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Leap-frogging the Urban-Poor to a High Income Economy: A Case Study From a Developing Country

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Abstract

Urban-poverty is a major concern for policy-makers in the developing world. If measures are not taken to address urban-poverty, it will result in growing social problems, which can lead to economic and political instability. It is widely recognized that ICT is a leap-frogging technology that can close the knowledge-divide and income gap between the 'haves' and 'have-nots'. In this study, we examine if ICT diffusion can improve the income level of urban-poor communities in Malaysia. Three types of ICT were considered in this study, namely mobile phones, computers and internet. The study was conducted using survey data for 434 respondents from selected urban-poor communities in the Klang Valley region in Malaysia. The empirical analysis showed that all three ICTs enhanced the income level of this marginalised community. This provides evidence that ICT diffusion strategies should be an integral part of national development plans to address urban-poverty in developing countries.

Keywords: Urban-Poverty; ICT adoption; Sustainable Development;and Developing Country.

1. Introduction

The developing world has experienced rapid economic growth over the last three decades and this has improved the standard of living in many of these countries. Much of the economic development has been in the urban areas. Montgomery (2009) predicted

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an increase in global population of 2.5 billion people over the next four decades and that most of the population will reside in urban areas. A more recent World Bank report states that 90 percent of the growth in the urban areas is taking place in developing countries and close to 70 million new residents are moving into the urban areas (World Bank, 2011).

Migration of people from the rural areas to urban townships has led to increasing 'urban-ghettos' mushrooming in many of the developing countries. This has resulted in increasing social problems in many urban localities in developing countries. The causes of urban-poverty are multidimensional and complex. It is attributed to the following reasons: lack of employment opportunities in the rural areas; mis-match between skills of new residents and skills required in the urban areas; lack of social safety nets; inadequate affordable housing; limited access to healthcare, education and capital for business development; weak entrepreneurship ecosystems and low economic/industrial development in urban-poor localities; racial and gender discrimination; and lack of political capital and voice in decision making (Teitz and Chappel, 1998; Curley, 2005, World Bank, 2011)

One of the key technologies that have been used for 'pro-poor' development initiatives is ICT, which has multidimensional applications. It has the potential to enable the poor to enhance their reach for resources, information, knowledge, products, services and markets. ICT is also an important catalyst for strengthening social, economic, financial and political inclusion and "*the goal of the development process must be to include every last member of our society, particularly those who are at the*

margins. This not only broadens the support base for development but it also strengthens the government's ability to perform its core development role. ICTs have a vital role to play in realising the grand vision of inclusion of all sections and groups of society" (Prime Minister of India, Dr. Manmohan Singh, 2007, p.31 and p.36).

There are numerous case studies that show ICT is a key technology for enabling the marginalised communities to leap-frog to higher stages of economic development. The most popular case study is the Grameen Village Phone program, which created new employment for marginalised communities in Bangladesh (Stanley, 2005). Studies have also shown that ICT can improve productivity, income and quality of life of the poor (Bhatnagar, 2000; Pigato, 2001 and Palacios, 2008).

The benefits of ICT in assisting the poor to break away from the clutches of poverty have resulted in countries in the developing world increasing investment in ICT infrastructure and services. For example, mobile phone penetration rates in developing countries increased from 22.9% in 2005 to 89.4% in 2013; internet from 7.8% to 30.7%; and home computers with internet from 8.1% to 28.6% (ITU, 2013). Mobile phone with broadband connectivity for the region increased from 0.8% in 2007 to 19.8% in 2013 (ITU, 2013).

Malaysia, like all other developing countries embarked on an ambitious national plan to increase ICT connectivity among the bottom 40% of the population over the last decade. Among the key strategies to close the income gap between the 'haves' and 'have-nots' include plans to upgrade the national ICT infrastructure to enable the poor to

enhance their socioeconomic development. Some of the important 'pro-poor' ICT initiatives include the following programs: PC ownership program (One Home One PC, PC Gemilang 2 and PC Mesti Beli programs), the National Broadband Plan (NBP), ICT literacy programs in schools (Smart School Program; MySchoolNet Portal program; and Program Pembestarian Sekolah) and the community based internet facilities (Gerakan Desa Wawasan, Medan InfoDesa and Pusat Internet Desa, 1 Malaysia Telecentre) (EPU, 1996, 2001, 2006, 2008, and 2010).

As part of the New Economic Model launched in 2010, one of the National Key Eonomic Area (NKEA) and Government Transformation Program (GTP) is the upgrading of the communication infrastructure and networks across the country, including in localities where the poor reside (PEMANDU, 2010a). Access to affordable ICT services and skills will provide poor communities opportunities to increase their income levels and employment opportunities, a National Key Result Area (NKRA) under the New Economic Model (PEMANDU, 2010b).

The discussion above highlight that major programs have been initiated in Malaysia to assist the poor to access technology to improve their economic wellbeing. However, very few studies have been undertaken to test if these initiatives have had a positive impact on income levels of the poor in Malaysia. Thus, the objective of this study is to assess if ICT adoption among urban-poor communities in Malaysia have improved their income levels. This study was conducted among the urban-poor community in Malaysia, many of whom have migrated from rural areas in search of better employment opportunities. Results from this study provides valuable insights to policy-makers on

'pro-poor' ICT policies that can improve the income levels of this marginalized community.

This paper is organized as follow. A brief review of literature is given in Section 2. In Section 3, the methodology is outlined. The empirical findings are presented in Section 4. Practical implications of the results are given in Section 5 and finally the conclusion is provided in Section 6.

2. Literature Review

Poverty is a result of multiple factors, but recent developments in ICT provide policy-makers more effective and holistic ways of assisting the poor to move up the economic value chain. ICT is the foundation condition for a modern economy, enabling communities across the globe to tap into the 'global network brain' to access information, ideas and innovation that will improve productivity, wealth creation opportunities and quality life (Nair, 2011). ICT contributes positively to economic development as a key economic sector and its ability to foster inter-connectivity, integration and efficiency. Several macroeconomic studies have shown that ICT adoption enhances productivity and income levels (Brynjolfsson and Hitt (1995 and 2000), Waverman et al. (2005), Timmer and van Ark (2005), Nair et al. (2008), and Nair and Shariffadeen (2009),).

At the micro level, there is extensive literature that shows that ICT enable the poor to improve their productivity and innovation capabilities. It also enhances employment

opportunities and quality of life of the poor. For example, Batte (2005) showed that computers were used efficiently to manage farms in the USA. LaRose et al. (2007) in another study on rural households in three states in the US found a strong correlation between broadband internet use and income levels.

The urban-poor communities face a number of challenges. Among them include the lack of skills to function in a knowledge economy. However, new innovative teaching platforms using e-learning technology provides opportunities to enable the maginalised communities to have access to quality education and skills development programs. E-learning platforms are seen as important 'digital-equalizer' for connecting the under-privileged and disabled to leading knowledge centers and scholars across the globe (Khan and Williams, 2006; Sundarakrishnan and Prasad, 2006).

The digital medium also provides the poor access to business networks that enable them to obtain information that is strategic to the development of their businesses and economic wellbeing. This includes obtaining information on pricing, market conditions, weather patterns, healthcare facilities and other services. Senanayake et al. (2007) showed a case where ICT was used to assist paddy farmers in Sri Lanka to rebuild their livelihood after the 2004 Tsunami. The Tsunami resulted in inflow of saline water into the paddy fields, devastating the crops. Subsequent replanting proved to be challenging for the farmers. To overcome the information barrier among the relevant ministries and the farming communities, ICT was used to obtain information about the degree of devastation from the farmers. Best farm management practices, including success stories and information on the varieties of indigenous rice that would revive paddy

farming in the affected areas were communicated to the farmers via the digital medium. These initiatives assisted the farming community rebuild their livelihood.

Another major challenge encountered by the poor is the lack of capital for business development. Many of them do not have collateral to finance their businesses. The problem is exacerbated with lack of access to financial institutions in urban-poor localities. ICT via mobile-banking services is a viable financial channel that would provide the poor access to microfinance and to effectively manage their credit to ensure they develop their enterprises in a sustainable way. In a study in India, Vasimalai (2006) showed that an integrated microfinance scheme, incorporating ICT services is able to value add to the lives of marginalised communities by providing services such as education, healthcare, effective management of natural resources, nurturing local knowledge hub, connecting micro-enterprises to markets and fostering business development. The 'one-stop' ICT-integrated microfinance scheme is able to provide a more holistic service for the poor to move up the innovation value chain.

Marginalised communities in urban-poor localities also encounter lack of employment opportunities. Studies such as Anathakrishnan (2008) and Ionescu and Hamburg (2008) show that flexible work environment via tele-working models opens new opportunities for these under-privileged segment of the population to be active participants in workforce. This new medium of communication also enhances political capital by empowering the poor to have a greater voice in the decision making process and enable them to take charge for the development of their economic wellbeing.

The brief literature review examined above shows there are extensive studies showing the link between ICT and quality of life of marginalised communities. However, a majority of the studies are case studies and lack robust empirical analysis. This paper will address this gap in the literature by empirically assessing if ICT adoption among urban-poor communities improve their income level.

3. Methodology

Competitive advantage and wealth creation in the new economy is powered by the ability to transform information into knowledge, enabling enterprises to achieve economies of scale and scope in a relatively short period of time. Increased global connectivity powered by the information revolution have enabled open innovation models, allowing communities to transcend the limitations of diminishing returns of a production economy. Increasing affordable connectivity to the global economy has reduced the marginal cost of accessing information and is increasingly becoming a strategic tool for moving up the innovation value chain and a source of wealth creation.

In this section of the paper, the methodology to test the research hypothesis, the conceptual framework, the empirical method and data used in the study are discussed.

3.1. Conceptual Framework

In this paper, we adopt an integrated framework from the 'Reach-Richness Model' (Evans and Wurster, 2000) and the 'Innovation Ecosystem Model' (Nair, 2011) to show that ICT is a key driver for enhancing the value proposition and income generation

opportunities for marginailised communities. Reach and Richness is defined as follows (Evans and Wurster, 2000):

- Reach is the ability to connect to a number of people in diverse locations; and
- Richness is the quality of information defined by the ability to send and receive information speedily, customize information for specialized needs, ability to interact in real-time with a broad spectrum of stakeholders; and ensure reliability and security of information.

The Reach-factor is the foundation condition, while the Richness-factor is the driver condition for an innovation driven society (Nair, 2011). Evans and Wurster (2000) argue that rapid diffusion of ICT, adhering to global standards provide communities access to greater connectivity. Connectivity to the digital economy permits people to expand their Reach and Richness to a wider segment of the population. Communities that have access to this open communication channels are able to enhance five different types of capital listed below:

- *intellectual capital* – access training and skills via e-learning platforms;
- *social capital* – business/social networks and market intelligence;
- *economic capital* – financial services (micro-credit, loans, venture capital and other financial support systems);
- *political capital* – voice and empowerment in decision making; and,
- *emotional capital* – motivation and self-esteem/self-confidence.

In this paper, it assumed that as communities improve their Reach-Richness characteristics, their socioeconomic development will increase. The evolution of this development is captured into four stages shown in Figure 1 and described below (Nair, 2011):

- **Impoverished Stage** – people in this stage are not connected to the digital economy and are either unemployed or employed in low income sectors that are plagued by uncertainty and low self-esteem.
- **Imitation Stage** – people in this stage are using ICT for rudimentary use (basic communication and entertainment). Due to their weak ICT skills, many of them are employed in labour intensive sectors.
- **Integration Stage** – people in this stage use ICT for hedonic (entertainment), information seeking and business development. They are employed in sectors that are information-driven.
- **Innovation Stage** – people in this stage of development are well connected to the global economy and are able to create multiple value streams. They are innovative in the use of ICT for hedonic, information seeking and business development. Many of them are in knowledge-intensive and high income sectors.

In this paper, we assume that income levels of the poor are categorized in 7 bands (B1 to B7) based on the level of ICT use and the characterization of the bands are given in Figure 1. These bands also capture people in transition stages of development. In the

next section, we will propose an empirical model to capture the dynamics between ICT adoption and income levels of the poor.

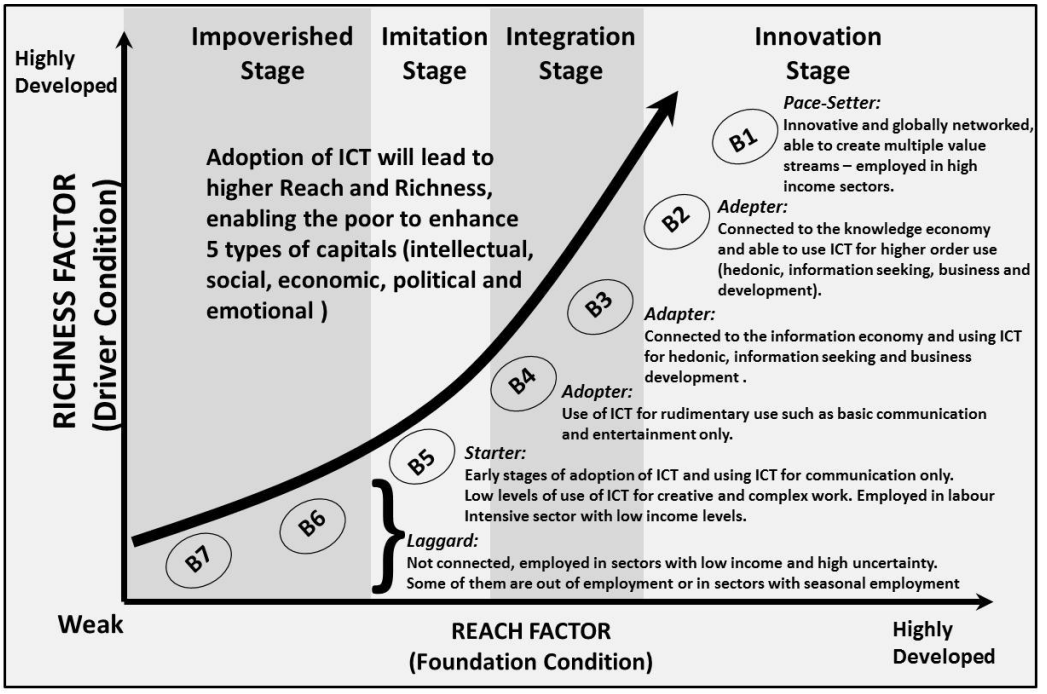

Figure 1: Moving the Poor up the Economic Value Chain (adapted from Nair, 2011)

3.2. The Data

In this study, we examine the relationship between ICT adoption and income levels for urban-poor communities in Malaysia. Urban communities here are defined as low-income communities that reside in the urban areas, mostly in low-cost public homes and flats. A questionnaire was distributed capturing information on ICT adoption patterns, employment opportunities and income levels among a sample of 520 urban-poor in the Klang Valley in Malaysia. Three types of ICT were included in the survey and they are mobile phones, computers and internet.

A random sample was collected from urban-poor communities around Klang Valley, namely Kampung Medan, Air-Panas, Pandamaran Jaya, Kapar –Taman Sentosa, Shah

Alam – Seksyen 17 and Rimba Jaya. From the 520 respondents, complete information from 434 respondents were obtained and used in the empirical analysis. The survey was conducted in the third and fourth quarter of of 2010.

3.3. The Econometric Method

In this paper, we examine the impact of ICT and other key factors on the income profile of urban-poor communities in Malaysia. Let $Income_i$ be the income profile for the ith respondent and is assumed to have the following specification:

$$Income = \mathbf{X}'\beta + \varepsilon$$

where ε is the residual and assumed to be Normally distibuted with mean 0 and variance Ω. The response variable $Income_i$ is defined as the income levels for the 7 bands given in Figure 1and is described below:

$$Income_i = \begin{cases} 1 \text{ if income } \leq RM\,500 \text{ [}Band\ 7 - B7\text{]} \\ 2 \text{ if RM501} \leq \text{income } \leq RM\,900 \text{ [}Band\ 6 - B6\text{]} \\ 3 \text{ if RM901} \leq \text{income } \leq RM\,1300 \text{ [}Band\ 5 - B5\text{]} \\ 4 \text{ if RM1301} \leq \text{income } \leq RM\,1700 \text{ [}Band\ 4 - B4\text{]} \\ 5 \text{ if RM1701} \leq \text{income } \leq RM\,2100 \text{ [}Band\ 3 - B3\text{]} \\ 6 \text{ if RM2101} \leq \text{income } \leq RM\,2500 \text{ [}Band\ 2 - B2\text{]} \\ 7 \text{ if income } \geq RM\,2501 \text{ [}Band\ 1 - B1\text{]} \end{cases}$$

The predictor variables in the design matrix $\mathbf{X}$ are defined as follows:

$$Mob_i = \begin{cases} 1 \text{ if use mobile phone} \\ 0 \text{ otherwise} \end{cases}; Com_i = \begin{cases} 1 \text{ if use computer} \\ 0 \text{ otherwise} \end{cases}; Int_i = \begin{cases} 1 \text{ if use the Internet} \\ 0 \text{ otherwise} \end{cases};$$

$$Eng_i = \begin{cases} 1 \text{ if proficient in English} \\ 0 \text{ otherwise} \end{cases}; \ Age_{i,26-35} = \begin{cases} 1 \text{ if } 26 \leq \text{Age} \leq 35 \\ 0 \text{ otherwise} \end{cases};$$

$$Age_{i,36-45} = \begin{cases} 1 \text{ if } 36 \leq \text{Age} \leq 45 \\ 0 \text{ otherwise} \end{cases}; \ Age_{i,46-35} = \begin{cases} 1 \text{ if } 46 \leq \text{Age} \leq 55 \\ 0 \text{ otherwise} \end{cases}; \ Age_{i,>55} = \begin{cases} 1 \text{ if Age} > 55 \\ 0 \text{ otherwise} \end{cases};$$

$$Gender_i = \begin{cases} 1 \text{ if male} \\ 0 \text{ otherwise} \end{cases}; \; Ethnicity_i = \begin{cases} 1 \text{ if Bumiputra} \\ 0 \text{ otherwise} \end{cases}; Married_i = \begin{cases} 1 \text{ if married} \\ 0 \text{ otherwise} \end{cases};$$

$$Educ_{i,\text{sec}} = \begin{cases} 1 \text{ if highest qualification is secondary} \\ 0 \text{ otherwise} \end{cases}; Educ_{i,ter} = \begin{cases} 1 \text{ if highest qualification is tertiary} \\ 0 \text{ otherwise} \end{cases};$$

$$Sector_{i,manu} = \begin{cases} 1 \text{ if employed in the manufacturing job} \\ 0 \text{ otherwise} \end{cases}; \text{ and,}$$

$$Sector_{i,service} = \begin{cases} 1 \text{ if employed in the service sector job} \\ 0 \text{ otherwise} \end{cases}$$

The Ordinal-Probit Model, correcting for heteroskedasticity using the Huber/White's method was used to estimate the income profiles of the urban-poor communities in Malaysia. Since computers and internet are highly correlated, they were estimated separately. The likelihood ratio test was used to test equality of the different education levels and sectors. The Jarque-Bera test was used to test if the residuals were normally distributed.

4. Empirical Findings

The empirical findings are presented in this section of the paper. The percentages of people using the three ICTs are shown in Figure 2. The empirical analysis show that mobile phones are the most popular ICT, with more than 90% using mobile phones in this community. On the other hand, only 46.6% and 34.9% in this community use computers and internet respectively.

The percentage of people using the three ICTs and income distributions are given in Figures 3 to 5. All three figures show that people from this community with higher income profiles are the ones who are using all three ICTs. It can also been seen that percentage with higher income levels are those using computers and internet compared to mobile phones.

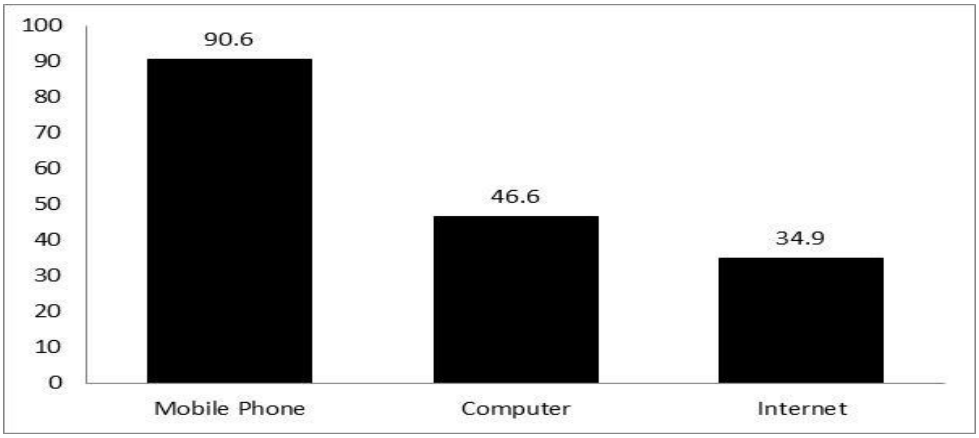

Figure 2: Percentage of people using ICT in the Urban-Poor Community

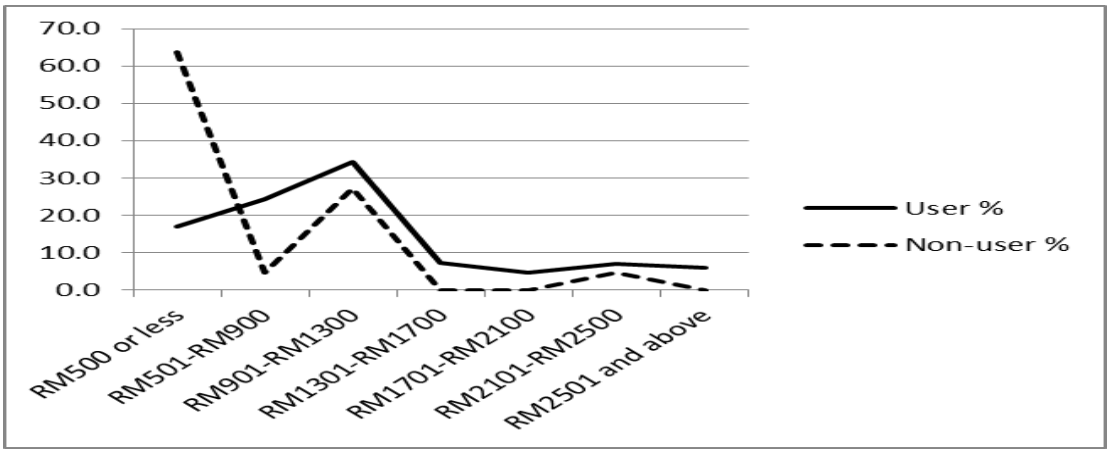

Figure 3: Personal Income Distribution and use/non-usage of mobile phone among Urban-Poor Community

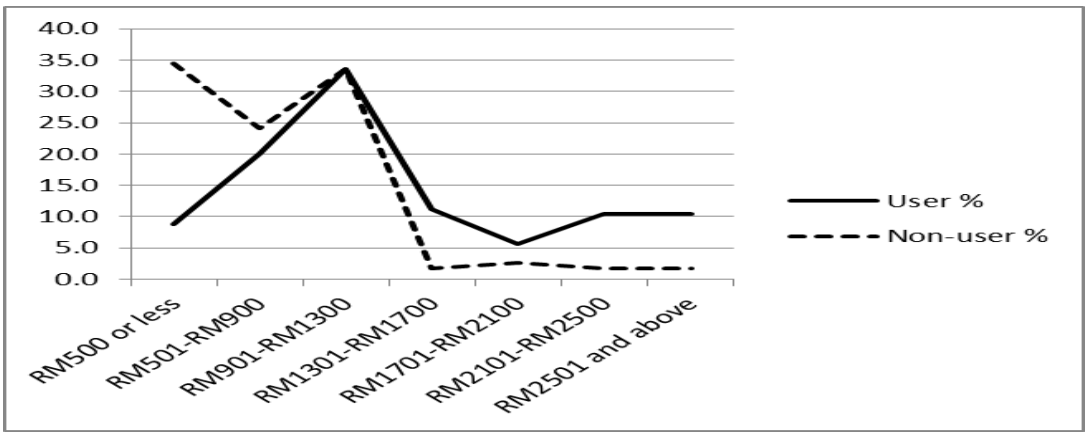

Figure 4: Personal Income Distribution and use/non-usage of computer among Urban-Poor Community

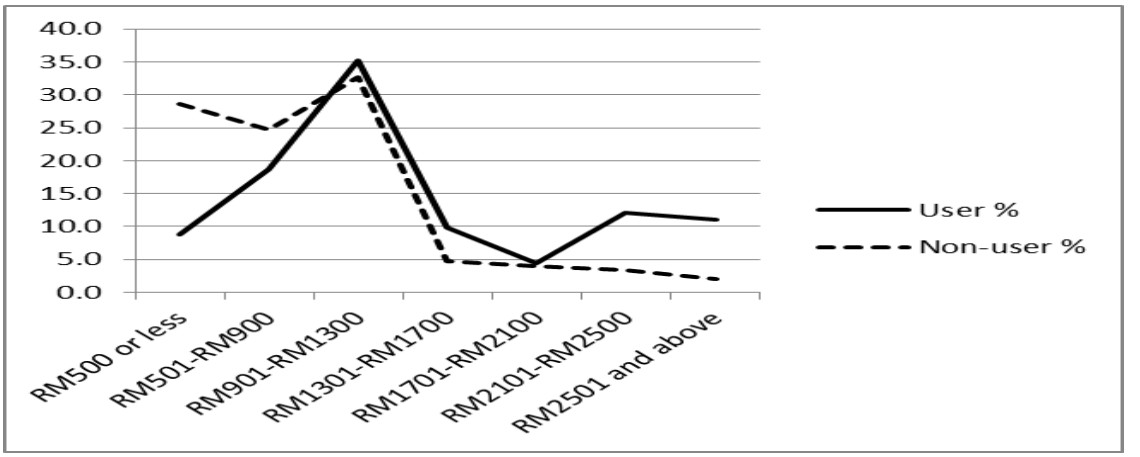

Figure 5: Personal Income Distribution and use/non-usage of the internet among Urban-Poor Community

The empirical estimation using the Ordered-Probit Model for the income profiles for this marginalised community is given in Table 1. The Jarque-Bera test shows that the estimated models satisfy normality assumptions. The empirical results show that in Model 1, mobile phones and computers are positive and significant at the 5% and 1% significance levels respectively. In Model 2 both mobile phones and internet are significance at the 1% significance levels. These results imply that the use of ICT increases the income of urban-poor communities, with mobile phones having the highest impact, followed by computers and internet.

The estimations for both models show that the variable *Eng* is positive and statistically significant at the 5% significance level. This implies that command of the English language was found to have a positive and significant impact on the income profile of urban-poor communities. Language dummy variables for Bahasa Malaysia and other vernacular languages were included in the model and were found to be statistically insignificant. This meant that they were not a major determinant of income in this community. These insignificant dummy variables were not included in the final model.

Table 1: Estimated Models for Income for the Urban-Poor Community

Variables \ Models	**Model 1**	**Model 2**
Mob	0.8284**	0.8977*
Com	0.4414*	-
Int	-	0.4194*
Eng	0.2929**	0.3275**
Age_{26-35}	0.0974	0.1052
Age_{26-45}	0.1406	0.0436
Age_{46-55}	0.0923	-0.0215
$Age_{>55}$	0.3695	0.2828
Gender	0.7120*	0.7193*
Ethnicity	0.0372	0.0248
Married	0.1365	0.2281
Edu_{sec}	0.4551**	0.5061**
Edu_{ter}	0.9452*	0.9344*
$Sector_{manu}$	0.1603	0.1732
$Sector_{service}$	0.3466**	0.3934*
Diagnostic Test:		
Pseudo R-squared	0.1018	0.1027
LR Statistic	81.5599*	83.1702*
Jarque-Bera	3.3541	3.0564
Akaike Info Criterion	3.1786	3.1807

Note: The symbols * and ** denote significance at the 1% and 5% significance levels, respectively.

It was interesting to note that the age variable for all groups, marital status and ethnicity were statistically insignificant. The variable *Gender* was found to have a positive and significant impact at the 1% significance level for both models, implying that males have higher income than females in this marginalized community.

On the impact of education on the income profile, Edu_{sec} and Edu_{ter} were found to be statistically significant at the 5% and 1% significance levels, for both models. A *t*-test for equality of coefficients for Edu_{sec} and Edu_{ter} was conducted and was found to be

statistically significant at the 1% significance level. These results imply that people with higher education levels have higher income levels.

The impact of the sectors where this marginalized community are employed were also tested in the two income models and the results showed that $Sector_{manu}$ did not have a statistically significant impact on income. On the other hand, $Sector_{service}$ was found to be positive and statistically significant at the 5% and 1% significance levels for Model 1 and Model 2, respectively. These results imply that people employed in the service sectors tended to have higher income levels than those working in the manufacturing, agriculture and other sectors.

In summary, the empirical analysis above suggests that ICT adoption, English language proficiency, gender, education and employment sector are important determinants for income among urban-poor communities in Malaysia.

5. Practical Implications

Over the two last decades, the Malaysian Government has intensified its plans to transform the nation into a knowledge-driven society, powered by sound ICT plans. One of the key initiatives under this strategic direction is to reduce urban-poverty by providing this marginalized community an information ecosystem that will enable them to improve their socioeconomic status. The empirical analysis discussed above suggests that these initiatives to some extent have been successful in connecting a segment of this marginalized community to the digital economy. Many of them have moved up the economic value chain.

While the study shows that there have been some progress in connecting this marginalized population to the information economy, only 46.6% of this population use computers and 34.9% use the internet. Further, the empirical analysis showed that females, employees in labour-intensive sectors and those with low educational

attainments earn lower income than males, employees in service sector and workers with higher education levels.

To ensure the urban-poor communities in Malaysia are not left behind in the nation's transition towards a high income economy, a number of strategies should be in place to close the digital-divide in this community. First, affordable ICT infrastructure (smart-phones) and services (broadband and other applications) should be made available in the market. Tax incentives should be provided to service providers who design and introduce new products and services using high speed mobile broadband that are affordable and user-friendly for the poor. These new applications will enable the poor to access services such as online learning, telemedicine, mobile-banking and other services that will enhance their competitiveness and income generation potential. Advanced ICT use for hedonic, information seeking and business development will enable the poor to leap-frog to a high income economy.

Second, many of the high income jobs are in the private sector, which requires a sound command of the English language. A large proportion of people living in the urban-poor areas are not proficient in the English language, hence are unable to seek employment in high income sectors. This result is consistent with a similar study conducted by Nair (2009) for rural agricultural and fishing communities in Malaysia, which showed that those with good command of the English language had higher ICT adoption and income levels. To address this challenge, English language proficiency among the young and working adults should be intensified, so as to enable them to be employed in key economic growth sectors. This can be achieved by strengthening the English language in the schools at the primary, secondary and tertiary levels. By improving English language proficiency, the urban-poor community will be able to access new knowledge, discoveries and innovations that are easily available with a click of a button.

Strengthening the command of the English language among the urban-poor communities can also be done via new computer based tutoring systems (CBTS) for language learning. The CBTS uses four key elements of effective learning, that is,

iterative learning, learner focus, learner motivation and simulation-based learning - a system that has been used effectively to bridge the language barrier in India (Rane, 2008). Further, incentives (tax, subsidies and grants) should be given to local technology players to develop similar types of user-friendly systems in English and in the local languages to bridge the language barrier among this marginalized community.

Third, many of the industries located in urban-poor localities are labour-intensive and low paying jobs. To ensure people in urban-poor localities move up the economic value chain, a more holistic urban planning approach, namely the 'pro-poor cluster' development plan (Nadvi and Barrientos, 2004) should be adopted. As part of the plan, key stakeholders in the community should be engaged to identify gaps in the ecosystem and develop a systematic framework to draw in resources from within the community and externally to develop a more conducive business ecosystem. This includes developing strategic plans with timelines to achieve the following: upgrading the infrastructure (physical, digital and technology); strengthening business networks; up-skilling the workforce; nurturing new businesses and entrepreneurs; and instituting a business-friendly regulatory and taxation system (Nadvi and Barrientos, 2004).

Fourth, the empirical results also show that females earn significantly lower income than their male counterparts. This result is consistent with a number of studies in the literature, among them include Umrani and Ghadially (2008), who showed low levels of ICT use and limited employment opportunities for women in India. Some of the reasons for this finding can be attributed to problems related to access, affordability, ICT literacy, family duties and low English language proficiency. To overcome the digital-divide in this community, greater effort should be in place to provide women access to education, ICT services and literacy programs. These initiatives will enable them to take up employment in high income sectors, while still having time to care for their children and family. New technology such as e-learning and teleworking can assist women to acquire the necessary skills and be employed from home without hindering their role as primary home-maker (Akinsanni, 2008; Anand, 2008)).

In summary, ICT is a leap-frogging technology that is able to bridge the income-divide due to varying levels of education and employment opportunities. It also encourages women participation in the labour force via virtual work environment.

6. Conclusions

Urban-poverty is a major social problem in many developing countries and if strategies and policies are not put in place to address this market failure, it can have a destabilizing impact on the social fabric of society. For example, recent social and political upheavals in the Middle East are attributed to prolong unemployment and poverty, especially in the urban areas. While ICT is not the 'magic bullet' for addressing the urban-poverty problem, it is widely accepted as the fundamental backbone for a knowledge society, enabling the poor to enhance their reach for resources that will improve their quality of life.

This study confirms that ICT contributes positively to the income of urban-poor communities in a developing country, Malaysia. The study also shows that some segments of this population have significantly lower income levels, in particular females, those with lower educational attainments, low English language proficiency and are employed in sectors such as manufacturing, agriculture and other labour intensive sectors. Several strategies to overcome income disparities in this marginalised community using ICT have been proposed in this study.

In conclusion, societies in developing countries are changing at a rapid pace powered by advances in ICT. These changes have opened new opportunities and challenges for the developing world. The challenge for many countries in this inter-networked world is to ensure all segments of the population have access to cutting-edge technology and skills to navigate the diverse oceans of information; continuously transforming information into meaningful knowledge that can enhance their competitiveness and quality of life. Thus, without effective ICT ecosystems in urban-poor localities across Malaysia, the vision of leap-frogging to a high income economy by 2020 will not be realised.

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References

Anand, J. (2008), "Telecommuting: An Indian Perspective," *Information for Development*, Volume VI, Number 7, 16-18.

Akinsanmi, T. (2006), "Gender and Online Collaborative Learning," *Information for Development*,Volume IV, Number 10, 29-30.

Ananthakrisnan, M.V. (2008), "ICT tools for Disabled and Underprivileged: ICT Based Solution," *Information for Development*, Volume VI, Number 3, 6-8.

Batte, M. (2005) Changing Computer Use in Agriculture: Evidence from Ohio, *Computers and Electronics in Agriculture*, 47, 1, 1-13.

Bhatnagar, S. (2000), "Social implications of information and communication technology in developing countries: lessons from Asian success stories", *Electronic Journal of Information Systems in Developing Countries*, 1 (14).

Brynjolfsson, E. and Hitt, L. (1995), "Information technology as a factor of production: the role of differences among firms," *Economics of Innovation and New Technology*, 3, 183-200.

Brynjolfsson, E. and Hitt, L. (2000), "Beyond computation: information technology, organizational transformation and business performance," *Journal of Economic Perspectives*, 14, 23-48.

Curley, A.M. (2005), Theories of urban poverty and implications for public housing policy," *Journal of Sociology and Social* Welfare, June, Volume, XXXII, Number 2, 97-119.

Economic Planning Unit (1996), *Seventh Malaysia Plan 1996-2000*, EPU, Prime Minister's Department, Putrajaya.

Economic Planning Unit (2001), *Eighth Malaysia Plan 2001-2005*, EPU, Prime Minister's Department, Putrajaya.

Economic Planning Unit (2006), *Ninth Malaysia Plan 2006-2010*, EPU, Prime Minister's Department, Putrajaya.

Economic Planning Unit (2010), *Tenth Malaysia Plan 2011-2015*, EPU, Prime .

Evans, P. And Wurster, T. S. (2000), *Blown to Bits: How the New Economics of Information Transforms Strategy*, Harvard Business School Press, Boston, Massachusetts.

Khan, H. and Williams, J.B. (2006), *Poverty Allevation through Access to Education: Can E-Learning Deliver?* U21 Global, Working Paper, No002/2006.

Ionescu, A. and Hamburg, I. (2008), "ICTs to cope with multiple impairments, *Information for Development* (i4D), Volume VI, Number 3, 19-20.

LaRose, R., Gregg, J., Strover, S., Straubhaar, J., and Carpenter, S. (2007), "Closing the rural broadband gap: promoting adoption of the internet in rural America", *Telecommunications Policy*, Vol. 31, pp. 359-373.

Montgomery, M. R. (2009), Urban Poverty and Health in Developing Countries, *Population Reference Bureau*, Volume 64, No. 2, June, (retrieved 25 May, 2013, www.prb.org)

Nair, M. (2011), "Inclusive innovation and sustainable development: leap-frogging strategies to a high income economy," in editor Ramachandran, Ramasamy, *ICT Strategic Review 2011/2012*, PIKOM and MOSTI, Malaysia, Chapter 11, 225-257.

Nair, M. And Shariffadeen, T.M.A, (2009), "Managing innovation in the network economy: lessons for countries in the Asia-Pacific region," *Digital Review of Asia Pacific 2009-2010*, 25-42.

Nair, M. (2009), "Language proficiency and affinity to the information society: challenges and opportunities for rural society," in *ICT Strategic Review 2009/2010: Innovation, the way forward*, PIKOM and MOSTI, Malaysia, Chapter 10, 141-160.

Nair, M., Davison, R. and Kuppusamy, M. (2008), "Competitiveness of ASEAN-5 in the information economy: an empirical analysis," in Editors Banerjee, I. and Rao, M., *Media and Development in Asia: Regional Perspectives*, Asian Media Information and Communication Centre (AMIC), Singapore.

Nadvi, K. and Barrientos, S. (2004), *Industrial Clusters and Poverty Reduction: Towards a Methodology for Poverty and Social Impact Assessment of Cluster Development Initiatives*, United Nations Industrial Development Organisation, Viena.

Palacios, J.J. (2008), "Innovation in MSMEs: Applying digital tech," *Information for Development*, Volume Vi, Number, 9, 10-13.

Performance Management and Delivery Unit (PEMANDU) (2010a), *Government Transformation Programme*, Prime Minister's Department, Putrajaya.

Performance Management and Delivery Unit (PEMANDU) (2010b), *Economic Transformation Programme: A Roadmap for Malaysia*, Prime Minister's Department, Putrajaya.

Pigato, M. A. (2001) 'Information and Communication Technology, Poverty, and Development in sub-Saharan Africa and South Asia'. *Africa Region Working Paper Series No*. 20, August 2001. The World Bank. http://www.worldbank.org/afr/wps/wp20.h (retrieved 25 May, 2013).

Rane, A. (2008), "Motivating Language Learning," *Digital Learning*, Volune IV, Issue 7, July, 11-14.

Sennayake, D., Abeywardane, H., and Ranthanbarathie (2007), "Reviving indigeneous paddy cultivation, *Information for Development* (i4D), Volume V, Number 9, 8-10.

Singh, M.M (2007), "ICTs – A Catalyst for Inclusion" Address at the Conference on Democracy, Development and Social Inclusion, December 2005, reported *in Information for Development (i4D)*, December, 33-36.

Stanley, R. (2005), Village Phone – A Tool for Empowerment, Grameen Foundation USA Publication Series, http://kubatana.net/docs/resour/gfusa_village_phone_0511.pdf, (retrieved 25 May, 2013).

Sundarakrishnan, J. and Prasad, S. (2006), "Learning ICT in Schools: Digital Equalizer integrating Technology in Hard-Up Schools," *Digital Learning*, Volume II, Issue 5, May, 30-32.

Teiz, M.B and Chapple, K. (1998), The Causes of Inner-City Poverty: Eight Hypotheses in Search of Reality,"Cityscape: *A Journal of Policy Development and Research*, Volume3, Number3, 33-70.

Timmer, M.P. and van Ark, B. (2005), "Does information and communication technology drive EU-US productivity growth differentials?", *Oxford Economic Papers*, 57, 4, 693-716.

Umrani, F. and Ghadially, R. (2006), "Economic Impact of IT Education Among Muslim," *Information for Development* (i4D), Volume IV, Number 10, 20-22.

United Nations (2012), *World Urbanization Prospects: The 2011 Revision Highlights*, United Nations, New York.

Vasimalai, M.P. (2006),"Microfinancing to enable rural communities," *Information for Development* (i4D), Volume IV, Number 5, 32-34.

Waverman, L., M. Meschi, and M. Fuss. (2005) "The Impact of Telecoms on Economic Growth in Developing Countries." *The Vodafone Policy Paper Series*, 2 March.

World Bank (2011), Urban Poverty: an Overview http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTURBANDEVELOPMENT/EXTURBANPOVERTY/0,,contentMDK:20227679~menuPK:7173704~pagePK:148956~piPK:216618~theSitePK:341325,00.html (retrieved, 25 May 2013)

Website Used:

ITU (2013) http://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx (date retrieved on 25 May, 2013).