MOBILE PHONE ECOSYSTEMS AND THE INFORMAL SECTOR IN DEVELOPING COUNTRIES – CASES FROM JAMAICA

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ABSTRACT

This study investigates the role of the ICT ecosystem within the informal business sectors of rural and urban Jamaica, relying on an exploratory collective case study methodology to highlight the differences in how the use of mobile phones have facilitated and enhanced entrepreneurial opportunities for business operators existing in the informal economy. The findings of the study confirm existing research about the socio-economic benefits of ICTs but also highlight specific characteristics related to informal ICT ecosystems. For example, we found that there was a close-knit set of entrepreneurs who were motivated by competition between one another but who would still engage in mutual learning and information sharing. These ecosystems also entail a system of social hierarchy among the actors, although there is potential for mobility. Finally, we note that our findings suggest a potential reconsideration of definitions of the informal sector that emphasize low-skilled labour.

Keywords: ICT ecosystem, informal economy, micro entrepreneurship, ICT4D

1 INTRODUCTION

A recent contribution to the scholarship on information communication technologies and development (ICTD) is that of ICT ecosystems. An ICT ecosystem "encompasses the policies, strategies, processes, information, technologies, applications and stakeholders that together make up a technology environment …most importantly includes people – diverse individuals who create, buy, sell, regulate, manage and use technology" (Open ePolicy Group, 2005, p. 3). Of particular relevance to developing countries is the argument that the emergence of the new information and communication technology (ICT) ecosystem "provides a ubiquitous infrastructure and innovation platform that facilitates economic growth, innovation, and social interaction throughout the entire economy" (Fransman, 2010, p. 3). While this scholarship is particularly cogent for ICTD interventions, we wish to focus on three main areas where this research provides greater insight and clarity.

First we note that research on the new ICT ecosystem tends to focus on the macro-economic outcomes. These works examine the role of the internet as an innovative platform in developed and transitioning economies (Antonelli & Barnes, 2007; Arlandis & Ciriani, 2010; Bauer, 2012; Fransman, 2007, 2010, InfoDev, 2007; World Bank, 2012a); notwithstanding the fact that the internet is not widely accessible in developing countries (Larsen, 2013; UN News Center, 2012).

Second, within the literature on development studies, many observers have noted the importance of the informal sector. Within developing countries, the informal sector plays a dominant role in the economy as it creates employment, generates income, contributes to livelihood development, generates capacity building and increases the overall production of a country (Ncube, 2013; Torero et al., 2011; Wedderburn et al., 2011; World Bank, 2004).

Given the ubiquity of ICTs, and more specifically the mobile phone, in contemporary economies as well as the particularly important role of the informal sector in developing countries, we note the important intersection between ICT ecosystems and the informal sector. It is this intersection that we focus on in this paper.

Third, we wish to examine a specific type of ICT ecosystem, that which has developed around the mobile phone. In developing countries this is one of the most significant ICTs with regard to national and individual development (Donner, 2008; Waverman et al., 2005; World Bank, 2012b). However, currently there is a paucity of research examining how post-mobile phone ecosystem informal intermediaries have emerged and in what layer of the ICT ecosystem. More importantly, there is little or no published research on how the ICT ecosystem facilitates symbiotic relationships in the informal sector that is to ask 'who are the stakeholders in the informal sector that thrive within the ICT ecosystem?'

This paper attempts to extend the literature on the socio-economic impact of mobile phones by examining the informal business sector using the emerging framework of ICT ecosystems. More specifically, the authors seek to examine the influence of informal ICT ecosystems at the sub-national level. In so doing, we seek to expand the existing discourse on ICT ecosystems by focusing on; (1) the growing informal sector that is prominent in the developing-country context, and (2) the community level where informal business networks are often more relevant than at the national level.

Our main argument is that since its inception in Jamaica, the new mobile phone ecosystem has had a significant bearing on the operations and conduct of the informal business sector by providing a platform for innovative and relatively cheap mobile technology to effect business transactions. It has influenced the pattern and mode of interaction among stakeholders in the informal business network, that is, between buyer and seller; network provider, mobile phone operators and phone card vendors. In this way, the mobile phone ecosystem has revolutionised this informal sector by providing an innovative platform on which these informal entrepreneurs operate their businesses which maintain pre-existing symbiotic relationships, while creating new ones.

This paper is divided in three sections; in the first section we provide an overview of the formal ICT ecosystem, its emergence and key characteristics focusing specifically on Fransman's (2010) work. The next section examines the importance of the informal business sector and its contribution to the economies of developing countries. We then aim to show how the emergence of an ICT ecosystem has influenced the informal trade within the rural and urban areas and describe more specifically how the mobile phone has facilitated this trade, by providing a conceptual overview of the interaction between these stakeholders.

2 THE ROLE OF THE MOBILE PHONE IN THE ICT ECOSYSTEM AND MOBILE PHONE AS AN INNOVATIVE PLATFORM IN A DEVELOPING CONTEXT.

The view that ICT contributes to development in the global south remains contested, especially in instances where innovation was transferred from a developed to a developing context (Avgerou, 2010; Braa et al., 2004; Hayes & Westrup, 2012; Heeks, 2002, 2010). Avgerou, provides a four dimensional overview of studies which explored the claim that ICT contributes to development, these discourses focused on; progressive transformation, disruptive transformation, innovation by diffusion and transformation and socially embedded transformation (see figure 1). Of particular interest is the discourse on innovation by transfer and diffusion. This discourse outlines an interlinked between diffusion, innovation and

progressive transformation development. This discourse highlight that innovation established in developed countries can be transferred as a requirement for improving efficiency and livelihood outcomes in developing context. Though this discourse acknowledges the possibility of socio-economic development through technology transfer, it acknowledges that one size does not fit all, moreover developing countries do not have the technical capacity to absorb these innovations in its natural form, consequently institutions must adopt/must go through a adaption (Avgerou, 2010; Braa et al., 2004). This argument is of significance since this paper attempts to transfer the ICT ecosystem, indigenous to developed economies to a developing context.

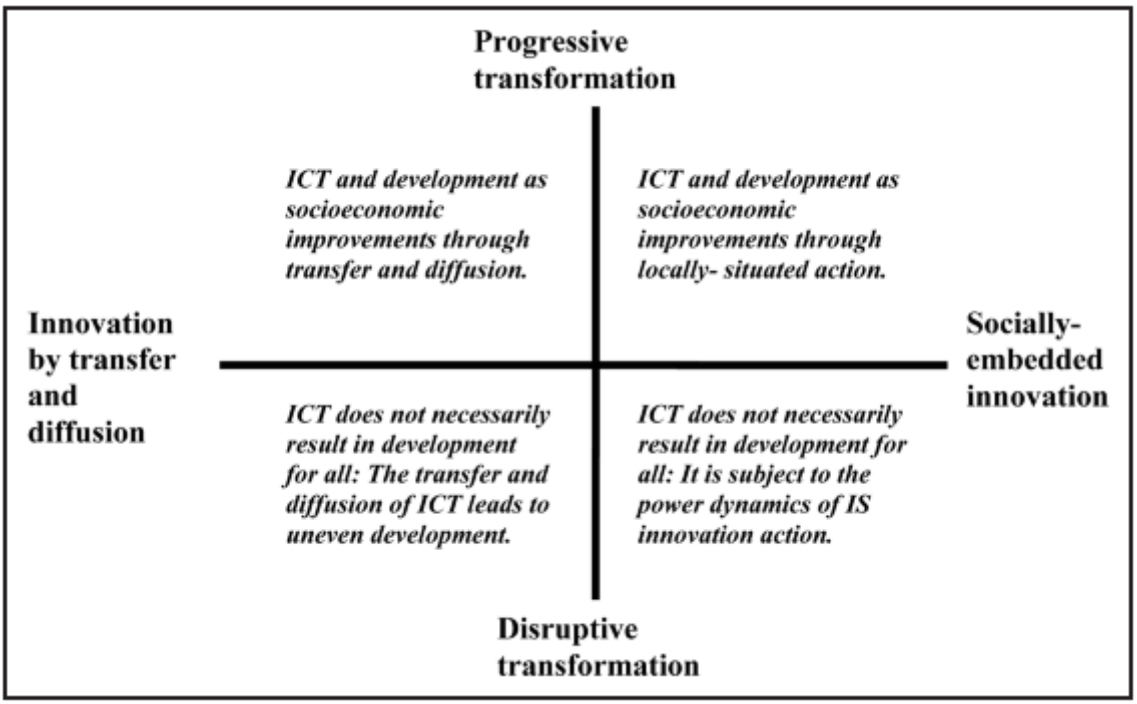

Figure 1. Four Discourses on ICTD, adopted from Avgerou, 2010

The concept of an ICT ecosystem was originally developed by Fransman (2010) who created the framework of analysis based on the biological ecosystem to be applied to large business sectors. Within the biological ecosystem, all the living organisms depend on each other for survival purposes and as such, symbiotic interaction and interdependence are essential. For instance, Antonelli and Barnes (2007), Arlandis and Ciriani, (2010) and Fransman, (2010) describe the ICT ecosystem framework as a four layer hierarchical model whose function is driven by the symbiotic interaction between the layers (see figure 2). In layer 1 are Network Element Providers, the foundation upon which the other three layers rest. At this stage are creators of computers and operating systems and routers. Examples of these network providers are; Samsung, Cisco, Microsoft and Alcatel etc. In layer two are Network Operators such as; Vodafone, Deutsche Telekom, T-Mobile etc., which provide networks services such as telecom, broadcasting, cable, satellite etc. Layer 1 and 2 are combined to form an innovative platform which is relied upon by Content and Applications Providers such as Facebook, Twitter, Yahoo, Apple's App store, Google Play, and Skype in layer three. Content and or services created in layer 3 are sold to a diverse customer base (companies, government, households among others) in layer 4.

Antonelli and Barnes (2007) note that members are not restricted to respective layers and in many instances are involved in more than one layer. This situation can best be described as a form of vertical integration, which exists within the ecosystem. Companies

may base most of their activities in one layer but might also be present in other layers, for instance Google continues to be listed as a layer 3 enterprise; however it has made significant advancement as a layer 1 enterprise with its Android software. Vertical integration usually occurs when there is a perceived need or opportunity to address shortcomings in the existing system. This vertical integration, however, does not seem to hamper the development of symbiotic relationships in the ecosystem.

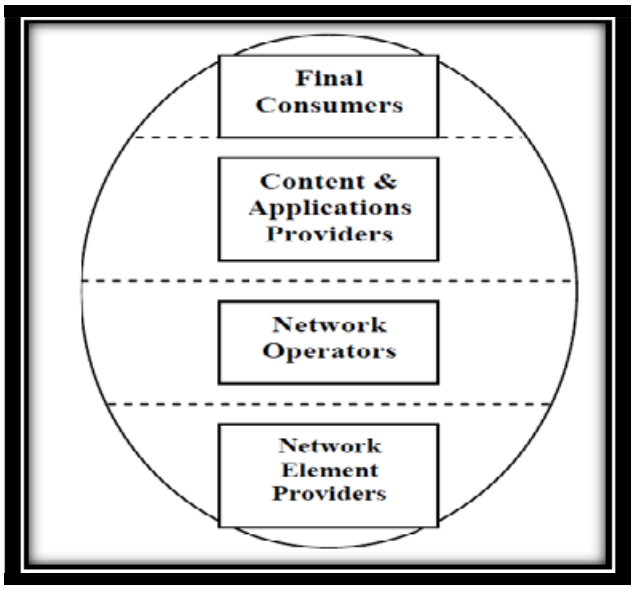

Figure 2. The Formal ICT Ecosystem (Fransman 2010)

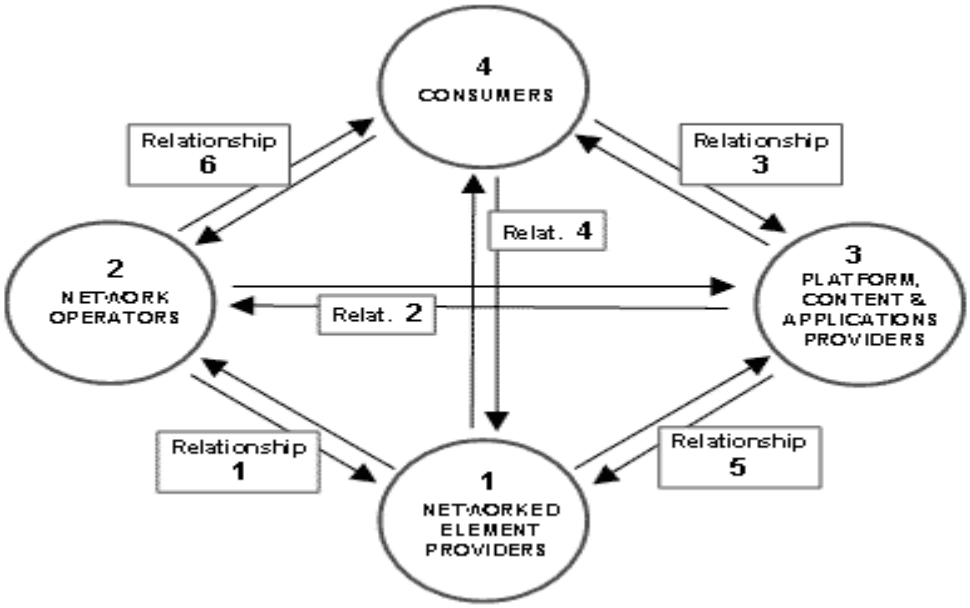

Figure 3. The Six Symbiotic Relationships with the ICT Ecosystem (Fransman, 2010)

	Relationship
1	Relationship between network element providers and network operators.
2	Relationship between network operators and content and applications providers.
3	Relationship between content and applications providers and final consumers.
4	Relationship between network element providers and final consumers.
5	Relationship between network element providers and content and applications providers.
6	Relationship between network operators and final consumers.

Figure 4. The Six Symbiotic Relationships within the ICT Ecosystem (Fransman, 2010)

According to Fransman (2010), the newly emerged ICT ecosystem has had implications on the economic sector, as it has altered the existing status quo and created new industries. He highlights how the emergence of ICTs served as an innovative platform which facilitated the amalgamation of the telecommunication and economic sectors (2011, p. 3). The ICT ecosystems emerged through technological innovation. This innovation challenged the capitalist status quo which was dismantled and reconstructed. In order to survive the players had to adapt. Fransman used Darwin's work to highlight that adaptation is key to survival. That is, within an ecology, changes in the environment are inevitable and to survive species have to conform to these changes to remain relevant. Similarly, adaptation and survival of firms and businesses is reflected in the economic sector whenever there are large-scale shifts in the ICT sector. The internet represents one such game changer.

During the ICT revolution, innovation forced other sectors to create new relationships and strengthen old ones. This was particularly so among the business sector such as the media, telecommunication sector and other competing firms. Firms were forced to transfer from the brick and mortar structures to online space in order to capitalise on the wave of innovation which brought efficiency through a reduction of distance and time. The internet provided a platform that facilitated new relationships with network providers, search engines, and linked online business with buyers and sellers giving rise to new sectors like social media. The innovation evolution is ongoing and in order to survive, organisms within the ICT ecology have to adapt by finding new ways to adjust and compete, maintain their survival and extend or completely transform the reach of their business.

Central to all ICT ecosystems is an innovative platform, which is regarded by Fransman as "a building block, which can be a product, a technology, or a service that acts as a foundation upon which other firms can develop complementary products, technologies and services" (Fransman, 2010, p. xviii). As such, in the case of developing countries, the mobile phone serves as an innovative platform in creating a significant impact within the informal sector. This is in contrast to developed countries where the internet is utilized as an innovative platform in creating a new ICT ecosystem. Invariably, Fransman and other scholars focused extensively on the new ICT ecosystem in the formal economy in developed countries, with the internet as the ICT under study. Understandably so, this was not applied to developing countries as the internet is not widely distributed. Furthermore, the internet does not significantly affect the informal sector in developing countries as it does the formal economy in developed countries. Nevertheless, while developing countries have limited internet coverage, they and by extension their informal economy has experienced an evolution of the ICT industry through a different type of ICT: the mobile phone, to which Fransman's framework of the ICT ecosystem is convincingly just as applicable.

Whereas the Internet has expanded significantly in the developed world, in developing countries the mobile phone has emerged as a cheaper and more accessible version of the ICT. Since the 1990's, the mobile phone has infiltrated rural and urban areas in developing countries at a much faster rate than the internet (ITU, 2013). This rapid rate of penetration has had a profound impact on the economy (Waverman et al., 2005). To effectively understand its impact, one must consider how mobile phones have introduced incremental benefits: improvements in pre-existing services, cheap communication, as well as reduction in distance and travel. Countries such as Kenya and Bangladesh are exemplars of how the mobile phone has introduced transformational benefits through the provision of an innovative platform such as M-banking and M-commerce. Significantly, the mobile phone has also introduced production benefits through the creation of new livelihoods, especially for the informal sector (Singh, 2009).

With the continued expansion of the international telecoms sector, in particular that of mobile phones, there has been significant growth in the occupational opportunities for providers and end users of this technology (Andjelkovic & Imaizumi, 2012; Quadir, 2012). According to Andjelkovic and Imaizumi (2012); Duncombe (2007) it has become evident that mobile phones have opened new avenues for its users to earn significant sums of money, buttressing their ability to sustain their livelihoods, as well as, shaping chances for them to become entrepreneurs. The authors explained further that there are no significant skill restrictions on who can benefit from the occupational opportunities available in this sector, as the entire gamut of employable people - top level management to low skilled individuals - are included (Andjelkovic & Imaizumi, 2012).

3 THE INFORMAL SECTOR

Given the importance of the informal sector among the rural and urban entrepreneurs, the structure of the mobile phone ecosystem differs from the formal sector, as trade tends to be unregulated. This unregulated trade, gives rise to "the informal economy which refers to activities and income that are partially or fully outside of governments' regulation, taxation, and observation," where, "…the main attraction of the undeclared economy is financial" (World Bank, 2004 p.1). We should note that there are numerous ways in which this phenomenon is construed (Mead & Morrisson, 1996). This includes the use of political criteria (e.g., whether or not the government regulates the sector, its inclusion in national statistics, or whether it is considered illegal), economic criteria (actors evade taxes, size of the sector, etc.), and social criteria (used as a means of survival, or is based on social networks) (Gërxhani, 2004).

The informal sector contributes significantly to the GDP in most developing countries, accounting for 80 per cent of the labour force in some cases and employing nine out of every ten individuals in both the rural and urban areas of Sub-Saharan Africa (Ncube, 2013). Highlighting figures for the Jamaican context, Torero et al. states that:

> "The informal economy represented a large and growing share of the overall economy, measuring in the vicinity of 40 per cent of total economic activity as currently measured. This growing sector represents a diverse group of enterprises and workers, ranging from local peddlers to sophisticated small entrepreneurs" (Torero et al., 2011, p. 5).

Blavy (2007) notes several features of the Jamaican informal sector that are relevant to this discussion. These include actors who are more economically vulnerable and have lower access to social services and training than their counterparts in the formal sector. Also

observers such as Blavy (2007) and Anderson (1987) and others note that the informal sector is often characterized by low-skilled work in Jamaica, a point which this paper will challenge using current evidence.

4 THE MOBILE PHONE ICT ECOSYSTEM IN JAMAICA - AN ADJUSTED MODEL

Perhaps what can be described as the informal ICT ecosystem both in the urban and rural areas owes its existence to two significant epochs in the mobile phone evolution in Jamaica. In the first stage, the liberalization of Jamaica's telecom industry paved the way for new mobile phone companies to enter the market. In April 2001, Irish Mobile Telephone Company Digicel was granted its telecommunications licensed to operate in Jamaica. Initially, the company projected that it would reach 100,000 customers after its first year; instead the company reached its mark within the first 100 days and established itself as the major mobile network provider. At present, the company controls about 75 per cent of the cellular phone market in the country (Golding et al., 2011). Its main competitor is the UK based enterprise Cable & Wireless which operates under the brand LIME. Cable & Wireless was formerly the largest telecommunications operator in the Jamaican market.

In 2012 mobile phone subscriptions per 100 persons in Jamaica was 96.54 (ITU, 2013). The vast majority of consumers use pre-paid services with one 2007 survey suggesting this proportion was as high as 97% (Dunn, 2007). Although little data exists, based on anecdotal evidence we estimate that a small but important minority of these consumers have smartphones.

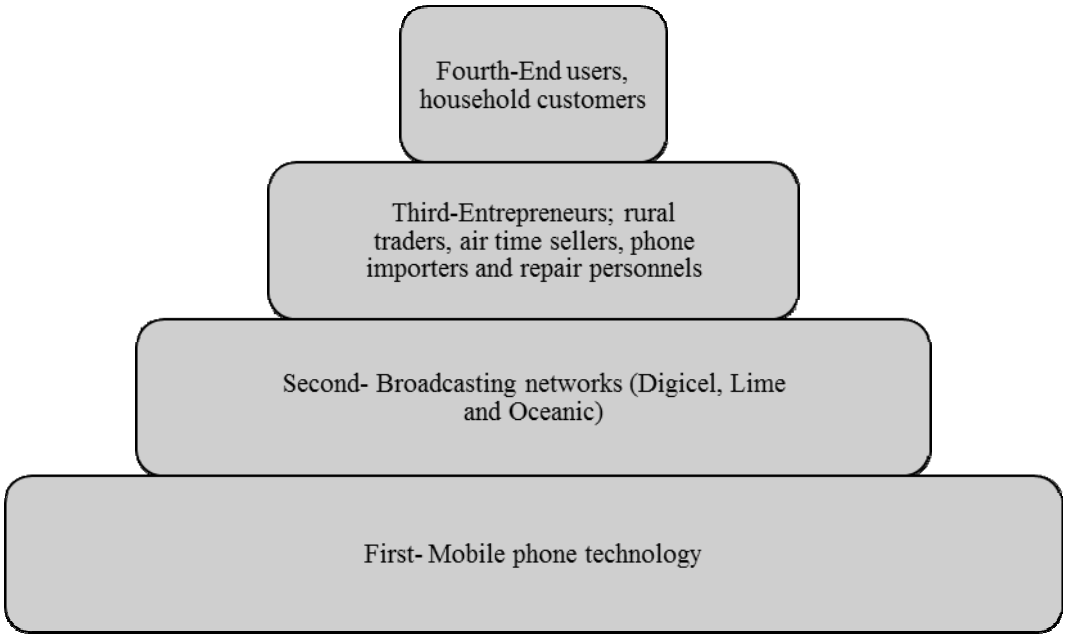

Figure 5. The Informal ICT Ecosystem

The overview of Fransman ecosystem above highlights the need for modification before transfer and application to a developing context affected by limited internet access and a large informal economy. At this juncture it is important to conceptualize the informal ICT ecosystem by tracing its trajectory. The informal ICT ecosystem did not emerge simultaneously with the inception of the mobile phones, but developed over time through a series of innovations. As illustrated in figure 5 the emergence of the mobile phone only represented the first layer of the ICT ecosystem. Like the formal ecosystem, figure 5 depicts a four layer hierarchical model, in layer 1 are handset providers (Nokia, Sony Erikson,

Motorola, Panasonic etc.). These handsets manufacturers relied on Jamaica's local network providers (Digicel and LIME) in layer two for its operability, the convergence between layer one and two created a platform for intermediaries. Within the ICT ecosystem, phone card vendors are one of the earliest known intermediaries in layer three. These vendors thrived as a result of the inability of network and handset providers to meet the demand of users, who depended on a ubiquitous supply of locations and avenues to purchase airtime (credit). Network providers had to rely on the phone card vendors to retail credit in the form of scratch cards to customers in layer four.

During the early years of the mobile phone's inception, it was used primarily for communication by end users in layer four. This was particularly important, as prior to the mobile phone most Jamaicans did not have personal access to any telephone-based service. Thus the mobile phone has enabled persons to join communication networks which previously did not exist in the country (Horst & Miller, 2006). However, over the years its role has evolved into a service delivery platform, facilitating connectivity and interdependence among buyers and sellers–predominantly at the third layer. A rise in alternative ways of conducting business among rural entrepreneurs, for instance, was now applied to conduct pre-existing business as entrepreneurs found new ways of connecting and communicating inside their markets. In addition, this medium, similar to Fransman's model (see figure 4), facilitated several mutual relationships: the mobile phone is dependent on the capacity of the mobile service provider to maintain its operative functions; the mobile networks in turn are dependent on the airtime vendors to distribute its services and; small and medium enterprise depends on the mobile phone, as well as the air time vendor for connectivity and communication with its customers to sustain their livelihoods (see case study 1 and figure 6).

Adjacent to the formal trade which includes phone stores, distributors of mobile phones and phone warranty repairs, is the informal trade in the urban area that includes a host/network of players in the form of importers, repair personal, phone parts traders, internet service providers and end users. Collectively, the interaction and interdependence between each player creates an ICT ecology. These players arrived primarily in the second stage of the mobile phone evolution.

The second stage of the mobile phone evolution in Jamaica is underlined by the emergence of smart phones, the services of these phones extended beyond the SMS and voice to multimedia communication capability. It included data usage, internet capability and video recording, as well as video playback. Whereas the initial emergence of the mobile phone provided an alternative medium for both rural and urban entrepreneurs to produce and distribute their products, the second wave of the mobile phone evolution has had a more profound impact in the urban area (see case study 2 and figure 7).

5 METHODOLOGY

An exploratory collective case study methodology was used to explore how and in what ways the ICT ecosystem transformed the modus operandi of a pre-existing entrepreneur as well as provided an innovative platform that facilitated emergent informal entrepreneurs (Baxter & Jack, 2008; Yin, 2003). The cases being compared include two sets of informal entrepreneurs who rely on the ICT ecosystem for their livelihood. The first case study features a pre-existing entrepreneur whose business transformed from a traditional system of operation to an innovative platform based in the ICT ecosystem. In the second case study, we examined how the emergence of the ICT ecosystem has introduced intermediaries in the form of informal retailers and technicians who have established an interdependent business network which

relies primarily on the ICT ecosystem for their operability. A comparative analysis of these two cases was conducted to identify how each set of informal entrepreneur functions uniquely within the ICT ecosystem.

Informal entrepreneurs were identified and selected using a combination of purposive and snow ball sampling. For case study one, the informal entrepreneur was selected using purposive sampling. The criteria for selection was that the prospective entrepreneurs had to have a business which preceded the ICT ecosystem and had an established interdependent network of buyers, sellers and suppliers who used traditional means of interaction. For case study two, we identified and included six informal entrepreneurs who have an established network within the ICT ecosystem providing goods and technical services to end users. The established network of these entrepreneurs would have proceeded exclusively from the ICT ecosystem. These informal entrepreneurs were contacted based on referrals both from customers who used their services and from other informal entrepreneurs. In the end, both case studies primarily target the principal trader in each network, and data on the operations and functions of the respective networks in relation to the ICT ecosystem was captured from their perspective.

Upon selection of informal entrepreneurs in both cases, the aim was to gain a first-hand understanding of their network's operability (centring on the ICT ecosystem) by way of face-to-face interviews. This method was adjusted from time to time to suite the circumstances and preference of the interviewee. In some instances the interview schedule and tape recorder were abandoned and instead a general conversation centred on the main interests of the study was conducted. This allowed participants to relax and develop a level of trust with the interviewer so that they were more comfortable with expressing themselves. In instances where respondents refused to be recorded we resorted to conversation and overt observation of the entrepreneur's activities.

For the entrepreneur whose business preceded the mobile phone ecosystem, the interview schedule explored (1) the nature of the business, (2) the level of interdependency among the players within the informal business network, (3) how and in what ways stakeholders within the network interact/operated before and after the emergence of the ICT eco-system and the extent to which they benefitted from the system and (4) the difficulties experienced in transforming from the traditional platform to being incorporated in the ICT ecosystem. In the case of the post-ICT ecosystem entrepreneurs, the interview guide captured information on; (1) their means of employment prior to the emergence of the ICT ecosystem, (2) their role in the ICT ecosystem, (3) strategies adapted in order to remain competitive and relevant within the ecosystem and (4) the types of symbiotic relationships that have resulted from the ICT ecosystem.

Overall, we interviewed six informal entrepreneurs from the post ICT ecosystem network and one from the pre-ICT ecosystem network. These were all conducted in 2013 within a 2-month span throughout Jamaica. Aliases are used in all cases throughout the paper.

The data was analysed within a qualitative interpretative framework, while discourse analysis was used to examine the use of language (what was said) in relation to social context. The respondents' interview scripts were reviewed meticulously for particular words or phrases that had applied social meaning (Janks, 1997). These phrases were deconstructed to better understand their socio-economic significance as well as to construct a clearer picture of how the respective informal ecosystems operate in relation to the emergence of the ICT ecosystem.

5.1 Quality Assurance in Interpretative Research

The qualitative/ interpretative framework is criticised for being subjective and lacking political rigour and objectivity (Rundall et al., 1999). The authors acknowledged these criticism as the data came primarily from "a small group of people based on personal opinion/judgement" (Waller, 2006, p. 141). Despite its vulnerability to such criticisms, interpretive research still has legitimacy as an approach to data collection and analysis.

Klein and Myers (1999) outline that interpretive research:

> "focuses on the complexity of human sense making as the situation emerges; it attempts to understand phenomena through the meanings that people assign to them…interpretive methods of research in IS are aimed at producing an understanding of the ***context*** of the information system, and the ***process*** whereby the information system influences and is influenced by the context." (p.3)

Overall, the authors attained quality assurance in data collection and analysis, as we adhered to Klein and Myers' (1999) seven principles of interpretative field research; the Hermeneutic Circle, Contextualisation, Interaction between Researchers and Subjects, Abstraction and Generalisation, Principle of Dialogue and Reasoning, Multiple Interpretations as well as Principle of Suspicion. For instance, we treated each interview as parts which were combined to achieve a full understanding of the phenomenon under study. These meanings were also analyse within two different contexts; one, Jamaica as a developing country; two, rural vs. urban setting. The researchers also took into account the historical context, namely the modus operandi of entrepreneurs in the pre and post emergence of the mobile phone. Interaction between researchers and subjects assisted in improving researchers understanding of how the mobile ecosystem influenced their trade.

To build trustworthiness within the study's interpretative frame work, also in keeping with the principle of abstraction, and generalisation, raw data was checked against secondary data and pre-existing theoretical frameworks (development/ecosystem and Information system frameworks), conducted in other settings. This was especially so for the case study two, which had a few outliers. Comparison to previous work to confirm or disconfirm researchers' biasness or distortion in respondent's views was balanced by being sensitive to the fact that multiple response may arise across respondents (Klein & Myers, 1999; Walsham, 1995)

6 RESEARCH RESULTS

6.1 Case Study 1 – The Rural Entrepreneur

This case is located in one of Jamaica's many remote rural communities in the south western part of the country. The community has a population of approximately 20,000 residents. The majority of adults earn their livelihood through farming, shop keeping, taxi operating and fish mongering. In the case of Ms. Blossom, she is a well-known individual in the community and makes her living by peddling/vending food items of fish and bammy[1] which she has done for over 40 years.

Previously, Ms. Blossom's primary mode of transport was a donkey which she would use to ride around the community in search of sale and sometimes ride up to fourteen miles as

[1] Fish and bammy is a popular meal in Jamaica; bammy is made from cassava flour

well to the local fishing village in order to purchase raw materials for her business. Since the advent of the mobile phone however, this entrepreneur has changed the modus operandi of her business and has fully integrated into the ICT ecosystem. As such, she is now based at home and customers reach her via her mobile phone. Customers also now have the option of placing their orders ahead of travelling to pick it up.

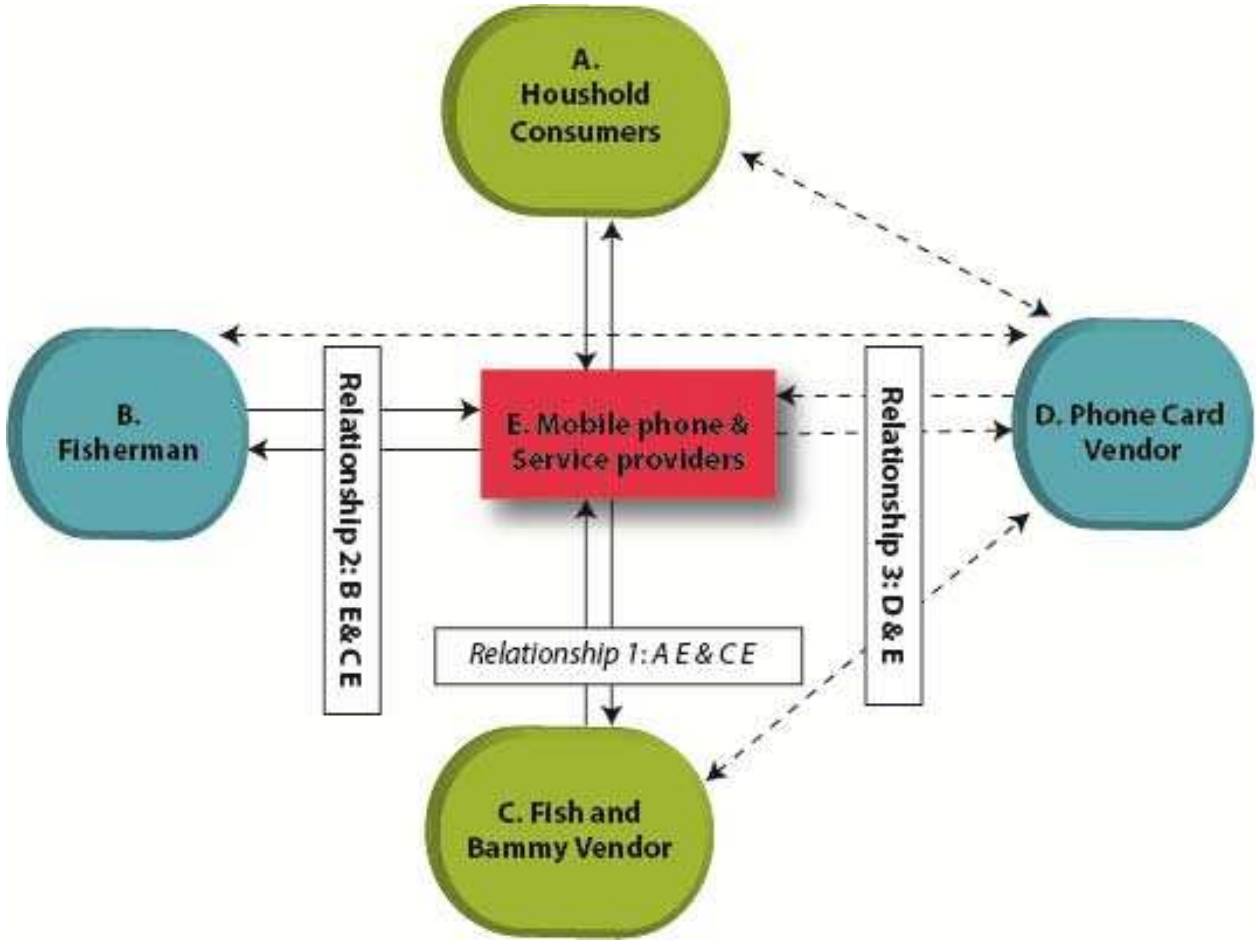

Figure 6. Symbiotic Interaction among Organisms

The case of rural entrepreneurs provides an overview of how the ICT ecosystem has evolved from a medium of communication to a platform on which a number of interdependent commercial relationships are established and maintained. It can be further stated that the introduction of the mobile phone has strengthened the symmetrical interaction among a number of the stakeholders. In the case of the rural ICT ecosystem, six symbiotic relationships were identified (see figure 6); 1)mobile phone and mobile service provider, 2) mobile phone service provider and phone credit vendor, 3) phone credit vendor and household, 4) phone credit vendor and Fisherman, 5) phone credit vendor and 6) Ms. Blossom.

Similar to the internet, the convergence of the mobile phone and network operators provide an innovative platform for the different players (phone card vendors, Fishermen and Fish vendors) to interact in the ecosystem. In essence, the mobile phone is central to the end users interoperability. For instance, in the case of the fish and bammy vendor, the mobile phone sustains the symbiotic relationship between her and her customers, as well as with her suppliers of raw materials. As seen in Figure 6, the buyers of her fish and bammy represents her primary market and she is dependent on them for her sale just as the customers are

equally reliant on her for the supply of fish. To satisfy their needs, it is essential that they make contact with her. With the use of the mobile phone, each organism is able to communicate back and forth with each other. Her customers are able to call and place an order, likewise she is able to call and ascertain if they need her service. The transformation of Ms. Blossoms' business network to the mobile technological platform has increased her ability to communicate within her network as well as to increase efficiency with other stakeholders in her business network. For example, Ms. Blossom, recalls that there are days when she is at home and her fisherman calls and informs her that he is not going out to sea, this saves her an unnecessary trip to the seaside.

> "The fishermen call me and let me know when they are going to sea, if they are not going they will call and let me know that they are not going so that I don't waste my time to go there…"-Ms. Blossom.

In the past she would have to go to the fishing village and sometimes wait an entire day for fishermen to come in with the days catch. In such a situation it was a 'first come, first serve basis', there were instances in which others bullied their way ahead of her and were able to purchase the fisher man's catch. This hostile situation has now been far removed from the business environment in which she operates. Ms. Blossom now places her order in advance to the fisher man. She no longer goes to wait, and he calls her when he is close to land. She then takes a taxi and goes to meet her supplier to pick up her order.

The mobile phone, the network service provider as well as the phone card retailer are important actors in the eco-system as they maintain a symbiotic relationship with all other organisms, while facilitating interdependent relationships among the others. The mobile device is owned by each organism and is used as a means of communication whereas the phone service provider facilitates interaction through its networks across the island.

6.2. Case Study 2 – The Urban Entrepreneur

The second ICT ecosystem examined is located in the urban capital city of Kingston. We focus particularly on persons involved in the ICT trade. This informal system involves individuals who import (phones and parts), sell, repair, unlock, and trade used phone parts locally. These urban entrepreneurs, emerged as a result of the advent of mobile phones, unlike rural entrepreneurs or pre-existing businesses in Fransman model, they did not go through evolution nor were they subjected to adaption for their own survival, instead these entrepreneurs like those in the original model (Facebook, Twitter, Amazon) emerged primarily through an interdependent relationship between layer 1 and layer 2. Based on the hierarchy of this ecosystem, at layer 1 are formal handset manufacturers (Samsung, Nokia, Apple etc.), these handsets are made functional based on service provided by local network element providers (Digicel and Lime) in layer 2. However, the handsets provided in layer 1 are sourced by customers or the entrepreneurs from overseas. This runs parallel to the traditional, locally licenced phone distributors whose phones are locked to their network. These urban entrepreneurs who source, sell, repair and unlock cellular phones in layers 1 and 3 are connected to buyers who are dependent on their trade, as well as to local and overseas suppliers who, in turn, depend on these entrepreneurs for purchases, thus forming several symbiotic relationships.

The emergence of these informal entrepreneurs coincided with the entrance of the mobile phone into the local market. The continued evolution in the design and capability of the mobile handset influenced the emergence of new players within the ICT ecosystem, particularly at the third layer. The inception of mobile phones in Jamaica created a space for

additional intermediaries such as phone repair personnel, which was intensified with the emergence of more sophisticated handsets like the Sony Erickson P800 (one of the earliest to emerge) followed by the Motorola Razor. This influx gained momentum with the introduction of the Blackberry smart phone and more recently the Apple iPhone, Samsung Galaxy and HTC phones which have created a completely new market for a variety of entrepreneurs.

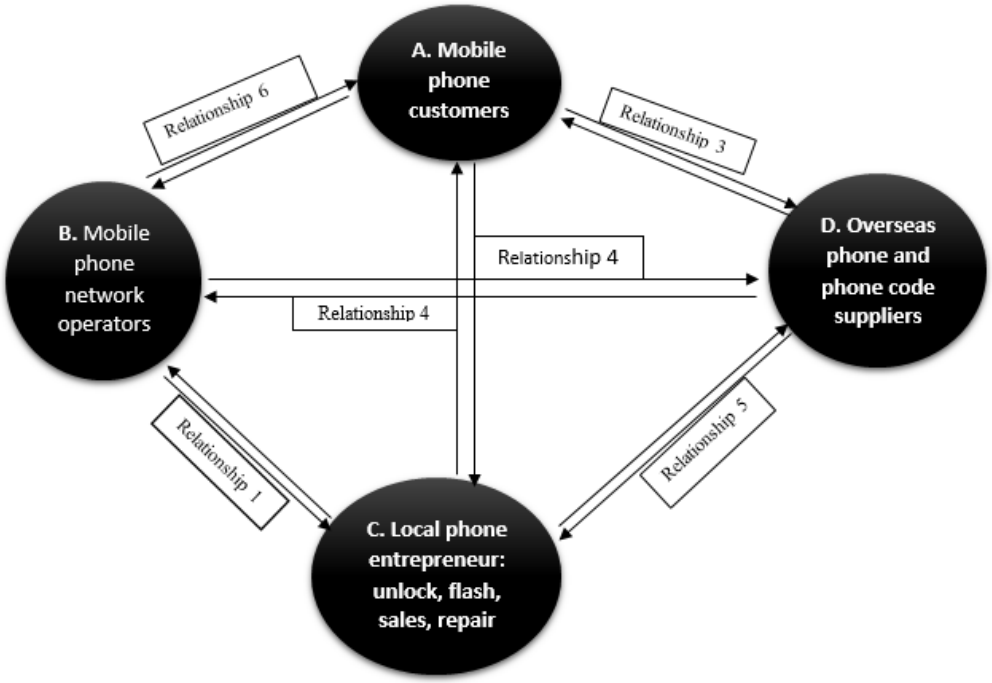

Figure 7. Symbiotic Interaction between Organisms

The boom in the variety of smart phones has spawned an increase in indirect jobs, that is, jobs which fall outside the realm of the formal employment sector in the mobile phone industries. Persons have entered the industry by buying and selling smart phones below the market price of the two established phone companies in Jamaica. These phones are sourced on the Internet from overseas suppliers and are purchased and imported to Jamaica. These informal entrepreneurs are dependent on their overseas suppliers for new stock, while the local clientele is in turn are dependent on the local entrepreneur for the supply of the smart phone for which there is a high demand (see figure 6). However, often times these mobile phones are locked to an overseas network and therefore require a network code to be unlocked to function on the networks of local providers. This service is not provided by any of the two local phone companies, as it is in their financial interest to ensure that the phone they distribute is locked to their network to prevent customers from switching to their rival. End users nevertheless wish to have the liberty of purchasing an unlocked smart phone to work on any network internationally. Within the urban area, the demand for unlocked smart phones is met by informal entrepreneurs. To unlock the phone, these informal entrepreneurs purchase a phone code online from an overseas website and this is then programmed into the locked phone; where this does not work, the phone is "flashed," that is, hooked up to a computer and the software erased and reinstalled with the unlocked settings.

The emergence of mobile phones and by extension smart phones has also created a demand for phone technicians to provide cheap high-skilled services. As time passes, smart

phones for one reason or another do malfunction, thus creating demand for more technical competencies such as replacement of batteries, keypads, screens, data boards, software re-instalment and update. These technicians also attract illegitimate customers, who steal phones and require them to wipe the information, thus underlining the dark side of this informal sector. Collectively, the interaction between local informal importers/retailers of mobile phones along with the overseas suppliers, website hosts, phone code distributors, local internet service providers as well as reliance on the PC to conduct specific aspects of the trade and purchases of the imported smart phones, give rise to the urban informal ICT ecosystem. This is undoubtedly so as the emergence of the smart phone has created a new market/open space in which the interacting players converge to establish symbiotic relationships as well as interdependence among each other.

7 DISCUSSION –

7.1 Technology Transfer and Diffusion

While discourse on ICT4D remains divided on innovative transfer, arguments that innovations displaces pre-existing groups and leads only to the emergence of others, can be challenged, as the possibility exists that innovations can strengthen pre-existing groups while introducing new ones. It can therefore be argued that the ICT ecosystem framework is useful in explaining the evolution of Jamaica's informal business sector.

Though Fransman's framework was designed to examine large scale firms, this framework nevertheless becomes applicable here, as when transferred to the local setting, like large scale firms, small scale informal business experienced a similar evolution however using a different technology, the mobile phone, as opposed to the internet. Moreover, when compared, both systems revealed movements of members across multiple layers, though they have different members. In this study, and in keeping with the principle of innovation by transfer and diffusion; Fransman's ecosystem model is used to demonstrate ICT models established in developed countries can be transferred to a developing context and socio-economic achievements be achieved. Nonetheless, the prevailing infrastructure of the two cases used to reflect the informal sector, highlights that the informal sector is not equipped to facilitate Fransman's model in its natural form, instead adaptation is required (Avgerou, 2010; Braa et al., 2004).

7.2 Adaptation and Evolving Definitions of the Informal

Adaptation is key to the survival of participants in both instances. For the rural case study adaptation during the emerging stage of the mobile phone was central to Blossom's business' survival. Of limited educational background, the sole trader indicated that initially she did not know how to use and was not interested in owning or using a mobile phone.

> "When my daughter said, she is going to buy me a phone I said don't buy it! Don't buy it! I don't know how to use it." (Interviewer A)

As technology continued to evolved and other stakeholders within her network began to use the mobile technology, Ms. Blossom's ownership and knowledge of the use of a mobile phone became critical to the survival of her business in order to remain relevant within her local community network. Similarly, adaptation remains integral to the viability of the urban entrepreneurs business, as technology evolve they have to upgrade their skills simultaneously. Traders had to adapt to the newly emerged business by acquiring the requisite skills and knowledge to function. Unlike the fish and bammy vendor, adaptation is more critical for informal mobile traders who must constantly develop their technical skills and

knowledge base. Without the constant improvement in knowledge the survival of their livelihood becomes threatened with stagnation or extinction. In the end only entrepreneurs with advanced skills have a high possibility of prolonged survival.

The development of technical skills within this sector leads us to an observation and reconsideration of what is an appropriate definition of the informal sector. As we discussed earlier scholars such as Anderson (1987) have noted how in the Jamaican context, the informal sector has often been characterised by low-skilled work. Our evidence suggests that this is no longer the case, or to be more precise the definition of the informal sector needs to evolve as the requirements of contemporary ICT eco-systems have changed. Thus entrepreneurs such as "Interviewee B" mentioned above may well have a technical skill set that is beyond the average person but can still operate in the informal sector.

7.3 Social and Economic Value of the Informal Ecosystem

As Ms. Blossom herself notes:

> **"**I do a better business now than the first time because of the phone, before if customers wanted me, they did not know how to get a message to me, they may come to my house but they do not know whether they are going to find me or not, now the phone help me a lot…?**"**

From the rural case study, it is evident that the possession of a mobile phone has allowed the entrepreneur to maintain a closer relationship with her suppliers and customers as well as improve the overall efficiency of informal business operation, a finding which is keeping with much of the literature cited above. Previously there was disjointed interaction amongst players which resulted in time and money being wasted. The incorporation of the mobile phone has created an efficient system of transaction, facilitated by the introduction of the network service provider and phone card operator. Through the utilization of this technology, the entrepreneur was able to significantly cut potential losses, which in the past were incurred from long and extensive commutes to customers as well as suppliers. The entrepreneur has eliminated losses in the area of spoilage as well as the chance of retaining excess fish as her customers now place their orders and travel to her for receipt of such (Abraham, 2007; Aker, 2010). The entrepreneur has also decreased the likelihood of monetary and produce loss and increased her opportunity for profit simply from the acquisition of an inexpensive mobile phone.

The informal ICT ecosystem has created a reversal in the direction of Ms. Blossom's interaction with her customers. For instance, in the past Ms. Blossom would reach out to her customers by travelling from house to house in the community on her donkey in 'search' of customers, use her voice to announce (call out) her presence as she passes through the community and, on a productive day would be able to complete a day's sale without substantial spoilage. Though the symbiotic relationship between her and her customers remains, the direction of the relationship has reversed. Ms B now stays at home exclusively, and with the use of the mobile phone, customers can reach her directly. She now takes orders by phone and prepares her fish and bammy according to order; this has completely eliminated spoilage and significantly reduced financial loss with substantial increase in profits.

7.4 Spillover Effects: The Value of ICT Entrepreneurs

Another key finding from our second case study suggests that these informal entrepreneurs play a very significant role in the ICT ecosystem. Buying a smart phone is a large scale investment by end users, especially for business persons. End users value sustainability, and as such, having the phone repaired is often the cheaper route when compared with purchasing

a new phone especially from the established providers locally. This then creates a business opportunity for phone repair persons, such as Interviewee B (a mobile phone entrepreneur in Kingston), who are of importance in the event that the phone malfunctions. Interviewee B is thus essential in providing value to ICT entrepreneurs as repairing the phone, is often times the more cost effective option.

There are also the opportunity costs associated with not having a phone. For instance, it is not feasible to buy a new phone each time the current one may malfunction so when a person does not have their phone for a day, they lose production time, profits, and the ability to communicate. The ability to purchase an unlocked phone gives end users the power of independence and the ability to increase their purchasing power. End users have the option to purchase a SIM card from their preferred network without having to worry about the operability of their handset. They in turn benefit in the long run as they switch between networks depending on who is offering lower rates.

7.5 Competition and How It Drives Innovation and Restlessness

Urban ICT entrepreneurs try to keep up with technology amidst continual innovation and maintain their relevance in the ICT ecosystem through self-education and competition (Fransman, 2010). This process of maintaining relevance is supported by close knit communities of like entrepreneurs. Online groups that shares technical knowledge about handsets and YouTube videos help greatly to improve their technical skills. Some also carve out a niche in the market by developing skill sets that caters to customers with more advance mobile handsets:

> "I try to go after harder stuff, something that persons will not want to touch; I will venture into like iPads, iPhones, those things… I want to go for something harder, just to keep myself in the market, have a niche rather than compete with everybody out there." – "Interviewee D"

7.6 Information Sharing

Within the urban ICT ecosystem, even though informal entrepreneurs compete with each other, they cooperate by sharing information within their network. Information sharing remains integral to their survival as it is through information sharing that these entrepreneurs develop and continuously expand their knowledge base. For example, one interviewee noted that in instances where he as well as his colleagues have come across problems beyond their technical ability, they reach out to others within their local network or on the internet community for information on how to solve the problem:

> "what you find now is a lot community sharing, sharing of information, you have a pool of people that...that are in the same industry they do the same thing, what you do is that you bounce idea off everyone, someone will come to me and say I am trying to 'pull' this phone and I am having difficulty how it should work? I will assist them and if I have a problem and I am not finding a solution I go to somebody and say I come across this problem, how do you solve it? So basically everybody kind of work within this whole underground phone community and everybody knows everybody and then of course if all fails, you go to the lovely YouTube…"- "Interviewee D"

7.7 Social Mobility

Engaging in the mobile trade has served as a means of social mobility, as emersion in the ICT ecosystem is viewed more favourably than remaining in menial or less rewarding jobs (Toivanen et al., 2012). There were instances where informal entrepreneurs were previously

engaged in other sectors, for example “Interviewee C” explains that he used to wash cars and load buses in the corporate area, while “Interviewee B” use to work at a now defunct phone company as a customer service representative and eventually worked his way up to being a phone packager. According to him, while working at the phone company he realised there was an actual need for phone repairs and unlocking so with very little technical skills he decided to venture out and open his own store. He went on the internet and educated himself. With practise he became confident in his craft. This supports the position that where informal entrepreneurs have the requisite capacity for entry into the market, they are drawn to the ICT ecosystem as it has provided an opportunity for upward social mobility.

In the words of “Interviewee B”:

> “I saw a business opportunity so I take it and open a store for myself, while working at the phone company I was trained as a customer service rep …I started out fixing mainly PDMA phones, little Nokias, some little Samsung, [what are you capable of doing now?] Everything overall, any phone you name it I can fix it, I can unlock BlackBerrys, Samsungs, HTC”.

This is not the case in the rural ICT eco-system. However we argue that while Ms. Blossom was able to benefit in terms of efficiency, increase in profits and a reduction in spoilage of products; the rural ICT network has experienced very little else. Within this business network, with the exception of the airtime vendor, limited opportunity for employment exist beyond that of the sole trader who provides fish and bammy. Additionally those involved in the trade are not challenged to improve their skills beyond the ability to make and receive phone calls.

For the urban case study, the ICT ecosystem had more far reaching implications. For instance, the ICT ecosystem provides the opportunity to informal entrepreneurs who have carved their own niche within the technological ecosystem, creating new relationships and interdependences. In the case of urban informal entrepreneurs, the benefits of the informal ICT ecosystem extend beyond efficiency and innovation. The emergence of the telecom industry has provided new employment opportunities. This market is open to informal traders of varying types that includes persons who are employed in another sector and engage in the trade as a side job. The trade nevertheless has had a more profound impact on the poor, unemployed, and uneducated persons for whom this market is the sole source of income. In some instances the ICT ecosystem provides an opportunity for low skilled intermediaries to achieve social mobility. This is so especially for those who were previously engaged in more menial jobs as inclusion in the ICT ecosystem has provided a means to continue individual growth and development by staying abreast of the revolution in the sector. Thus while the urban case presents the greater potential for wider and deeper benefits, these are more likely to be restricted to men.

7.8 The Social Hierarchy

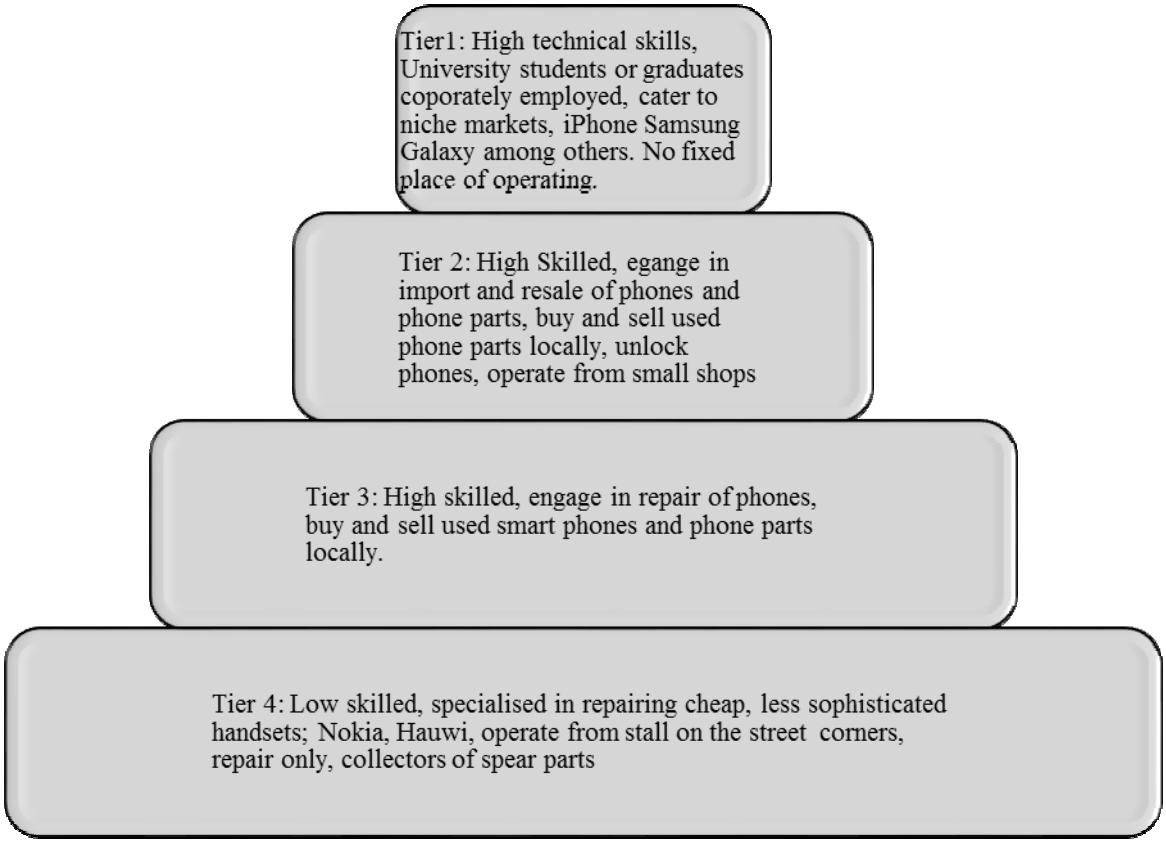

Figure 8. Social Hierarchy of Urban Entrepreneurs

Based on observations during the data collection exercise, it would appear that a social hierarchy exists among the informal ICT entrepreneurs with university students as well as graduates at the top of the pyramid in Tier one (figure 8). These individuals noted that the sale and repairing of phones serves as a secondary job because they were either in school or had their regular corporate jobs and mainly engaged in the mobile trade to supplement their primary source of income or as a means of making money while being a student. They have no fixed place from which they work and may operate from their homes, out of their cars or respond to being summoned. At the second tier, persons like “Interviewee B” who owns a small shop within the busy commercial area of Kingston, has up to a secondary level of education. Within tier one and two, it is an established pattern for operators to engage in all aspects of the ICT trade.

At the third tier, are repair personnel who engage in phone repairs (replacing screens, keypads and batteries, unlocking, flashing software rewriting). In addition, they also trade used phone parts obtained from old non-functioning phones. Typically, these males are “youths” aged 18-25 years who venture into the trade straight out of secondary school and the phone repair service is their only income. While in the fourth tier, there are much older traders who ventured out of a menial career such as washing cars or loading buses, they do not import and sell phones and engage primarily in the repairs of less sophisticated and cheap handsets like Nokia 105, 110 or Huawei U2801, or Blackberries (much older versions). Most significantly, unlike “Interviewee B” the third and fourth tier operators do not conduct business from a rented shop; instead they converge along shop piazzas or along the roadside at a major traffic intersection and offer their services

8 CONCLUSION

The role of the ICT ecosystem when applied to a developing context has become indispensable to the interoperability of pre-existing businesses in trade through facilitating interdependency among critical agents within an informal business network. Additionally, emergent informal agents have created a niche within the ICT ecosystem through the provision of critical services to meet the demand of end users who are dependent on their services. These micro entrepreneurs are predominantly poor with very low levels of education but significant IT skills. They are however able to empower themselves through the use of their phones within their network to command greater control over space and time and harness the power to increase profits and gain employment all within a local space.

What is clear is that the ecosystem is a place where persons of high-skill and limited resources can engage in and benefit significant monetary rewards. The efficiency gains that are realised are widely perceived by those who use their mobile devices to conduct business. From a development perspective, governments should realise that having a well-functioning ICT ecosystem will have a direct impact on the poor's ability to earn and increase their standard of living. They should therefore ensure that the regulatory framework that governs the administration of telecommunications and other ICT endeavours are well established with good policies that are properly enforced. The aim is to ensure that all persons have access to the technology. This would include service coverage as well as a natural state of adopting new and up to date technology. A competitive regulatory environment could ensure that this takes place. In Jamaica, the Office of Utilities Regulation regulates public services. Over the years the cost of communication and ICT has fallen to affordable levels and so the entire population has been able to benefit.

The mobile ICT ecosystem is open as well as inclusive in so far as stakeholders are willing to adapt as it is only the fittest of the fittest survive, therefore the possibility of isolating those who are not able to use the mobile technology platform remains. Development agencies should therefore reassess how the use of simple and complex technologies can help them achieve their mandate. For example, in cases where there is a poverty reduction mandate, it could be prudent to educate persons on the use of ICT in their small businesses. This would however be done after careful analysis of the regional situation as it would only have an impact in areas that have telecommunication services already set up, or are about to benefit from such services. Another point of action could also be the empowering of persons through skills training on how to repair these devices, which have become so pervasive in daily use. The ability to earn an income has been clearly shown and NGO's that engage in skills training could consider packaging a programme to train persons in this skill.

Moreover, the study provides evidence to suggest that contrary to existing definition the informal sector no longer attracts only low skilled workers, as among these emergent agents are high skilled service providers who constantly engage in skill empowerment through self-education and information sharing. Future studies could perhaps look at the specific modes of information sharing within informal ICT eco-systems and how this might promote innovation within the system.

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