A Conceptual Model of The Role of ICT's on Entrepreneurial Growth as a Promoter of Sustainable Development

ABSTRACT

The influence of internet access on economic development through entrepreneurship growth and the subsequent sustainable economy has been suggested in the literature but has not been conceptualized and therefore thoroughly examined. The conceptual model proposed in this paper stems from the Jinhui Wu and Raghupathi's framework (2015) and from The Telefónica Index on Digital Life (2016). In addition, it incorporates research related to the knowledge based economies, the knowledge spillover theory of entrepreneurship, innovation and the sharing economy. The main hypothesis of this proposed conceptual model is that ICT's (access, usage, and skills) promotes entrepreneurial growth. A growth that in turn promotes a sustainable economy in which the sharing/collaborative economy emerges with new businesses that use new technologies like the star-ups apps based businesses. The model considers as promoters for entrepreneurial growth innovative and imitative entries into new markets by established firms.

Keywords: Information Communication Technologies (ICTs), Entrepreneurial growth, Sustainable development

INTRODUCTION

Researchers coincide that modern information and communication technologies (ICTs) facilitate socio-economic transformation by improving participation in the process of development. The globalized economy, is described as a knowledge-based economy in which knowledge and information determine the extent of productivity and promote economic growth (Allam and Al-Roubaie 2013). Studies on the effect of broadband availability on economic growth suggest that the introduction, the diffusion (Czernich, Falck, Kretschmer, and Woessmann 2011) and improved access channels per inhabitant play a positive and significant role in the per-capita gross domestic product (GDP) growth (Bojnec and Ferto 2012). Furthermore, they acknowledged that information technologies play key roles in sustainable development by facilitating the generation and dissemination of knowledge (Leidig and Teeuw 2015). For that reason, empowering nations with ICTs could increase productivity, promote human development, create knowledge, disseminate information and reduce poverty (Allam and Al-Roubaie 2013). In this regard, Jinhui Wu and Raghupathi (2015) empirically examined a framework that portrays the association between ICTs factors and sustainability development indicators at the country level. Their research proposed that ICTs' factors such as access, affordability and applications have the potential to improve country sustainability at the macro level. And that these factors lead to improved environment, efficient transportation, effective delivery of energy, increased economic development, and higher literacy.

Zuckerberg (2014) suggests that online tools let people use information to do their jobs better and in turn create even more jobs, business and opportunities. Moreover, he affirms that internet has the potential to promote economic sustainability. With respect to the creation of business opportunities, The Information and Communications for Development Report 2012 published by the World Bank stated that the rise of entrepreneurship in the mobile industry is impressive. New information-sharing and collaboration practices that transcend the closed communication channels are promoters of new businesses and markets while providing new ways to collaborate in the product development process. The World Bank report also indicates that one of the most promising areas for entrepreneurship is in mobile software applications, where the barriers to market entry for individual developers and small and medium enterprises (SMEs) are generally low. In this regard, the UNCTAD Report shows that macro-enterprises in low income countries are rapidly adapting mobile phones as key tools for advancing their commercial activities (UNCTAD Information Economy Report 2010).

Even though the role of ICT on entrepreneurship seems evident, there is no conceptual framework that addresses these relationships and there is no certitude of how much the mobile communication sector has contributed to employment and entrepreneurship. Therefore, this proposed conceptual model and its future evaluation represent a first attempt to relate ICT's to entrepreneurial growth.

LITERATURE REVIEW

Globalization driven by technological changes (ICT and the telecommunication revolutions), has transformed the economic meaning by shifting the comparative advantage from large-scale mass production to knowledge-based economic activities (Block, Thurik and Zhou 2009). Knowledge,

which is described as inherently uncertain, unbalanced and subjective, makes knowledge-based economic activities difficult to replicate by competitors (Block, Thurik and Zhou 2009). Knowledge creates entrepreneurial opportunities for small and new firms, which in turn drives the transformation of the economy from a managed economy to an entrepreneurial economy (Block, Thurik and Zhou 2009). In this regard, economists, scholars and policy-makers have recognized that the traditional resources of a managed economy, that is, capital and labor, are not the only inputs to economic competence and growth; knowledge and entrepreneurship are acknowledged as new driving forces for economic growth in an entrepreneurial economy (Block, Thurik and Zhou 2009).

Both, the endogenous growth theory and the R&D approach indicate that knowledge is a major driver of economic growth (Block, Thurik and Zhou 2009). The endogenous growth theory suggests that combined knowledge capital, including knowledge and human capital, responds to market opportunities. "Investment in knowledge is not only about new knowledge creation through R&D efforts, but also about the knowledge that largely and continuously spills over to other agents in the economy (Block, Thurik and Zhou 2009)." However, neither knowledge nor entrepreneurship alone is sufficient to push economic growth. Investments in new knowledge are an indispensable condition. For which, new knowledge needs to be developed and put into commercial usage such that it can lead to higher levels of competitiveness and economic growth (Block, Thurik and Zhou 2009).

Knowledge

According to the neo-classical production function, returns diminish as more capital is added to the economy, an effect which may be offset, however, by the flow of new technology. Although technological progress is considered an engine of growth, there is no definition or explanation of technological processes (OCDE 1996). In the new growth theory, knowledge can raise the returns on investment, and in turn contribute to the accumulation of knowledge (OCDE 1996). It does this by stimulating more efficient methods of production organization as well as new and improved products and services. There is in consequence the possibility of sustained increases in investment which can lead to continuous rises in a country's growth rate. Knowledge can also spill over from one firm or industry to another, with new ideas used repetitively at almost no cost. Such spillovers can reduce the limitations placed on growth by insufficiency of capital (OCDE 1996).

Modern development is a product of knowledge application in economic activities which depends on the country's capability to promote scientific learning and innovation. Therefore, economic growth depends on the ability of the economy to produce knowledge-intensive products in a process of innovation designed to sustain the creation of new knowledge and spread new technologies (Ahmed and Al-Roubaie 2012).

Advancements in ICTs have improved information diffusion and improved knowledge absorption (Ahmed and Al-Roubaie 2012). Global competitiveness requires efficiency enhancers that include higher education and training, labor market efficiency, technological readiness, financial market development and goods market efficiency. And at a later stage a conducive environment for entrepreneurship and innovation gestation (World Economic Forum, 2010). Advancing growth in modern economies is not possible without knowledge creation and technological dissemination. Balanced and sustainable economic development emerges from production and export of high-

tech products and services for global markets (Ahmed and Al-Roubaie 2012). Partaking in global trade and finance requires countries to build an empowering environment capable of increasing competitiveness, improving linkages, fostering technology transfer, promoting innovation, disseminating information, acquiring skills and absorbing knowledge (Ahmed and Al-Roubaie 2012). These reforms demand substantial investment in education, training, research and development (R&D), innovation, technological learning and skill creation to provide the elements for the production of high-value-added knowledge-based products and services (Ahmed and Al-Roubaie 2012).

Knowledge based economies

Knowledge based economies are defined as: "the economies which are directly based on the production, distribution and use of knowledge and information and the role of science, technology and industry policies is to be formulated to maximize performance and well-being in such economies(Al-Maadeed and Weerakkody 2016)." The rise of the knowledge economy has gained conceptual and theoretical support and has evolved across time through various eras. The periods are described by scholars as the information society, the knowledge economy and the learning economy. Of these, the "learning economy" has been perceived as the main process and "knowledge" as the fundamental economic resource of the developed knowledge-based economies. The liberalization and globalization of economies have also inspired the change to the knowledge-based economies, and as a result governments and institutions took the initiative to introduce knowledge-based economies to act in response to aperture in markets in knowledge sectors and to enter international competition (Al-Maadeed and Weerakkody 2016).

Important features of the knowledge economy are growth in technological diffusion, skills acquisition and lifelong learning that are used to produce knowledge intensity products and creative ideas to foster rapid economic growth and sustainable development (Ahmed and Al-Roubaie 2012). It is not possible for an economy to compete and gain global access without knowledge support systems based on production and distribution of knowledge and technology. A knowledge-based economy revolves around investment in R&D and in innovation as the basis for capacity building necessary for knowledge absorption and information dissemination. Technological diffusion involves technological learning in which knowledge workers augment their capabilities to absorb and adapt knowledge. Universities and training centers should adopt programs that upgrading skill levels of workers – in turn, enhancing the economy's ability to distribute and share knowledge (Ahmed and Al-Roubaie 2012).

As stated above, academics suggest that the critical function of knowledge-based economies fluctuates across the following indicators: wealth generation and economic growth, scientific knowledge and novelty production, human development and employment growth. On their part the Triple Helix theory addressed that the main functions of knowledge-based economies are: "(1) the generation of economic wealth, and (2) the generation of scientific and technological novelty, while (3) locally controlling the two functions at a system level (Al-Maadeed and Weerakkody 2016)." The literature indicates that the main characteristics of knowledge-based economies are: "(1) the increasing importance of human capital, (2) the high adaptation capacity to change i.e. Adopt best practices, and technology change to reach competitiveness, (3) advanced technology utilization (4) firm and institutional heterogeneity, (5) collaboration and networking that demolish boundaries, and (6) efficiency and productivity in managing and utilizing knowledge with strategic

alignment" (Al-Maadeed and Weerakkody 2016). In summary, the literature discloses that the development of human capital and maintaining the value of knowledge asset are the ultimate functions of knowledge-based economies. It also suggest that learning, education, ICT (Information Communication Technologies) and innovation are the main pillars of knowledge-based economies (Al-Maadeed and Weerakkody 2016).

The history of economic growth in western countries is related to innovation driven by rapid institutional changes, increase in trade, industrialization and growth in financial services. In addition, the broadening of colonial trade and the rise of large enterprises were helpful in opening up new markets and developing new products. Through these processes came scientific innovation and technological improvement which in turn increased capital accumulation and accelerated investment. The direct impact of technological development was on income levels and poverty reduction in countries where innovation surfaced. Human development is about expanding human capabilities to exploit human potential through the creation of knowledge, innovation and scientific development (Ahmed and Al-Roubaei 2012).

Governments play a crucial role in technological development and innovation. Knowledge creation and technology diffusion depends on government support programs that implement economic incentive regimes and fund educational and training facilities. Without governmental intervention, the private sector cannot realistically start technological diffusion and knowledge assimilation. However, the government can empower technological development by enhancing the ability of domestic enterprises to apply new technologies and invent new products (Ahmed and Al-Roubaei 2012).

Learning is an important prerequisite for promoting the knowledge economy. The dynamic process of knowledge creation requires continuous learning to ensure upgrading skills and meeting human capital requirements. In the new economy, workers, involved in knowledge management and information handling, require special skills and continuous training to harness the benefits of the knowledge economy (Ahmed and Al-Roubaei 2012). Consequently, formal education alone may not be sufficient to meet the skill requirements of the knowledge economy. Workers periodically need to renew their skills to keep up-to-date of the most recent developments in scientific and technological knowledge (Ahmed and Al-Roubaei 2012). Building capacity for digital learning requires investment in communication and information systems to facilitate connections with the rest of the world. Competition in the global markets requires up-to-date information and collaboration with various actors and suppliers. Enterprises involved in R&D, to succeed in innovation, need access the most recent technological advances pursuant to the development of new products (Ahmed and Al-Roubaei 2012).

As stated by Ahmed and Al-Roubaei (2012) the important factors of an effective strategy for developing an innovative system are:

1. Creating a socio-economic environment capable of exploiting both local and external knowledge systems and make use of them for the creation and adoption of new technologies. This requires the creation of a good business climate capable of promoting innovation and generating linkages.
2. Adequate human skills and training programs to empower local workers are critical for building capacity for innovation. The creation and diffusion of new technologies depends on

the skill of workers in order to upgrade and improve the existing technologies. The quality of education spurs the process of disseminating technology as well as facilitate the adaptation of global knowledge into the local knowledge system. Education is also important for preparing entrepreneurs and business leaders to take part in development. The complex nature of global business and the importance of knowledge diffusion underscore the need for knowledge workers capable of conducting R&D and creating enabling environment for innovation. Under such circumstances, establishing linkages between enterprises and universities for knowledge sharing and research is essential. In the linkage between enterprise and education, government could become a facilitator by instituting economic incentive regimes that foster such joint collaboration on the national, regional and international level.

3. Creating a supporting environment for technological learning and innovation. A supporting environment for innovation is defined as "one that provides the resources required for building a complex multidimensional and dynamic range of knowledge, skills, actors, institutions and policies within specific political-policy structures to transform knowledge into useful processes, products and services." In this description, an enabling environment encompasses several elements including the building of effective infrastructure, constructing sound socio-economic policies, establishing efficient institutions and investing in education and lifelong learning
4. Building ICT capacity for bridging the digital divide and encouraging knowledge transfer. Widening of the capacity for knowledge absorption and application requires communication system capable of providing access to information, skills and technological learning (Ahmed and Al-Roubaei 2012).

The State New Economy Index (Atkinson and Andes 2008) established that the New Economy is a global, entrepreneurial, and knowledge-based economy in which the keys to success lie in the extent to which knowledge, technology, and innovation are embedded in products and services. In the new global economy, information technology is the major driver of both economic growth and improved quality of life. An educated workforce is critical to increasing productivity and fostering innovation. In fact, IT was responsible for all of the labor productivity growth increase from 1995 to 2002.

Entrepreneurship

Entrepreneurship is a complex, yet important, driver of economic growth. Entrepreneurs create new firms, which in turn create wealth in the local economy, as they generate new jobs, add efficiency and boost innovation within the territory (González-Pernia, Jung and Peña 2015). The effect of entrepreneurship on economic development depends on the quality of new business formation (González-Pernia, Jung and Peña 2015). In fact, it is the entry of innovative new businesses with potential to grow, and not new businesses in general, which drives the development of countries (González-Pernia, Jung and Peña 2015). This is why policy-makers in many advanced economies have made efforts to establish suitable conditions for nurturing new businesses that grow by introducing innovations into the market (González-Pernia, Jung and Peña 2015).

Block, Thurik and Zhou (2009) expressed that entrepreneurship increases the level of economic output by serving as a mechanism that facilitates the commercialization of knowledge. The

commercialization of knowledge, in particular new knowledge, includes efforts such as financing product development or market research. The outcome of this process is often highly uncertain and requires a risk-taking attitude from those actors who manage the process. Having an entrepreneurial attitude comes into play at this stage. Entrepreneurs are considered different from other individuals; for example, they are considered to have an above-average level of willingness to take risks, a tolerance for ambiguity, a great need for achievement, and a preference for autonomy. In particular, being a risk-taker and having a tolerance for ambiguity are crucial in managing the process of commercializing new knowledge. A high rate of entrepreneurship and exposure to an entrepreneurial climate facilitate the process of turning knowledge into innovative products.

It was proposed and examined that entrepreneurship serves as a moderator between new knowledge and innovation performance. A higher rate of entrepreneurship facilitates the process of turning knowledge into innovative products which in turn might lead to economic growth. Knowledge and entrepreneurship are the sources of competitive advantage both at the country-level and at the firm-level (Block, Thurik and Zhou 2009). Refer to **Figure 1**.

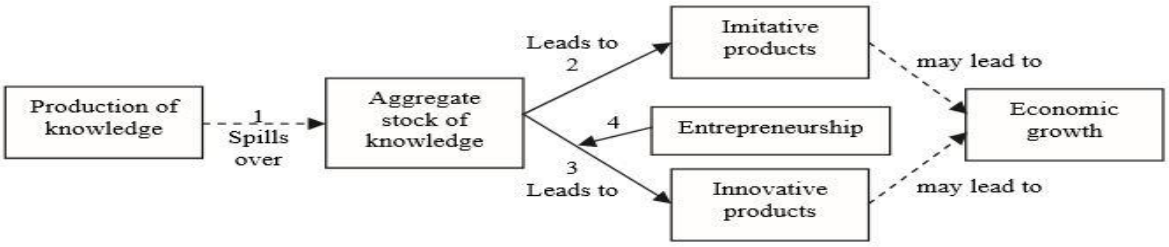

Figure 1 (Source: OECD 2012)

Knowledge spillovers theory

Block, Thurik and Zhou (2009) stated that entrepreneurship refers to the creation of new economic activity including new venture creation and new economic activity of established firms. Knowledge spillover theory recognizes new ventures as a driving force that can penetrate knowledge filters. This theory introduces entrepreneurship as an independent production factor like human, physical and knowledge capital into the production function. Various studies indicate that entrepreneurship is an important contributor to economic growth, for example due to its effect on innovation, and on job creation. In a geographical context, entrepreneurship increases competition and enhances diversity that in turn generates growth of local economy.

The knowledge spillover theory seeks to explain the ways in which knowledge spillover occurs and how it works in practice. Empirical evidence shows that knowledge spills over through various conduits such as: scientific literature and patents human capital mobility and through the inter-firm networks (Block, Thurik and Zhou 2009). The production of knowledge can lead to spillovers: individuals or organizations other than the creators of knowledge may benefit from the knowledge that the creator has produced. Thus, by investing in knowledge, a firm not only increases its own level of knowledge but also makes a contribution to the aggregate stock of knowledge (Block, Thurik and Zhou 2009).

Entrepreneurship is identified by its role in opportunity recognition, discovery, and creation. Knowledge spillovers are suggested as a possible source of entrepreneurial opportunities. This has also been termed endogenous entrepreneurship. These spillovers serve as a source of opportunities for other firms and for individuals who want to start their own business. The knowledge spillover theory of entrepreneurship states that entrepreneurial activity is greater in the presence of higher investments in knowledge.

The knowledge spillover theory of entrepreneurship (KSTE) emphasizes the importance of knowledge as a source of entrepreneurial opportunities to spark innovative start-up businesses. Accumulated knowledge inevitably depends on coordination among local agents and the prominent role played by contextual factors. According to the fundamental premises of the KSTE, start-ups are among the conduits through which a territory's stock of knowledge produces territorial revitalization and local prosperity (González-Pernia, Jung and Peña 2015).

Innovation Driven Entrepreneurs

The early work of Schumpeter (1911) established conceptually the ''entrepreneur as innovator'' as a key figure in driving economic development. The innovative activity of entrepreneurs feeds a creative ''destruction process'' (Schumpeter, 1942) by causing constant disturbances to an economic system in equilibrium, creating opportunities for economic rent. In adjusting to equilibrium, other innovations are spun-off and more entrepreneurs enter the economic system. In this way, Schumpeter's theory predicts that an increase in the number of entrepreneurs leads to an increase in economic growth (Wong, Ho and Autio 2005). A large body of empirical work has evolved from this focus on technological progress and innovation. These studies have established that the level of technological innovation contribute significantly to economic performance, particularly at the firm and industry level. Endogenous growth models emphasize the importance of knowledge, knowledge spillovers and technological substitution in the process of economic growth, conceptually parallel to Schumpeter's early growth theory.

Kirzner's (1973) stressed the concept that ''entrepreneurship consists of the competitive behaviors that drive the market process." For itself entrepreneurship is manifested not only by market entry of new firms, but also by innovative and imitative entries into new markets by established firms. From this point of view, technological innovation is a form of entrepreneurship. This implies that existing models linking innovation to growth have in fact attended a specific aspect of entrepreneurship, that of innovative entry. Basically, the literature suggests that entrepreneurship contributes to economic performance by introducing innovations, creating change, creating competition and increasing competition (Wong, Ho and Autio 2005).

Schumpeter view entrepreneurs' essential contribution to economic growth through innovation. Innovation-driven entrepreneurs (IDE) are important in both developed and developing countries due to its transformative capacity. Acs and Varga (2005) found that opportunity entrepreneurship has a significant positive effect on economic development, whereas necessity entrepreneurship has no effect. Similarly, Gries and Naudé (2010) showed how opportunity-driven entrepreneurship (rather than survival-focused self-employment activities) drives structural transformation in both modern and traditional sectors.

González-Pernia, Jung and Peña (2015) stated that innovation-driven entrepreneurs play an important role in invigorating territories and renovating industrial sectors. The knowledge spillover theory of entrepreneurship suggests that the stimulus of innovative driven entrepreneurs is important for growth and that it is of particular significance for developing economies, where market and institutional failures abound. Even though innovative entrepreneurs account for a small portion of the entire population of business founders, they have an extraordinary economic impact, as they develop new technologies, create new jobs and enhance the revitalization capacity of territories.

Innovation and ICT

The traditional theory held that innovation is a process of discovery which proceeds via a fixed and linear sequence of phases. In this view, innovation begins with new scientific research, progresses sequentially through stages of product development, production and marketing, and terminates with the successful sale of new products, processes and services. It is now recognized that ideas for innovation can stem from many sources, including new manufacturing capabilities and recognition of market needs. Innovation can assume many forms, including incremental improvements to existing products, applications of technology to new markets and uses of new technology to serve an existing market. And the process is not completely linear. Innovation requires considerable communication among different actors – firms, laboratories, academic institutions and consumers – as well as feedback between science, engineering, product development, manufacturing and marketing (OECD 1996).

Information and communication technologies (ICTs) offer many opportunities for innovation (OECD 2012). Furthermore, since the dissemination of knowledge plays a pivotal role for innovation ICTs could among other contributions make a substantial difference to firms' technology uptake and innovation performance. In fact, ICTs could be a powerful means to help lower- and middle-income groups and their businesses overcome barriers to technology uptake and innovation performance by broadening the group of innovators. The success of mobile banking in developing countries is one such example of a business model built on ICTs (OECD 2012).

An OECD report (2012) indicated that information and communication technologies (ICTs) drastically reduce the cost of accessing or diffusing information. For example, they enable scientists and innovators from the developing world to access scientific or business knowledge from all around the world more easily, and help entrepreneurs to reach more customers and broaden their potential market. This is critical for many emerging and developing countries where market size and transport or information infrastructure often restrain business productivity and growth. ICTs have also facilitated the emergence of global value chains, which are an engine for industrial and technological development in a number of countries, allowing technology transfers from multinational firms.

In this regard, Osorio-Urzúa (2008) stated that "ICT is changing the speed and economics of innovation by (1) decreasing the costs of experimentation and prototyping;(2) increasing the rate of failure and speeding the discovery of sub-optimal alternatives by speeding design-test cycles;(3) allowing better acquisition, management, and analysis of information; and (4) empowering customers to become innovators and firms to benefit from the innovations created by their customer base."

The availability of venture capital and skilled labor, sound labor regulations, and a culture that values learning from failures are among the contextual factors that can affect firms' performance in innovation. ICT can foster the innovative process by enhancing firms' exploration capacities, helping them to fail as much, as soon, and as cheaply as possible "new generation innovation process": processes for innovation that are supported by technologies that help to improve and increase the capacity to acquire, transfer, transform, and control the information necessary for innovating faster and better (Osorio-Urzúa 2008).

Osorio-Urzúa (2008) indicates that for high-income nations business Internet use is the most relevant ICT-related factor for innovation, and the most relevant players are firms. Firms in developed nations use ICT to promote their innovation processes by improving the acquisition of more and better market data, refining prototyping and test cycles, rising the power of their networks in order to influence the resources of their ecosystem, and advancing their capabilities for learning before doing by incorporating failure through experimentation. However, in the case of low-income nations the author stresses that the most important factor seems to be how governments design, develop, and implement their long-term strategies for ICT. Remarkably, many governments manage both ICT and innovation policies as separate and distinct matters.

The recognition that ICTs can be development enablers, if applied and used appropriately, is critical to countries that are moving towards information- or knowledge-based societies, and is central to the ICT Development Index (IDI) conceptual framework (see **Figure 2**). The ICT development process, and a country's transformation to becoming an information society, can be depicted using the three-stage model illustrated in **Figure 2**: Stage 1: ICT readiness – reflecting the level of networked infrastructure and access to ICTs; Stage 2: ICT intensity – reflecting the level of use of ICTs in the society; and Stage 3: ICT impact – reflecting the results/ outcomes of more efficient and effective ICT use.

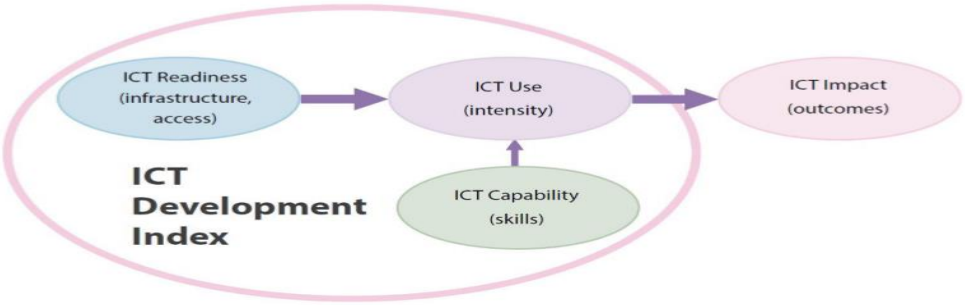

Figure 2
(Source: The ICT Development Index (IDI) – Global Analysis (2016) Measuring the Information Society Report 2016)

Advancing through these stages depends on a combination of three factors: the availability of ICT infrastructure and access, a high level of ICT usage, and the capability to use ICTs effectively, derived from relevant skills. These three dimensions: ICT access, ICT use and ICT skills form the framework for the IDI. The first two stages correspond to two major components of the IDI: ICT access and ICT use. Reaching the final stage, and maximizing the impact of ICTs, crucially depends on ICT skills. ICT skills determine the effective use that is made of ICTs, and are critical to leveraging their full potential for social and economic development. Economic growth and

development will remain below potential if economies are not capable of exploiting new technologies and reaping their benefits. The IDI therefore also includes indicators concerned with capabilities within countries which affect people's ability to use ICTs effectively.

A single indicator cannot track progress in all three of these components of ICT development. It is therefore necessary to construct a composite index, which aims to capture the evolution of the information society as it goes through its different stages of development, taking into consideration technology convergence and the emergence of new technologies.

Based on this conceptual framework, the IDI is divided into the following three sub-indices, which are illustrated, with their component indicators:

- Access sub-index: This sub-index captures ICT readiness, and includes five infrastructure and access indicators (fixed-telephone subscriptions, mobile-cellular telephone subscriptions, international Internet bandwidth per Internet user, households with a computer, and households with Internet access).
- Use sub-index: This sub-index captures ICT intensity, and includes three intensity and usage indicators (individuals using the Internet, fixed-broadband subscriptions, and mobile broadband subscriptions).
- Skills sub-index: This sub-index seeks to capture capabilities or skills which are important for ICTs. It includes three proxy indicators (mean years of schooling, gross secondary enrolment, and gross tertiary enrolment).

ICT enables scientists and innovators from the developing world to access scientific or business knowledge from all around the world more easily, and help entrepreneurs to reach more customers and broaden their potential market. This is critical for many emerging and developing countries where market size and transport or information infrastructure often restrain business productivity and growth. ICTs have also facilitated the emergence of global value chains, which are an engine for industrial and technological development in a number of countries, allowing technology transfers from multinational firms (OECD 2012).

The Sharing Economy

As expressed by Arun Sundararajan when interviewed by Gerald C. Kane: The sharing economy, which is sometimes called the collaborative economy or the on-demand economy, started out as a way for consumers to pay to temporarily access or share products and services rather than buying or owning them. Today, it is a broad and emerging economic system with five distinct characteristics:

1. Market-based, which means that there is some sort of digitally enabled market that enables the exchange of goods and the emergence of new services. Uber and Airbnb are good examples. One is a peer-to-peer marketplace providing transportation, and the other is a marketplace for short-term accommodation.
2. Increase in the impact of capital, which represents that a range of things, from physical assets to people's time to people's money, begin to get used at levels close to their full capacity.
3. Emergence of crowd-based networks that compete with centralized institutions is another characteristic. These networks flourish when the supply of capital, the supply of assets, and the supply of labor originates from decentralized crowds of individuals rather than from aggregates assembled centrally by corporations or governments.

4. Blurring of lines between what used to be personal and what used to be professional. In scaling and commercializing peer to-peer activities, giving someone a place to stay, lending someone money, giving someone a ride, many activities that used to be considered personal are now entering the commercial realm. Hosting an Airbnb part-time or driving a Lyft part-time or becoming a banker through funding circles are all examples of personal activities that are blurring these lines.
5. Blurring of lines between a fully employed workforce and casual labor. What used to be a full-time job is now supplanted partially by contract work.

The sharing economy is associated to entrepreneurship. In this regard, Sundararajan (interviewed by Kane 2016) expressed that "the single most important skill that tomorrow's workforce will need is the ability to run a small business, to be a sort of micro-entrepreneur. A typical job for more and more employees is going to be some form of entrepreneurship, involving managing projects, managing relationships with clients, setting prices — basic skills needed to run a small business. It will also require that employees be less specialized and learn to become generalists. And like entrepreneurs, the success of tomorrow's workforce will also be contingent on generating some of their own demand. To facilitate the shift toward this kind of workforce, we're going to have to deliver a much higher quality level of entrepreneurship education and design thinking than we do today."

New commercial online services have emerged in recent years. These services offer ondemand access to goods or services with the click of a mouse or swipe of a smartphone app. Others promote the commercialized sharing of products or expertise, while others seek to connect communities of interest and solve problems using open, collaborative platforms (Pew Research Center, May, 2016).

The online services that have emerged have reshaped the way consumers shop, eat, earn a living, go on vacation, get from place to place, and share goods, services and money with each other. These services are often based on removing the conflict, difficulty and inconvenience from users' everyday lives for a price. They offer same-day delivery of a variety of household items so that users are saved a trip to the grocery store after a long day at the office, or offer users the ability to instantly call for a driver or personal chef at a moment's notice from a smartphone app (Pew Research Center, May, 2016). The ride hailing app Uber or the home-sharing platform Airbnb represent some of the most well-known examples of these new services, but they encompass the host of services, apps and online platforms of various sizes that are generally considered to be part of the shared, on-demand and collaborative economy.

PROPOSED CONCEPTUAL MODEL

The following model (**Figure 3**) summarizes the literature examined. The influence of internet access on economic development through entrepreneurship growth and the subsequent sustainable economy has been suggested in the literature but has not been conceptualized and therefore thoroughly examined. The conceptual model proposed in this paper stems from the Jinhui Wu and Raghupathi's framework (2015) and from The Telefónica Index on Digital Life (2016). In addition, it incorporates research related to the knowledge based economies, the knowledge spillover theory of entrepreneurship, innovation and the sharing economy. The main hypothesis of this proposed conceptual model is that ICT's (access, usage, and skills) promotes entrepreneurial

growth. A growth that in turn promotes a sustainable economy in which the sharing/collaborative economy emerges with new businesses that use new technologies like the star-ups apps based businesses. The model considers as promoters for entrepreneurial growth innovative and imitative entries into new markets by established firms.

The model developed by Jinhui Wu and Raghupathi (2015) portrays the association between ICTs factors and sustainability development indicators at the country level. Their research was motivated by various propositions that ICTs' factors such as access, affordability and applications, and the like — have the potential to improve country sustainability at the macro level. Once in place, these improvements may lead to improved environment, efficient transportation, efficient delivery of energy, increased economic development, and higher literacy. Jinhui Wu and Raghupathi (2015) addressed the relationship empirically. Although studies in past decades have examined and generally confirmed the positive role of ICTs in development, productivity and other macro level indicators (Avgerou, 2010; Bengtsson & Agerfalk, 2011), none have examined the quantitative role of ICTs in enabling sustainability.

In relation to countries' adaptation to technology, The Telefónica Index on Digital Life model portrays the systemic capacity of countries to adopt digital life. The index consist of: (1) Digital Openness: how well a country's digital infrastructure facilitates access to information; (2) Digital Confidence: how promptly and securely individuals and organizations engage with the country's digital infrastructure; and (3) Digital Entrepreneurship: how readily citizens and organizations are influence and in control of the digital infrastructure for entrepreneurship and innovation (Digital Life Index Report 2016 -TIDL Report).

The conceptual model proposed (**Figure 3**) depicts two drivers for achieving economic development and sustainability that results in sharing economy. In one route ICT promotes entrepreneurship growth through imitative businesses, and the second through innovation. All of these mediated by knowledge. The model excludes necessity entrepreneurship or survival-focused self-employment activities as a driver of economic development.

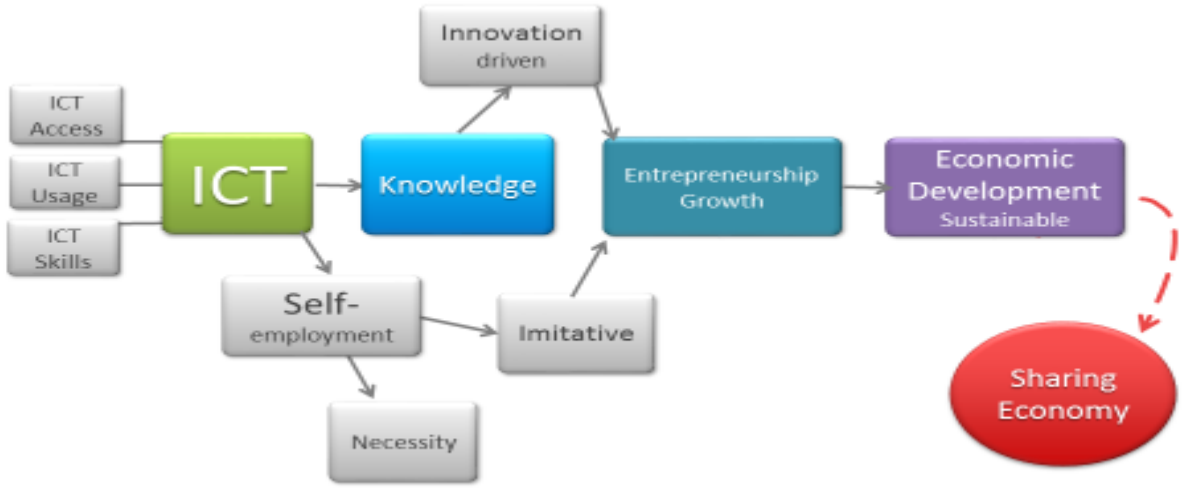

Figure 3

Conceptual Model – The Role of ICT on Entrepreneurial Growth

Based on the literature examined and on the proposed conceptual model the following questions arise:

1. Is ICT's access, ICT's usage and ICT's skills related to:
    a. entrepreneurship growth?
    b. imitative driven entrepreneurship?
    c. innovation driven entrepreneurship?
2. Is ICT's access, usage and skills and entrepreneurship growth mediated by knowledge?
3. Which type of entrepreneurship activity promotes greater levels of economic and sustainable economy?
4. Is ICT related to economic development and sharing or digital economy?

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