunities are embedded for low income users and developing nations. This is reflected in Yoshio Utsumi's comment on the increasing importance of communications and the possibilities that can be achieved if they are leveraged correctly:

> With this widening of the communication horizon, we are able to build bridges across cultures as never before, generating a cross-flow of ideas, empowering people with information and knowledge, and promoting meaningful dialogue with information and knowledge, and promoting meaningful dialogue between different regions and communities, between nations and between civilizations. We now have technological capacity to reach out to vulnerable and displaced communities and close the digital divide that deprives millions from the benefits of information and communication technologies. These powerful tools have the potential to help achieve the development goals and aspirations of people across the planet, such as reducing poverty and illiteracy, increasing agricultural production, and improving health care and environmental protection (Utsumi, 2006).

It is in this context that we argue that mobile telephony, as an emerging champion among ICTs, should be pursued as an important part of the national and global ICT development strategy, given its dynamic nature and potential impact. Our studies have shown that among the great majority of users the mobile phone is functioning as an intermediary or bridging technology to higher levels of interactive broadband usage and e-commerce applications among the poor.

In the Jamaican household survey (Dunn, 2007)[1], some 1,174 low-income respondents were sampled to get a wider understanding of mobile telephony usage patterns among the poor, and to examine the social environment and other contextual issues related to ICT use. Following the quantitative baseline data gathering, the additional ethnographic study was undertaken over a six-month period (Dunn, 2008), with respondents ranging from urban

youth to older users in poor rural areas and inner city communities. This qualitative component involved in-depth interviews, focus group sessions, research diaries and the more probing diary-assisted interviews. It is the data from these studies that are brought to bear on our analysis in this paper.

Mobile telephony in Jamaica: main findings and theoretical underpinnings

The emergence and growth of the current phase of digital technologies, including mobile telephony, has given rise to a discussion about the role of technology and its impact on change and on society. It is reaffirmed here that technologies are not ends in themselves, but means by which humans can fashion our environments and societies. These means, when taking the form of pervasive personal attachments, can acquire disproportionate influence beyond their normal roles. The mobile telephone is at least as prevalent in the lives of new adopters as television and radio combined. This messaging and information system has enjoyed a faster adoption rate than any other communication technology in the region, and has captured the imagination of both men and women, and of people in all age ranges. The mobile phone is at once social and personal, and is in current deployment as an ''almost anywhere any time'' medium with access to many other antecedent or subsequent innovations and services, including radio, television, the landline phones and the internet.

Mobile adoption

Early analysts of technology innovation and diffusion have argued that adoption modeling by successive groups of users can explain the nature and pace of adoption of innovations. Rogers argued that a minority of early adopters tend to lead the way into mass utilization of newly emerging technologies (Rogers, 1962). He advocated measurement of two key variables: the speed of initial take-off and the pace of subsequent growth.

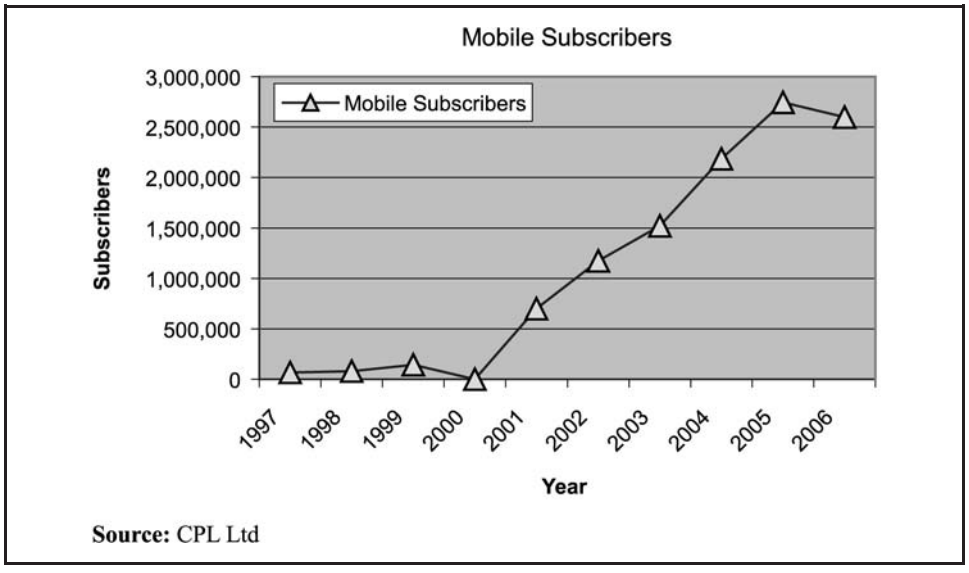
Data on the adoption of mobile telephony in Jamaica fit Roger's framework. Early development and marketing of the mobile phone was targeted at the upwardly mobile and professional classes. It was initially intended as an expensive product for the business leaders, who were the elite group of innovators and early adopters. But once the product became accessible in price and availability, as a result of competition and market reforms, there was rapid mass adoption. This was based on pent up demand, intensive competitive marketing, convenient prepaid usage cost coverage options and failure in the market for wired domestic telephones. There was a dramatic reduction in the use and importance of call boxes and a growth in fixed to mobile substitution. According to our surveys, young people were among the fastest adopters and at 2008 there was overall only a very small group of citizens that constitute non-users or the so-called laggards within the system.

Figure 1 indicates the adoption trend for the mobile phone in Jamaica during the decade after its initial introduction in Jamaica. The trend lines reflecting uptake of mobiles for the first four years is low and flat, indicating a small number of early adopters. It should be pointed out, however, that this pattern is not an indication of genuine lack of market uptake. The attributes of the cellular phone were known to the Jamaican consumers, as mobiles were already in wide use by then in neighboring North America, to which many Jamaicans travel.

The reality is that many citizens, unable to gain access to landlines, were keen to get a telephone by any means possible. But not at any price. The low initial rate of adoption was more a reflection of a cost and access distortion created by the monopoly provider. The pent-up demand exploded between 2000 and 2001, when new competitive providers entered, offering a wider range of choices, easier access, more widely available prepaid options, new features such as per second charging, lower handset costs and better marketing.

It is clear that where initial adoption of the mobile phone was slow, the primary inhibiting factors were service availability and handset prices as well as network effects such as limited access by other users. Once competition had driven prices down and made access more general in the population, growth became exponential. Figure 1 does not reflect the later stages of the adoption process, although, as indicated, we are aware of near ubiquity by 2008. The adoption pattern conforms to Beal and Bohlen's (1958) technology adoption

Figure 1 Jamaica's mobile adoption trend-line 1997-2006



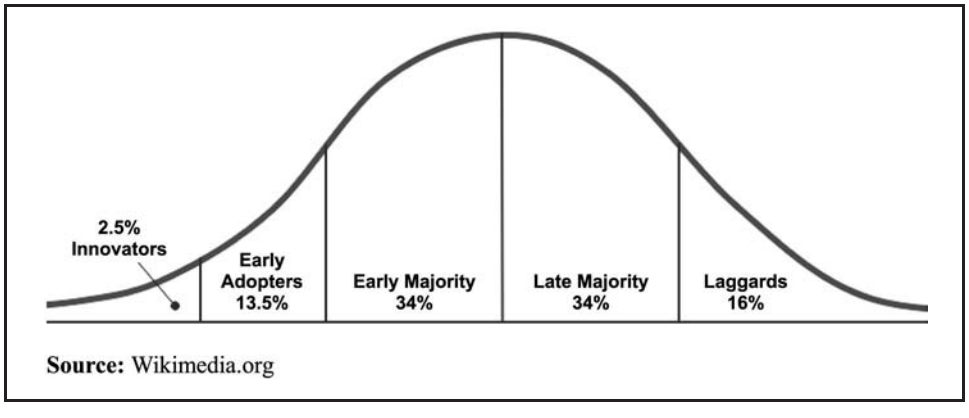
cycle, with an upward trend, followed by a leveling and then a downward trend as the technology becomes more mature and the market more saturated (Figure 2).

Rogers' (1962) ideas of innovation diffusion were built on the earlier theoretical constructs of the technology adoption lifecycle model, introduced by Beal and Bohlen (1958). Discussing agricultural and seed corn innovation, they argued that a new product or service would be more easily adopted based on knowing the mindset and characteristics of specific groups of innovators or first adopters followed by other groups of early adopters, then late adopters and afterwards those who are the end-stage adopters, called laggards. Applied to the mobile phone adoption market, the latter group would include an estimated four percent of Jamaicans who had not yet acquired a mobile phone. But the great majority of adopters would be represented in the mid-point stage of the product lifecycle in Jamaica and the region.

Mobile usage – survey results

The 2007 Household Survey of 1,174 low-income respondents in Jamaica indicated a very high level of usage among all the low-income respondents sampled. Some 94 percent of respondents indicated that they had used a mobile phone to make or receive calls in the preceding three months. The results also indicate that 6 percent of respondents had not

Figure 2 Technology diffusion cycle



used a mobile phone in the reference period. However, as an indicator of the overall high levels of mobile phone usage in Jamaica, the results show that usage was recorded consistently above 90 percent across most age groups. This was also true among both men and women where 94.9 percent of women and 93.1 percent of men had used a cell phone in the three months preceding the study.

The data suggest mobile telephony constitutes a common, well-established and constant feature in the lives of a large majority of Jamaicans. This is supported by 69 percent of the respondents who reported that they had used the mobile phone for a period of four years or more, which is consistent across both sexes with 67.5 percent of males and 71.6 percent of female users having long usage profiles.

Respondents in the 2008 qualitative component of the Jamaican mobile telephony studies also emphasized their need of the mobile phone as an inextricable feature of their lives. Respondents from depressed inner-city communities said that having a mobile phone is like a necessity, because through the mobile they were accorded an elevated social status and respect. One respondent indicated that it ''is all about being part of a crew or gang. Wid yu phone yu feel hype and yu gain respect.'' This is a powerful motivation for ICT technology acquisition and a foundation for more intensive engagements with broader social, educational and personal applications.

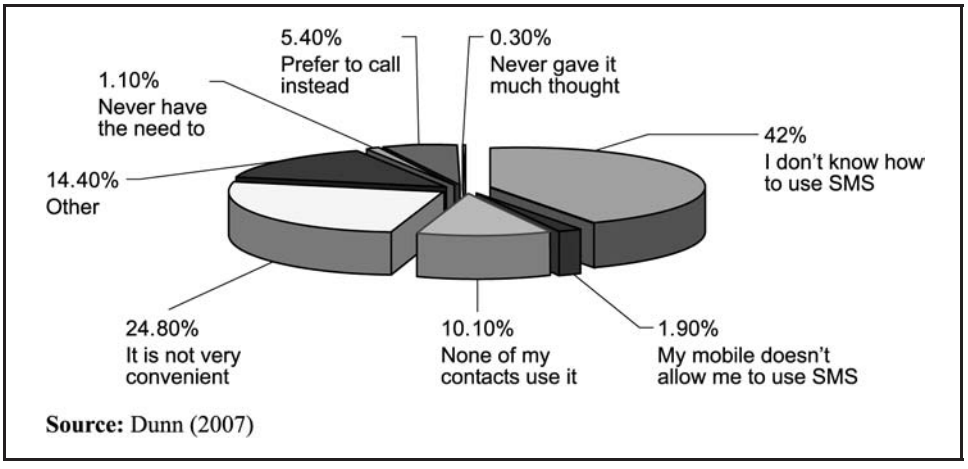
The study also found that the majority of mobile phone use is mainly among the more educated strata of younger working people who engage in simple SMS text searches as a conduit for transactions. Significantly, however, we found that an unusually high proportion of poor rural and inner city youth were opting to use voice calls instead of ''texting''. Figure 3 highlights some of the reasons why respondents were not using the text message feature.

Further investigation indicated that illiteracy among these groups was a real impediment for using text messaging. It would seem that while older users were put off by the manual dexterity required for texting, many younger users who would normally be expected to use SMS were not able to do so as they cannot read or write to the required standard. To encourage widespread text-based usages, public policy will need to address basic literacy as a critical step towards information literacy and greater involvement in the digital space.

General attitudes to technology

To demonstrate the occurrence of extensive mobile phone usages among poor Jamaicans, the survey further explored the attitude of these users to technology in general. The findings from the 2008 study indicate that Jamaicans are in fact keen on technology adoption if the appurtenances are affordable. An example of this attitude is the response to mobile telephony after the liberalization of the telecommunications sector in 2001. Digicel, now the leading mobile services provider in the country, was able to amass 100,000 mobile

Figure 3 Reasons for not using SMS regularly



Source: Dunn (2007)

subscribers in its first 100 days, a goal which the new company had established for its first year of operation.

Extending the argument beyond the Jamaican shores, to neighbors in Haiti, a similar affinity was displayed towards the cell phone as a common phenomenon throughout the Caribbean. Charles (2007) reports that ''cell phones are connecting Haitians in unheard-of ways, touching the lives of rich and poor, farmer and urbanite, and propelling this Caribbean nation to nearly first-world stature – at least when it comes to talking on the phone.''

The core message of this shared regional experience is that people with low-incomes have a high degree of affinity for mobile telephony because it enables them to manage their lives and social reality better. Many indicated that they aspire to greater skill levels and more advanced ICT applications, once these were affordable. They agreed that not only is the cell phone bridging or transitioning low income people to more sophisticated technological usages, but also to more advanced economic and social involvements. The potential positive externalities of the mobile phone among low-income people are discussed in the section below.

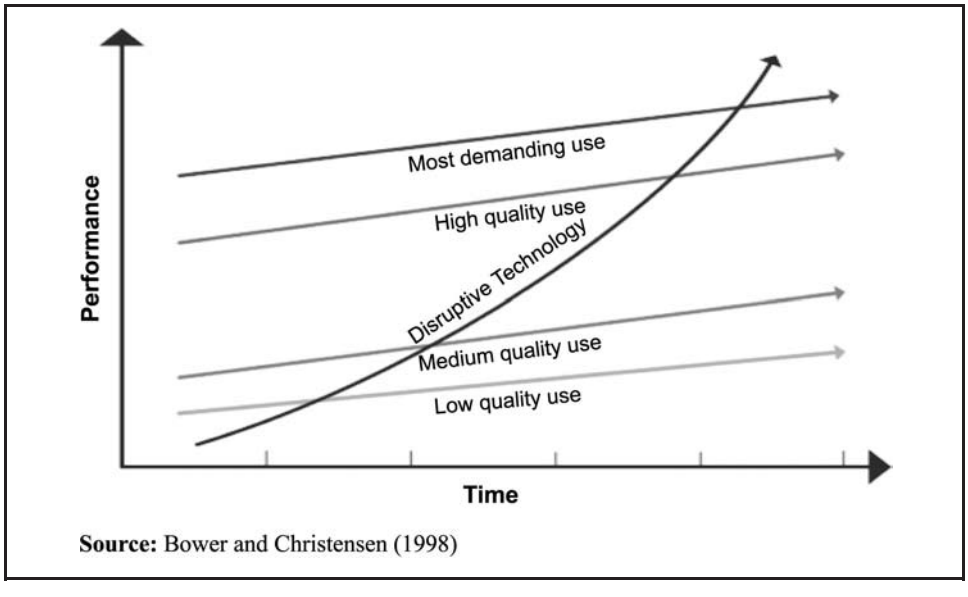
Mobile – from disruptive to transitional technologies

It may well be that what Bower and Christensen described as ''disruptive technology'' has found expression in the manner in which the low-priced mobile phone is developing. In Christensen's later works he uses the term ''disruptive innovations''. These innovations are ones that may be lower in performance and cost, but can fundamentally alter market diffusion patterns of an established technology. This radical market disruption often comes from low-end products that more effectively meet user needs and are found to be attractive to a larger number of users than the main existing product.

Other recent examples of disruptive innovations include cheap digital photography that made print film virtually obsolete for a large part of the market. Another example is the portable, inexpensive ''flash drive'', which has had a disruptive effect on the cost and purchasing patterns of earlier systems of computer memory storage.

That mobile broadband is becoming a disruptive innovation in relation to conventional methods of internet access is something that is increasingly evident with the emerging convergence of voice over internet protocol (VoIP) – a cheaper means of delivering voice messages globally. Figure 4 illustrates how disruption can occur across multiple established

Figure 4 How low-end disruption occurs over time



Source: Bower and Christensen (1998)

services and usages, each showing mild to moderate growth rates, but superceded by the radical growth of a low-end innovation over a similar or shorter period.

Within this schema, the mobile phone may be regarded as a disruptive innovation in its low cost and capacity to re-structure and radically change the established markets for interpersonal communication. This includes its impact on fixed line phones, and on emerging access patterns to the Internet among a majority of users.

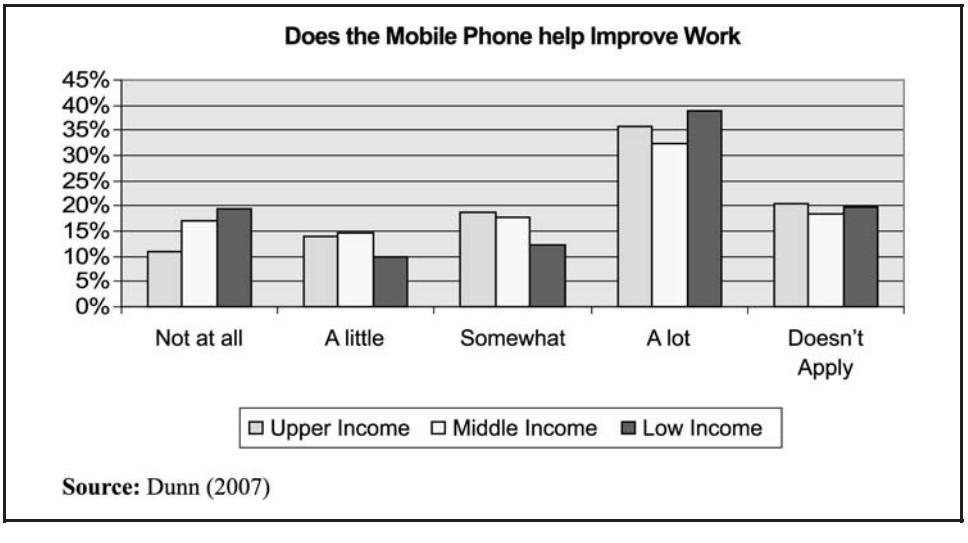
The mobile phone has already transformed the established market for wired telephony in ways that now render disproportionate the number of mobile phones to landlines both in Jamaica and globally. According to the International Telecommunication Union (ITU), the process widely documented as mobile substitution is continuing to redefine the meaning of such terms as ''teledensity'' and ''universality''.

The fixed to mobile substitution rate in Jamaica has mirrored the rate of change globally, despite efforts to slow the consumer shift from landlines to mobiles. Between 2004 and 2007, there was a 15 percent decrease in the number of fixed line customers in Jamaica, even as the mobile customer base expanded. The number of mobile subscribers has been increasing rapidly and stood at just under three million in 2007. The entry of Flow, a fixed line, triple play provider in that year may however eventually slow the pace of substitution, but not the continuing disruptive growth of the mobile side of the network and its potential as a bridging innovation into wider and more popular broadband uses. This mobile trend may well be even further extended with the competitive effect of América M?vil's Claro entering the market.

While Christensen demonstrated that these characteristics can lead to the uprooting of other more traditional technologies, the argument can be extended to demonstrate that not only are the older personal communication technologies being uprooted by mobiles but also that certain fixed aspects of the social structure are being disrupted as well. While we do not ascribe this exclusively to the mobile phone, we nevertheless note its role and relevance in increasing re-adjustments to interclass and interpersonal relationships. In the same way that online networking sites are able to bridge social and geographical divides among varied users globally, so too can the mobile phone in enhancing linkages among all classes of users. Growing business opportunities are created with skilled inner city workers advertising their services and their mobile telephone contact numbers to upper and middle class residents on the basis of initial address anonymity.

Among the key questions asked of respondents is the extent to which having access to a mobile phone has improved aspects of their lives. Figure 5 displays response with regards to work.

Figure 5 Mobile phone usage at work



Source: Dunn (2007)

What can be observed from Figure 5 is that the percentage of low-income respondents, who indicated that the cell phone assists a lot on their jobs, is actually higher than that of the high-income respondents. This result runs counter to the prevailing beliefs that higher income earners gain more extensive benefits from use of the cell phone. The qualitative findings corroborate the observed quantitative differential between socio-economic classes in terms of the impact of mobile phone usage for work.

In terms of educational and information services, the quantitative findings suggest that the mobile phone is being used in these areas by both the high and low income earners, as shown in Figure 6.

Again we observed that low-income citizens are relatively as avid as upper income groups in the extent to which they engage in complex applications of the mobile phone to suit specific social and personal needs. It is from this vantage point we argue that the mobile phone has an inherent field of embedded opportunities for the poor and marginalized in Jamaica and the wider Caribbean. The data demonstrate that low-income people are not technology averse. Internet enabled mobile phones are becoming ubiquitous among all socio-economic groups owing to decreasing handset costs, and that the mobile phone is being used as an educational instrument. These are all pointing to the mobile phone as a potential development tool.

But, some might question why traditional fixed line broadband services are not also considered as a possible route to connect low income Jamaicans to the information highway. Based on the survey findings close to 70 percent of the respondents indicated they do not have a fixed line connection at home. The low uptake of fixed line telephony among the respondents can be generalized to the overall population. The World Bank reported that in 2006 there were 17.8 fixed telephone lines per 100 people in Jamaica, which is a low fixed teledensity by any standard[2]. Fixed line telephony is still the main avenue through which people access the internet. The low fixed line teledensity in Jamaica therefore suggests that a large percentage of the population is unable to access the Internet through this medium. Figure 7 illustrates this fact.

It is from this vantage point that the paper argues for mobile broadband as a viable strategy to connect low-income people to the Internet Society.

Residential anonymity

A cluster of respondents in the Jamaican qualitative study indicated that a key reason for the affinity demonstrated towards the mobile phone is what we have termed ''residential anonymity''. One of the many plights that inner city communities in Jamaica have to contend

Figure 6 Education services and information access through the cell phone

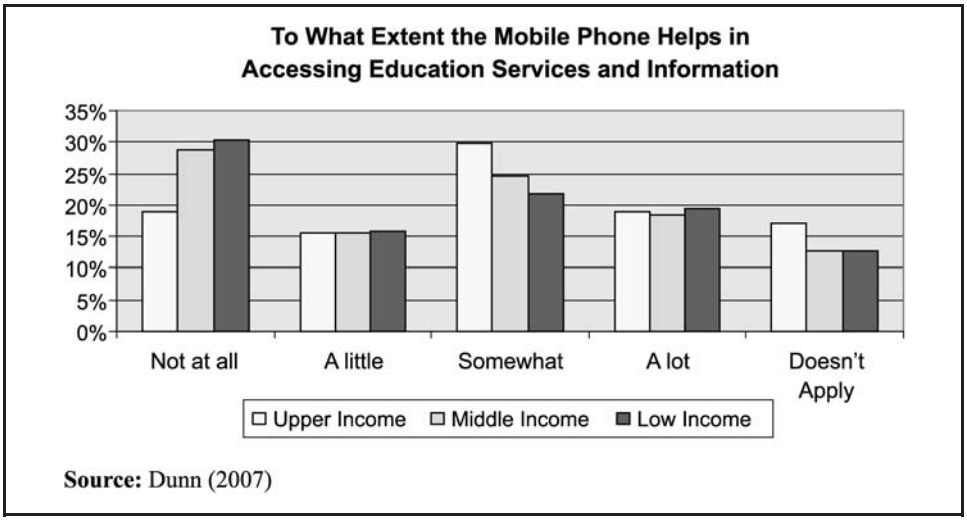
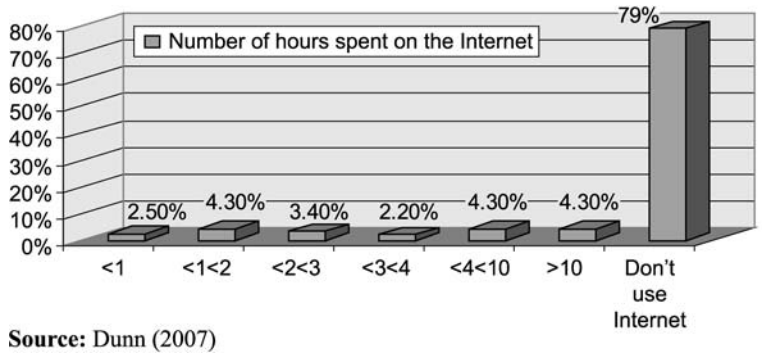


Figure 7 Number of hours spent using the internet



Source: Dunn (2007)

with is the issue of stigma associated with residing at the so-called ''wrong address''. Since political independence in 1962, there was a massive migration of people from rural areas to the national capital, Kingston, to seek opportunities and jobs. As the population in Kingston swelled, large pockets of depressed communities of poor, unemployed and mainly young Jamaicans emerged on the outskirts of business centers and more established residential communities. In a later volatile political period buoyed by ideological clashes between political partisans, residents in these makeshift communities were designated as being from various camps and some youth recruited as pawns in a bloody political game to violently reinforce political party power.

The social history of that political period has carried over into modern day Jamaica, where these garrison communities are still perceived as comprising partisans of one stripe or another, or criminals and untrustworthy individuals. The reality is that even uninvolved professionally qualified residents of such communities are often stigmatized and unable to find meaningful employment when their addresses come into question.

Respondents in the study who hail from such communities highly value the mobile phone, because it disguises their postcode and physical location. Said one respondent:

> Even with fixed line numbers an employer could use the area code to pinpoint exactly where a potential employee lives but not so with mobiles . . .

The residential and inner city communities represent two distinct physical places and spaces. The data suggest that the social mobility of an individual from one physical address to another is very difficult because of specific social barriers. An implicit notion arising from the qualitative leg of the study is that inner city residents are now able to transcend their places of abode to actively engage in a virtual space that involves both the elite and the poor without changing their physically embodied place. As one respondent noted:

> Nobady nuh know wey mi live when mi gi dem mi phone numba [no one knows where I live when I give them my phone number].

This also demonstrates the potential of the mobile phone to move beyond being a disruptive technology to becoming a transitional or bridging technology in people's lives. The reality is that the cell phone is vital in terms of poor peoples' usage of it to realize a tangible personal or family income benefit, to offer services, build and extend social and interpersonal relations or to seek employment.

Mobile – the transitional technology

Mobile telephony can be viewed as a transitional or bridging technology in the sense that it is facilitating mobility to higher levels of communication technology usage. Will lower hardware prices and cheaper network access drive wide scale popular adoption of broadband technologies in the same manner as the mass adoption of the once elite mobile phone? This is likely to some extent, although effective access to broadband usage requires a higher

level of training and cognitive skills. The ultimate answer to the rate of popular broadband adoption may well relate to the development of a ''killer'' application that can capture the imagination of lower income users in the manner that e-mail dominated the middle class adoption of the internet.

The patterns of technology adoption to-date have demonstrated that Jamaicans are not technology averse, and would be both quick learners and early or mid-stage adopters in the lifecycle of innovations regarded as beneficial to themselves and their families. The technologies of choice in the present era appear to be ones that combine mobility, low and user regulated costs with high delivery speeds and easy access. With continued growth in network competition leading to lower prices, and with improvements in the fidelity of WiFi and WiMax wireless technologies, mobile broadband would appear to have a future of more wide-scale adoption among working people in Jamaica, the Caribbean and globally.

WiMax

Wireless technologies are potent enabling platforms for outreach to underserved communities and digitally excluded individuals. The initial cost for network development in terms of infrastructure is historically not as daunting as fixed-line networks. A further positive attribute of wireless technologies is that they can enable larger geographical coverage in a much shorter time than fixed line technologies. The Jamaican government through its executive agency, the Spectrum Management Authority, has initiated the process of enabling wireless access to all Jamaicans by auctioning the requisite spectrum band frequency. Following this move, the dominant Jamaican mobile telephony firm has signaled its interest to offer mobile WiMax services to its clientele across Jamaica. This is an important development with significant implications for low income Jamaicans who are unable to access the internet through traditional avenues such as the desktop or personal computer. This mirrors developments across the world. Countries in Europe have already begun this move, with Sweden and Norway auctioning their 2.6 GHz spectrum in November 2007 and April 2008, respectively in a move to build out WiMax networks. The UK is in the process of doing the same.

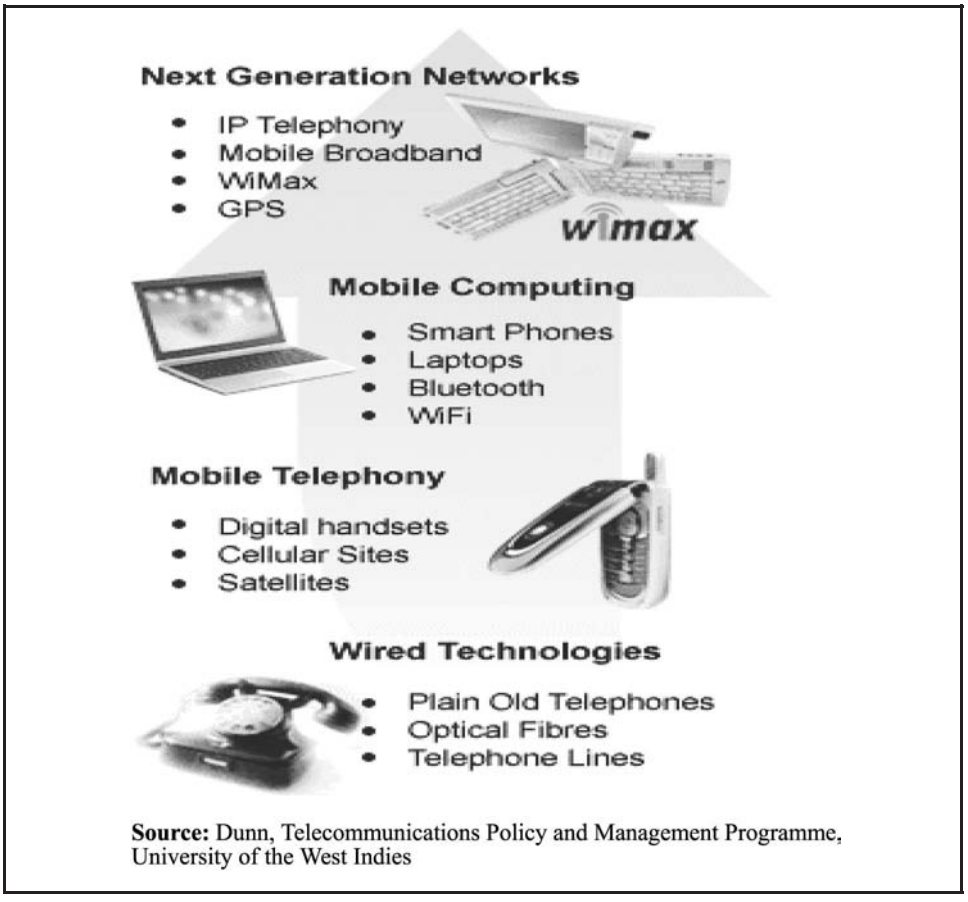
Wireless interoperability for microwave access (WiMax) has been heralded as an optimal technology with the extensive range and wireless reach capable of bridging the gap between those now excluded and advanced broadband users. In 2005, the Institute of Electronics and Electrical Engineers (IEEE) ratified the 802.16e standard for mobile WiMax, an important development in the broader access strategies we are foregrounding. WiMax is a digital technology that supports wireless broadband with a large geographical spread. Compared to a WiFi network with a geographical radius of about 100 feet, WiMax can cover a radius of 40 miles or more. As the technology does not have to operate with line of sight (LOS) between a user and a base station, it is regarded as very cost effective even in a developing country context.

Another important aspect of digital WiMax networks is the great degree of spectrum flexibility that they allow. According to IEEE specifications, WiMax networks operate in the frequency bands of 2 to 11 GHz and 10 to 66 GHz (licensed and unlicensed bands). Spectrum has become an increasingly important resource as the global communications industry expands. Governments are therefore moving towards technologies that are more spectrally efficient, without compromising the quality of communications services.

WiMax, when converged with the internet, GPS systems and other emerging information networks and delivery systems, is already providing the leading edge for next generation applications. It is to these applications that today's generation of mobile users will graduate, in a complex but already discernable process of technology transitions, as reflected in Figure 8

The upward transitioning of information and communications technologies is in the direction of increasing mobility, inter-operability and addressable applications. The trend reaffirms Ahonen's notion of the mobile phone as the seventh mass medium, providing the functionalities of most mainstream media. It is these integrated features available in a small, mobile and affordable device that, no doubt, endear the mobile phone to so many low-income users.

Figure 8 Selected technologies and transitions



Source: Dunn, Telecommunications Policy and Management Programme, University of the West Indies

Open source and content access

Ongoing improvements in open source mobile operating systems represent an avenue for wider access to content. In 2008, several industry players launched a partnership to unite the Symbian operating system platform. The partnership includes Nokia, Sony Ericsson, Motorola and NTT DOCOMO. The resulting unified platform is expected to be open source and royalty free.

This strategy is intended to increase the rate of innovation in mobile operating software without incurring substantial research and development costs. It would provide more advanced services to wireless consumers at current prices. This is an important initiative that will no doubt begin to rival the deployment of Google Android, a Linux based mobile operating software that has the potential to fundamentally change the mobile industry ecosystem.

Therefore, greater broadband access via WiMax signal distribution systems could be complemented by low-cost, open source content in the growing wiki world of Web 2.0 and beyond. These developments could contribute immeasurably to transitioning the digitally excluded communities from mainly voice-based mobile devices to more advanced data-capable high-speed applications for individual and social development.

Applications – banking and M-services

The Jamaica survey findings challenge a common perception that low-income people's use of mobile phones is mainly for chatter or idle social conversations. Our data suggest that the majority of calls consist of a deeper networking element intermixed with light social greetings, enquiries and personal updates. Data gathered from respondent's diaries in

Jamaica in 2008 indicated that while social conversation may disguise more deeply embedded economic inquiries, there is rarely only informal chatter pervading a call.

Beyond social or economic issues, Jamaicans are assimilating the cell phone into a range of different usages in order to challenge some of their social and economic limitations. Below are some of the responses from interview respondents:

Shawn, male and an unemployed inner-city resident:

> . . . most times I don't have access to a TV so I use the Internet on my cell phone to get certain sports news like football and the NBA.

Mr. Miller, male security guard:

> . . . my life is really dependent on the cell phone because I have to use it for a number of things all at once. I can't wait to get an internet phone because I am a sound selector and then I can download music.

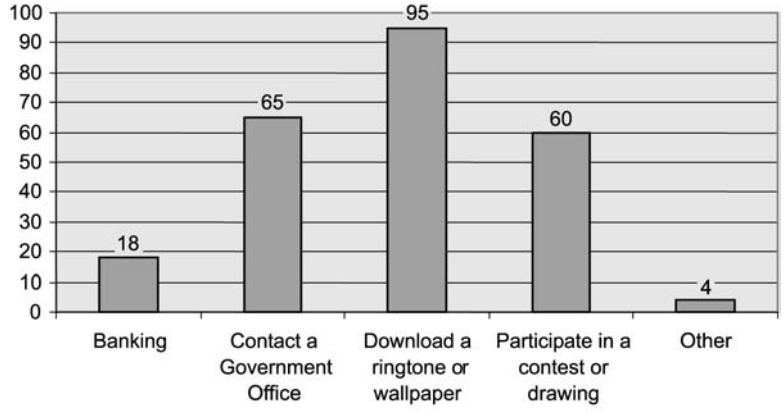
Luke, male, full time and working university student:

> . . . I have a blackberry phone and the internet is very important to me because I am always on the road and I need to check mails and those kind of things for new opportunities and to set up interviews.

As indicated in Figure 9, there are other beneficial uses for which the mobile phone is being used by low income Jamaicans. Drawing further on the results from the quantitative study we have found that a small but growing number of people are using their mobile phones to:

- conduct limited banking transactions – e.g. checking balances and shifting funds between accounts;
- access Government services – e.g. finding out details of regulations, tax liabilities and other fees;
- download internet content – ranging from music, weather and sports reports to stock market results and porn; and
- participate in contests or competition drawings – such as television game shows and music contests.

Figure 9 M-services by number of respondents reporting use



Note: Values are actual number of respondents and not percentages out of 1174

Source: Dunn, Telecommunications Policy and Management Programme, University of the West Indies

Applications – mobile money

One of the questions asked in the 2007 quantitative study, tried to gauge the attitude of poor people to the mobile phone as a money transfer device. A total of 75 percent of the respondents indicated that they would definitely use a facility that allowed them to transfer money from abroad through their phones. A smaller 25 percent indicated some apprehension about such transactions. Emerging initiatives for using mobile phones to effect sale and transfer of credit and to transact business in mobile money appear to have some foundation for the future. In a wider sense, an important finding is that there is an open popular embrace among literate low-income users of e-commerce, using the mobile phone for starters.

Mobiles in educational pursuits

The pursuit of educational qualification through the mobile phone is another real yet under-explored deliverable of the mobile phone. Beside the possibility of internet research through more advanced mobile units, the portable handset contains many features useful for educational pursuits.

Stanford University, through its International Outreach Programme, undertook a pilot study called the ''Dunia Moja'' project, which provides distance education in Africa through mobile phones. Stanford enlisted the support of three African universities: Makerere University in Uganda, Mweka College of African Wildlife Management in Tanzania and the University of the Western Cape in South Africa. The project also involved private sector telecom services providers who donated high-end mobile phones to the program as well as helping with the technical issues involved. Pre-recorded lectures and lecture notes were circulated through the cell phone to students who were part of the project in Africa.

In Jamaica, a strategy being developed by university students is to record class lectures via digital mobile phones and also capture complex images or diagrams using the photo feature of the phone and later downloading these on faster, more powerful, larger screen systems at home, in libraries or in offices for closer study. These low cost pro-poor initiatives, among others, hold positive implications for more widely distributed educational opportunities from more endowed sources being made available to recipients anywhere in the world.

Techno-diffusion factors

While innovation and diffusion theories of technology adoption are generally concerned with people and the emerging tools used in society, they are analytically inadequate to explain the personal relationships that individuals develop with their communications devices. This is an area in communications research that needs to be more extensively developed in the future. The notion of the spatio-temporality of the mobile phone may point a lead in this direction. Brown and Perry (2002, p. 50) suggest that ''. . . to call something a 'place', brings attention to its located, embodied, personal, local, human nature. And to call something 'space' is to bring attention to its abstract, objective, global, general, inhuman qualities.'' The objective localized conception of space is instanced by a user of a communication technology who is in two spaces simultaneously: the physical space where each user is located and the metaphysical airtime space that both users occupy. Applied to mobile telephony, the interface of space, place and time offers an opportunity for more complex analyses about enhancing real time interactivity and possible new applications to reduce social spaces and distances. The idea of residential anonymity as mentioned earlier is a case in point.

This point is reinforced by Schegloff as cited by Rettie (2005). Schegloff's observation of the simultaneous existence of a mobile phone caller in two different places and spaces seems to fit into Bauman's notion of liquid modernity:

> In a world of shape-shifting capital and labor, modernity is best defined as amorphous – in short, liquid.

Bauman's idea can also be seen in the context of Urry's (2007) notion of multiple mobilities. Urry suggests mobility does not only refer to the movement of people but also ''of other societies of ideas, images, technologies, monies, flowing across various scapes'' (Urry,

2007, p. 188). Numerous other authors from disparate backgrounds have hinted at similar ideas using different terms: Castells (2000) called it ''timeless time'', Cairncross (1997) called it the ''death of distance'', and Urry (2007) called it ''instantaneous time''.

These ideas of narrowing spaces, contracted time-bands and swift outreach are defining features of the first decade of the twenty-first century. They describe emerging processes of social and technological convergence that privilege speed and utility. The gap we seek to address is the continuum of innovation and social uses that lead to upward mobility of both user and technology outcomes. It is this that defines our own ideas of the transitional and bridging attributes of the mobile phone. It facilitates the mutation from one stage to another usually higher stage of application while increasing the capacity to convey a user or process into a new space without necessarily abandoning the original technology or point of departure.

The policy nexus

The findings on mobile telephony in Jamaica reaffirm that the transitional possibilities are significant for poor and marginalized sections of the society. This is supported by the data on adoption and usage to advance social and economic circumstances. Furthermore, the development of technologies such as mobile WiMax and accessible open source content can enable mobile phone users to transition to more advanced forms of broadband technologies.

However, while the prognosis is positive, the inescapable reality is that there has been a very slow uptake of broadband applications in Jamaica. Our 2007 study indicates a household adoption rate of 21 percent for broadband services among low-income groups in Jamaica, a level mirroring wider Caribbean trends (Dunn, 2007).

In Europe, Massini ascribes the pace and effectiveness of mobile technology adoption to several factors explored in a comparative study of Italy and the United Kingdom. Seeking to avoid the temptation of a reductionist approach, she draws on not one but four interrelated influencing factors, in line with Lyytinen and King. She suggests that these factors perform determining roles in mobile technology diffusion and growth in the sector. In her 2004 multidimensional analysis, she concludes:

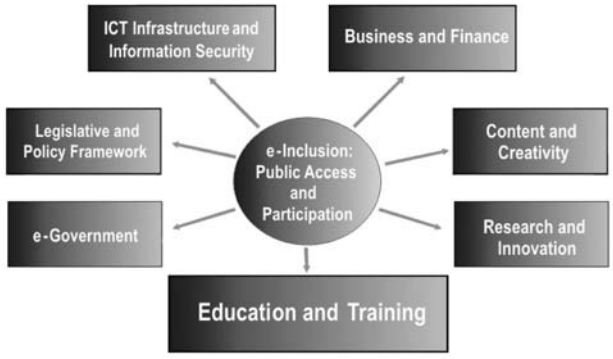
> A holistic research framework, based on Lyytinen and King's (2000) model, which incorporates the complex set of interactions between the innovation system, regulatory regime and the marketplace, all centrally co-ordinated by inter- and intra-system standards, is proposed as an alternative framework to analyze the complex set of interactions directly and indirectly impacting on the rates of innovation adoption and diffusion of complex services across markets (Massini, 2004).

While these factors emerged from a European policy environment that can be quite different from the context of the Caribbean, they are nevertheless found to be useful considerations in analyzing and understanding the Jamaican situation. In Jamaica there is a dynamic and accommodating interplay between the regulatory system, the innovation system and the market, in line with Massini's framework. However, there are other more qualitative insights and distinctions that are necessary to reflect the full spectrum of the techno-diffusion process. Such a multi-dimensional analysis is reflected in our 2008 research report entitled ''Wha' a Gwaan?' – A qualitative study of mobile telephony and poverty in Jamaica'' (see Dunn, 2008).

In addition to the above, the policy considerations for mobile as a transitional technology must be examined within the larger context of the Jamaican strategic roadmap included in the National Information and Communication Technology (NICT) plan (Dunn and Duggan, 2007). Figure 10 displays a possible strategic roadmap that spans seven very important interdependent variables, which are critical to address the overarching goal of e-inclusion and public access to ICTs. An enabling policy and legislative environment remains crucial, as is the development of multifaceted information literacy from early childhood to advanced members of the national community and workforce.

The Jamaican NICT proposals underline the importance of a creative mix of public policy and private sector initiatives in the domain of education, training culture, content and

Figure 10 Jamaica strategic roadmap of ICT development



Source: Jamaica National Information and Communications Strategic Plan

creativity as critical steps towards ensuring effective public access to ICT services. It is made clear that physical access to the wide range of ICTs is virtually meaningless unless people are equipped with the cognitive skills necessary to generate new innovations and make meaning from the bits of information flowing through networked systems.

One very important policy consideration in the Jamaican context is in the area of educational technology. On one hand, it was demonstrated that Jamaicans are not technology averse, and are willing to use available technologies to improve their livelihoods. On the other hand, it was demonstrated that among the poor, the usage for SMS and text related applications were low because of the high level if illiteracy. As a policy imperative, creative approaches in educational technology policies are now necessary in order to leverage the ubiquity of the mobile phone as a more pervasive learning device. This approach should be spearheaded by the major universities in collaboration with the government ministries of education and information. This might also turn out to be a creative approach to addressing widespread illiteracy among Jamaican youth, as it emphasizes self-directed learning and a process of ''learning smart''. However, it should be noted that prolific use of the mobile phone is no longer the key policy goal. Mobiles, as the most widely distributed form of ICT among the Jamaican populace, can empower more low income Jamaicans to use other forms of technologies for personal development, including enhanced education and income generation through higher levels of ICT entrepreneurship and global marketing.

Amidst the call for cheaper wireless technologies as tools for redressing global and local digital inequalities and poverty, we are also cognizant of the strategic importance of overall ICT sector development. Improved policy initiatives are needed to promote people's upward mobility through re-engineered low cost laptops, cheaper Internet enabled PDAs, more widespread use of WiMax and cloud computing as well as more interactive tools for e-government, e-health and e-banking. Such policy initiatives must facilitate low cost mobile handsets equipped with broadband capabilities providing a more efficient entry point by the poor to a continuum of faster and greater uses of the major global networks.

As with most policy issues, measurability of key parameters is integral to the policy formulation and implementation processes. We must keep track of local and global indices of telephony and broadband usage, densities and per capita expenditure on subscription and airtime credit, among other measures. In this regard, much more work remains to be done on developing objective and verifiable methods to capture the more nuanced and ingrained overlaps between poverty, ICT access and mobile telephony availability variables. This study affirms the importance of mobiles to inner-city residents who are now able to challenge the stigma associated with their addresses, through the anonymity they enjoy from use of the mobile phone. This improves their sense of well-being and agency. How is such a positive externality to be captured in growth accounting? How can the social capital that is

developed among community members as a result of improved telephony access be gauged as a sustainable developmental variable?

Conclusion

We have argued that the mobile phone is the technology of choice among poor Jamaicans seeking to better engage the opportunities of the knowledge economy. The rapid arrival of a stage of ubiquity in voice telephony in Jamaica signals the need to build on the foundation of what can be a transitional technology towards more widespread and intensive use of the mobile internet.

The centrality of promoting greater command of personal literacy including competences in basic as well as information processing skills is at the heart of the way forward and an inescapable conclusion of our analysis. That significant segments of young citizens in inner city and rural communities in Jamaica are unable to employ texting and more advanced uses of mobile ICT innovations is an important marker of the challenges ahead in building a new, literate workforce as the foundation for a knowledge-based economy.

This situation is by no means unique to Jamaica, and holds lessons for many other Caribbean and global South countries now looking to take advantage of the digital millennium.

On the other hand, many literate users have already started to gain effective access to the Internet for the first time via mobiles and are able to engage in a variety of pursuits ranging from educational, research and publishing ventures to social networking and economic transactions.

That the mobile phone can confer address anonymity to actors at the bottom of the pyramid who happen to live at the so-called wrong post-codes is also significant. While traditional fixed line telephony would expose caller locations, mobiles and mobile broadband applications such as texting, other SMS messaging and e-mailing are recognized as providing additional means to challenge the debilitating effects of digital exclusion.

As indicated, public policy must facilitate a transition from the predominantly voice-based universal access approaches to higher operational thresholds and wider broadband usage, from varied platforms ranging from smaller-screen mobile applications to larger screens on more advanced computing workstations.

Effective and not simply formal access to ICTs involves the recognition that intuitive systems, sustained affordable contact and relevant training are crucial in the use of ICTs for development. Transitioning from low cost mobiles to more advanced wired and wireless applications will require greater public and private sector investment in measures such as cloud computing, smart villages, low cost hardware, reduced software costs, ICT business incubators and in facilitating widespread training and a culture of ICT entrepreneurship.

Notes

1. The Jamaican household survey (Dunn, 2007), was conducted as part of a seven-country study co-ordinated by the Latin American and Caribbean research network DIRSI, with the support of the International Development Research Centre (IDRC) of Canada. Other countries in the study included Trinidad and Tobago, Columbia, Brazil, Argentina, Peru and Mexico. Many of the findings emerged in common, including the growing importance of mobiles to poor urban and rural communities and marginalized individuals in the region.
2. http://devdata.worldbank.org/ict/jam_ict.pdf

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