Contextualizing Technology Adoption and Self-Expression for Technology Entrepreneurial Innovation

Etayankara Muralidharan, Saurav Pathak

Contextualizing Technology Adoption and Self-Expression for Technology Entrepreneurial Innovation

Etayankara Muralidharan*
Associate Professor
School of Business
MacEwan University
5-254B, 10700-104 Avenue
Edmonton, Alberta, Canada T5J4S2
Tel: 780-6333533

Email: muralidharane@macewan.ca

Saurav Pathak
Assistant Professor of Entrepreneurship
Department of Management
Kansas State University
Manhattan, KS, USA 66506
Tel: 785-532-4354
Fax: 785-532-1839

Email: sauravp@ksu.edu

Contextualizing Technology Adoption and Self-Expression for Technology Entrepreneurial Innovation

Abstract

This article highlights the role of societal-level self-expression values and national-level extent of technology adoption for individual-level likelihood of engaging in technology entrepreneurial innovation. We posit that the effect of self-expression on entrepreneurial innovation is indirect – mediated positively by national-level extent of technology adoption, thereby rendering modes and mechanisms of technology adoption in a country as a more proximal whereas values as a more distal antecedent of technology entrepreneurial innovation. We infer that the benefits and effectiveness of government efforts geared towards improving formal institutional structures that assist technology entrepreneurial innovation would however only be felt if those that adopt newer technologies are self-expressive in the first place. Implications for theory, policy, and future empirical research are also discussed.

Keywords: Self Expression, Technology Adoption, Technology Entrepreneurial Innovation

1. Introduction

Entrepreneurial innovation has been considered a strong source of national competitive advantage [Baumol (2002)] and entrepreneurs play an important role in introducing innovations in the marketplace [Muralidharan and Pathak (2020)]. Scholars have related the concept of 'entrepreneurship' with that of 'innovation' ever since the early studies of Schumpeter [Autio *et al*. (2014)]. In our article we define technology entrepreneurial innovation (TEI) as the use of technology by entrepreneurs in developing new products and effecting new product market combinations [Pathak *et al*. (2014)]. While technology is considered as a key factor for economic development [Steenhuis and De Bruijn (2012)], technology entrepreneurship in high-technology businesses is suggested to enhance the innovative capacity of a nation [Wonglimpiyarat, (2017)]. Various examples of TEIs include the electronic calculator, alternating electric current, sound motion pictures, turbojet engine, examples from biotechnology, personal computer, and internet search engines [Autio *et al*. (2014); Scherer (1980)]. We use this term TEI interchangeably with entrepreneurial innovation and or innovation throughout this article.

Extant research however has also shown that not all entrepreneurs innovate. As per the Global Entrepreneurship Monitor (GEM) survey, only less than a third of the new enterprises that were surveyed report that their products were new or unfamiliar to most of their customers [Reynolds *et al*. (2005); Bosma *et al*. (2009)]. Part of the reason behind these findings is that while formal institutions provide the necessary incentive structures and are indicative of available support to promote and sustain innovation, they are neither sufficient nor do they shape the societal-level perceptions and receptivity for innovation adoption. It is not clear how these perceptions shape the intentions of individuals to adopt innovative technologies [Aldhaban *et al*. (2020)]. As a result, a large number of innovations are not successful because they fail to be

adopted and the real concern may not be solely the feasibility of entrepreneurs to innovate, but, *where they do so* and how their innovations are viewed [Autio *et al*. (2014)]. This concern therefore calls to attention the influence of context on entrepreneurial innovation [Autio *et al*. (2014); Welter (2011)].

The differences in national contexts are evident in the variation in their influences on entrepreneurial behaviors, such as business formation and business practices across different countries [Busenitz *et al*. (2000); Lee and Peterson (2000); Steensma *et al*. (2000)]. It is not unusual to see different patterns towards entrepreneurship in general among societies that may have similar institutional environments [Lee and Peterson (2000)], implying the role of informal institutions or cultural factors in explaining differences across countries [Muralidharan and Pathak (2017); Thomas and Mueller (2000)]. In as much as cultural traits [Hofstede (2001)] are found to impact decisions that firms make, such as forming alliances [Steensma *et al*. (2000)] and international entry modes [Kogut and Singh (1988)], we argue that these factors also influence decisions of entrepreneurial innovation, as they shape the propensities of the social groups to which these entrepreneurs depend [Baughn and Neupert (2003)]. Further innovations have been concentrated in a few countries. For example, during the 1970s and early 1980s, Switzerland which is a small country but a technology intensive one achieved a per capita patenting rate, one of the measures for invention, comparable with that of US inventors [Stern *et al*. (2000)]. This variation among developed economies in their ability to innovate leads us to believe that there could be underlying mechanisms which direct the influence of national cultural values on entrepreneurial innovation.

Extant scholarship has suggested the potential link between national culture and the propensity to support innovative activities [Jones and Davis (2000)]. Such scholarship has

examined, using Hofstede's [1980] dimensions of culture, linkages with the national rates of invention [Shane (1992)] and innovation [Shane (1993)], R&D productivity [Kedia *et al*. (1992)], the initiation and implementation of new product development [Hsieh *et al*. (2010); Nakata and Sivakumar (1996)] among others. National culture affects innovation because it shapes the way individuals in society think about and behave in regard to the opportunities, risks and rewards associated with it [Williams and McGuire (2010)]. Drawing however from literature that have examined linkages between national culture and entrepreneurship it is inferred that the relationship between culture and entrepreneurship has been characterized by mixed findings [Stephan and Pathak (2016)]. The reason for such findings is suggested to be the broad nature of national cultural concepts, whereas entrepreneurship or entrepreneurial activity is very specific at the individual or firm level [Stephan and Pathak (2016); Autio *et al*. (2014)], and therefore the importance of the role of intermediary mechanisms connecting national culture and entrepreneurial activities. It is suggested that since cultural values are shared ideals that are abstracted from specific behaviours, they may influence them only indirectly [Frese (2015); Stephan and Uhlaner (2010)]. Progress in comparative entrepreneurship research has been hampered by a lack of understanding of the mechanisms connecting national culture and entrepreneurial activities [Hayton and Cacciotti (2013)]. Our study addresses this gap.

Scholars have turned to cultural values of individualism and uncertainty avoidance, using the notion of 'culture-entrepreneurship-fit', as key aspects of entrepreneurial activity [Hayton *et al*. (2002); Krueger *et al*. (2013); Tung *et al*. (2007); Stephan and Pathak (2016)]. Individualism values were seen to facilitate entrepreneurial activities; just as individual entrepreneurs endorse these values [Noseleit (2010)]. These values tap the same dimension of cross-cultural differences as do survival-self-expression values [Fazel *et al*. (2015); Inglehart and Oyserman (2004)]. Self-

expression values as defined by Inglehart is the extent to which people give priority to individual choice leading to the expression and attainment of personal goals, which we argue is an important requirement for innovation.

Technology and innovation have common themes within literature discussing economic growth and economic development [Frank (1998)]. This linkage has been related back to the works of Schumpeter [Nelson and Winter (1982); Blaug (1986); Rostow (1992); Freeman (1994); Thanawala (1994)]. As per Schumpeter, the creative responses of entrepreneurs through entrepreneurial innovation are the key determinants of economic change, as entrepreneurs are the ones that carry out new product-market combinations that stem from desires to create [Frank (1998)]. Innovation is a result of the combination of *technology*, individual competence and vision of entrepreneurs to "bring new or improved products, services, and processes to the market more quickly and profitably than the competition" [Chandler *et al*. (2000)].

The objective of this conceptual article is therefore to further develop the relationship between the national cultural values and TEI by understanding the mechanisms that link these cultural values to entrepreneurial innovation. Our proposed conceptual model specifically discusses the roles of societal-level *self-expression* and national-level extent of *technology adoption* in predicting the individual-level likelihood of engaging in technology entrepreneurial innovation, by addressing the research question of 'how self-expression values in society influence technology entrepreneurial innovation'. We discuss how self expression values influence TEI by specifically examining the role of national level extent of technology adoption in order to answer the question ''Can technology adoption provide insights into the relationship between self-expression and entrepreneurial innovation". Our proposed theoretical perspective accommodates two levels – the country-level representations for self expression and technology

adoption and the individual-level for the choice of entrepreneurial innovation. Our propositions suggest that national level extent of technology adoption mediates the relationship between societal level self expression values and the likelihood of entrepreneurial innovation.

The article is organized as follows. We first discuss the theoretical backgrounds of entrepreneurial innovation and the contexts in which such TEIs occur. We, thereafter, draw on insights from literature on national culture to develop our conceptual model and propose relationships among self-expression, technology adoption, and TEI. We conclude by providing implications for theory, policy, and future research.

2. Theoretical Background

2.1. *Entrepreneurial Innovation*

Innovation is considered as the successful implementation of creative ideas [March and Simon (1958); Stein (1974); Tidd *et al*. (2001)]. TEI, as presented earlier, comes from the combination of technology, competence of individuals and entrepreneurial vision to "bring new or improved products, services, and processes to the market more quickly and profitably than the competition" [Chandler *et al*. (2000)]. Entrepreneurship is understood to be closely associated with innovation [Hung and Mondejar (2005)]. The entrepreneur is the personification of innovation, i.e. the individual who carries out the new product-market combinations [Hagedoorn (1996)]. As per Schumpeter, successful entrepreneurs might become capitalists, but they stop being entrepreneurs once they fail to continue to innovate and (re)turn to capitalist routines [Schumpeter (1934, p. 78)]. They are never satisfied by the results based on existing innovations and are constantly searching for new opportunities [Elster (1983); Santarelli and Pesciarelli (1990)]. Besides, it is argued in literature that the social context or conditions that prompt a want among consumers for innovation may not be the same as those that spur innovation [Bhide

(2008)]. Therefore, in exploring the supply side of TEIs, contexts and their influence on such activity need to be studied.

2.2. *Contexts for Entrepreneurial Innovation*

Autio *et al*. [2014], in their framework that discusses the contextual influences on entrepreneurial innovation, identified key contexts that influence entrepreneurial innovation. They are technological contexts and institutional contexts in which entrepreneurs are located and take decisions. Technological factors of context are essentially the structural characteristics of technological environments in which entrepreneurial innovation can take place [Obschonka *et al*. (2012); Thomas and Autio (2012)]. Important here is how the characteristics of technology, types of technology, the various platforms of technology, and other architectural attributes of underlying technology can facilitate or shape the innovative activities of entrepreneurs [Autio *et al*. (2014)]. Scholars claim that technology platforms exercise increasingly important influences on innovative activity in society [Garud *et al*. (2008)].

Similarly, institutional contexts have also attracted attention in entrepreneurship scholarship [Autio *et al*. (2013); Hart (2003); Hayton *et al*. (2002); Pathak and Muralidharan, (2016); Uhlaner and Thurik (2007); Welter (2011)]. Whereas formal institutions mostly influence economic outcomes and opportunity costs and include property protection [Autio and Acs (2010)]; regulation of entry [Djankov *et al*. (2002)], the rule of law [Djankov *et al*. (2002; Levie and Autio (2011)], rules regarding competition with former employers [Marx *et al*. (2009)], informal institutions that extend from cultural values [Stephan and Uhlaner (2010); Muralidharan and Pathak (2017); Muralidharan and Pathak (2018)] to cultural or social norms [Webb *et al*. (2009)] also influence entrepreneurial activity.

Interest on the links between context and entrepreneurial innovation is observed to be growing [Garud *et al*. (2014)]. While some scholars have adopted a micro perspective in emphasizing the importance of individual agency in entrepreneurial innovation, others have taken a macro perspective emphasizing the importance of contexts such as National Systems of Innovation (NSI) in entrepreneurial innovation. Further, scholars have a proposed multilevel approach arguing that innovation opportunities are discovered and created by entrepreneurs whose initiatives are moderated by contexts [Autio *et al*. (2014)]. We suggest in our study that these entrepreneurial initiatives for innovation may be mediated by contexts. Specifically, we propose a conceptual framework wherein we suggest that the effect of self-expression values in society on entrepreneurial innovation is mediated by societal or national level extent of technology adoption. In the next section we discuss in detail the key propositions that elaborate on our suggested mediation mechanism. Our conceptual framework is represented in figure 1.

-----Please insert figure 1 about here------

3. Proposition Development

3.1. *Self-Expression and Entrepreneurial Innovation*

Self-Expression in the context of innovation stems from the discussions around the hierarchy of needs and how these needs relate to the various phases of the industrial revolution. Self-expression forms part of the higher order needs i.e. esteem needs of the Maslov's hierarchy of needs (please see figure 2). Lee et al. (2018) have defined industrial revolution as the co-evolution between human desires and technological innovation (please see figure 2). As stated by them, the first revolution is characterized by physiological needs and mechanical technology; the second revolution is characterized by safety needs and electrical technology; the third revolution is characterized by social needs and information technology; and the fourth revolution is

characterized by esteem needs and intelligence technology. The move from the lower order needs to higher order needs is reflected in the cultural values that exist in society and is seen in the shift from a purely industrial society (broadly corresponding to the first and second industrial revolutions) to a knowledge society (broadly corresponding to the third and fourth industrial revolutions). Inglehart [2006] claims that the shift from 'industrial' society to 'knowledge' society is linked with a shift from survival values (addressing lower order needs) to self-expression values (addressing higher order needs). This, we infer, corresponds to the shift from the First Industrial Revolution to the Fourth Industrial Revolution. Self-expression is defined as the extent to which individuals' value personal choice over survival needs and therefore will allot topmost priority to personal choice versus survival needs [Inglehart (2006)]. This trend has been linked to economic prosperity of the country, which frees individuals from the pressures of resource or material scarcity and emancipates them from cultural restrictions on personal choice and freedom [Inglehart and Oyserman (2004)].

------Please insert figure 2 about here------

The findings from the World Values Survey (WVS) [Inglehart and Welzel (2005)] reveal that societal values are closely related and can be grouped into two major dimensions of cross-cultural variation: (1) traditional/secular-rational, and (2) survival/self-expression values. These two dimensions manifest what WVS terms as *communal values* and explain more than 70 percent of the cross-national variance on key variables, and each dimension is strongly correlated with scores of other important attitudes. According to social psychologists, one of the critical perceptions that can predict intentions to pursue an entrepreneurial opportunity is the perceived support by social values and norms [Krueger (2000); Carsurd and Krueger (1995); Krueger and Carsurd (1993)]. These values vary across national cultures. In some countries, social values are

more supportive of entrepreneurial activity than in others. In using the values perspective that is the more dominant approach in cross-cultural research [Shteynberg *et al*. (2009)], we specifically examine how self-expression values of society, which refer to as the extent to which individuals assign priority to personal decisions over survival needs [Inglehart (1997, 2006)], affect entrepreneurial innovation.

Time series analyses from the WVS suggest that with increasing economic development, societies tend to adopt values prevalent in high-income societies and give up values prevalent in low-income societies [Inglehart and Baker (2000)]. In countries with increasing economic prosperity, concerns for survival are diminished thereby making values related with survival less important than those that drive personal choices. The above change, which is related to a nation's economic prosperity frees individuals from the pressures of survival and resource scarcity and permits them to use their personal discretion [Inglehart, (2006)]. Individuals from societies that are plagued with high scarcity tend to avoid activities that have higher chances of failures leading to losses and those from prosperous societies feel more empowered and therefore are more likely to be successful through creative initiatives [Inglehart and Oyserman (2004)]. Self-expression values are therefore associated with personal advancement and growth of individuals. Individuals from societies that value self-expression (versus survival) are less likely to miss opportunities for advancement. Such individuals are more likely to be imaginative and would engage in creative enterprises [Inglehart and Oyserman (2004)].

Personal freedom and independence as motives of self-employment has been found to result in innovation [Hessels *et al*. (2008)]. These thoughts are also reflected by Joseph Schumpeter's views on the subject, in that freedom to think and act independently is expected to nurture creativity in entrepreneurs making them more innovative [Erunbang and Jong (2006)].

Therefore, individuals from societies that value self-expression (over survival) are more likely to engage in highly creative or innovative initiatives [Inglehart and Oyserman (2004)]. Further, self-expression-survival values addresses the same dimension of cross-cultural variation as does Individualism-Collectivism [Inglehart and Oyserman (2004)] and most of the measures of individualism have been found to have a positive effect on innovation [Taylor and Wilsom (2012)].

Entrepreneurial innovation can be considered to be creating something new [Schumpeter (1934)] by recognizing and taking advantage of opportunities early [Kirzner (1979)]. Reynolds *et al*. [2002] differentiated between necessity-based entrepreneurship (when other employment options are scarce) and opportunity-based entrepreneurship (when entrepreneurial opportunity exists to be taken advantage of) in establishing the motivation behind entrepreneurs. In societies that value survival (over self-expression) we argue that entrepreneurial activity will tend to be more necessity based where innovation based on technology entailing high investment is expected to be scarce. Further, scholars estimate that the majority of entrepreneurs especially in the developed world classify themselves as being motivated by opportunity as opposed to necessity [Reynolds *et al*. (2002)]. Further, opportunity based entrepreneurial activity has been found to be strongly correlated with high technology oriented and high growth firms [Hechavarria and Reynolds (2009)].

Integrating the discussion on self-expression values and entrepreneurial innovation we can therefore infer that societies high on self-expression values will more likely have a greater number of entrepreneurs who indulge in creative enterprises. Such opportunities will be a natural outcome of economic growth and development. There is evidence to show that as a country reaches higher levels of self-expressive values, there is a favorable impact on

opportunity-based entrepreneurship rates [Hechavarria and Reynolds (2009)]. Further, as societies experience prosperity, survival concerns minimize leading to the predominance of values associated with 'self-expression and personal choice' [Inglehart and Oyserman (2004)]. Extant research has shown that self-expressive values demonstrated a positive relationship with opportunity entrepreneurship or in other words countries with self-expressive values will likely encourage individuals to engage in entrepreneurial activities such as innovation as a means of personal motivation [Hechavarria and Reynolds (2009)]. We would expect that in survival contexts which are typically resource constraint, individuals will work together in supportive groups with the central motive of survival [Oyserman *et al*. (2002)] rather than search for technological resources and pursue innovation.

In summary, for survival motivated (unlike self-expression motivated entrepreneurs) entrepreneurs' daily economic sustenance will depend strongly on the survival of their businesses. Such individuals would avoid high technology related innovation in view of the risks involved and potential losses. These survival motivated entrepreneurs are more likely to be found in less wealthy regions and therefore likely to be constrained in their access to technological resources and other resources required for technology related innovation. Finally, self-expression values are part of the social values and norms that promote risk-taking, creativity, collaboration, and openness that are critical for the success of innovation [Dakhli and De Clercq (2004); Kumar (2014); Rauch *et al*. (2013)] as opposed to collectivism and conformity which are constraints for innovation [Taylor and Wilson (2013)]. Hence, we propose.

> **Proposition 1.** *Societal-level self-expression will be positively associated with the likelihood of technology entrepreneurial innovation.*

3.2. *Technology Adoption and Entrepreneurial Innovation*

Technology and innovation are common perspectives through which economic growth and development have been discussed [Frank (1998)]. Entrepreneurship has long been considered as the key force that drives innovation which in turns leads to economic development of a nation [Schumpeter (1934); Reynolds (1997)]. For instance, developed countries such as the United States of America (US) and the United Kingdom (UK) have industrialized at a rapid pace because entrepreneurial capabilities were allowed to flourish [Casson (1990); Storey (1994)]. For high innovation entrepreneurship to succeed, technology is one of the main sources of competitive advantage. For example, adoption of advanced manufacturing technology is strongly associated with the innovation strategy of small enterprises [Hewitt-Dundas (2004)]. Such entrepreneurs need to keep pace with changing technology and product innovations occurring in their domains as they must stay abreast with competition and the changing trends in their areas [Preece *et al*. (1999)]. For them to survive and be sustainable they will have to be at the leading edge of product development or competencies [Madsen and Servais (1997); Zahra *et al*. (2000)].

The innovative activities of global firms are usually based in their home countries and they are expected to derive firm specific technological competitive advantages from their home country environments [Cantwell (1995); Patel (1995)]. Such advantages could be gained from the presence of universities engaged in high technology research [Rao and Mulloth (2017)] and the presence of science and technology parks [Sadeghi and Sadabadi (2015)] in the country. Such institutions are characterized by high quality research, availability of highly qualified skilled manpower, networking opportunities with similar high technology entrepreneurs, and availability of high quality knowledge based workers all of which are resources that facilitate innovation. Thus, we infer that strong technological environment of the home country specifically supports innovation. The key here is the development and use of technology and

technology is the core resource relevant to innovative entrepreneurship, particularly for technology entrepreneurs [Autio *et al* (2000); Pathak *et al*. (2014)]. Technology entrepreneurs, as mentioned in our introduction, are entrepreneurs who use latest or new technology to bring about innovations. Therefore, in order for innovative output such environments in which entrepreneurs operate should provide access to latest technologies.

Further, extant research has also established that one of the key factors that drive innovation performance is technology flows. Such technology flows include adoption and diffusion of new technology. Scholars have established that the rate at which new technologies are incorporated (adoption and diffusion of technology) into the productive processes is a major force that drives economic growth [Rogers (1995); Rosenberg (1972)]. Since adoption and diffusion of technology are closely related i.e. diffusion occurs when user adopts a new technology, they may be used interchangeably [Erumban and Jong (2006)].

It may not be consumer and business demand that explain differences in innovation but also the government demand for advanced technology products [Hollanders and Arundel (2007)]. This is quite in line with the technology push argument among innovation researchers. The push argument suggests that innovation is driven by science which in turns drives technology and its application unlike the pull argument which argues the opposite [Chidamber and Kon (1993)]. It has been argued by extant researchers that governments which typically base their purchase decision for the procurement of advanced technology products on technical performance and innovativeness rather than on cost price, clearly drive innovation in their countries. The reason is that entrepreneurs operating in environments high in technological opportunities will gain more by accessing a larger pool of knowledge [Kafouros and Buckley (2008)]. Therefore, entrepreneurial innovation can be expected to be higher in environments

with higher technological opportunities as compared to environments with lower technological opportunities [Wang and Kafouros (2009)]. Therefore, the extent of technology adoption in the context of entrepreneurial activity, we argue is an important factor that induces entrepreneurial innovation. This extent of technology adoption can be argued as the overall technological sophistication of a society and its labor force. It can also be an outcome of investment and policy choices by both the government and private sector that lead to technology inputs into society, that creates a distinct environment for economic application of new technology [Stern *et al*. (2000)].

In sum, we argue that for innovative entrepreneurs to survive it is necessary for them to be at the edge of technological development in their domains. They will therefore need to have access to resources such as technology and knowledge provided by the environment in order for them to come up with new product combinations and markets. Firms, driven by their entrepreneurial motivations of their founders, will seek such resources to provide that leading edge in their innovative endeavors. Therefore, a context which provides a higher access to such new technologies would provide appropriate resources for entrepreneurial innovation. Hence, we propose:

> **Proposition 2.** *National level extent of technology adoption will be positively associated with the likelihood of technology entrepreneurial innovation.*

3.3. *Self-Expression, Technology Adoption, and Entrepreneurial Innovation*

It has been established that the rate at which new technologies are adopted is considered to be a major factor in driving the pace of economic growth [Rogers (1995)]. However, extant research has shown that technology adoption rates differ significantly across countries with similar economic conditions [Van Ark *et al*. (2002)]. Therefore, it may be argued that this variation in

technology adoption is not only due to economic conditions, but also to the cultural values prevalent in the country. We argue that national cultural values could therefore be the non-economic variable that explains the variation. Technology adoption decisions are highly subjective to the attitudes of the people in a country and, they may be influenced by the country's social and cultural conditions prevalent in the country [Erumban and Jong (2006)]. For example, with respect to the mobile broadband technology adoption in European countries, Meijer and Ling [2001] have shown the possible effects of political and cultural factors along with the economic and technological factors.

Despite rapid globalization there are considerable differences among nations in their adoption and usage of new technologies [Kovacic (2005)]. Hofstede [2001], based on empirical data, concluded that besides GNP per capita, cultural variables of countries predict the speed of technology adoption. Study on the impact of national culture on eGovernment readiness indicate that worldwide eGovernment readiness and its associated components are related to culture [Kovacic (2005)]. The adoption of ethanol-fueled transportation systems in Brazil is not only a reflection of the inherent characteristics of ethanol, but also a result of the interplay between the technological system that encompasses ethanol and the economic, institutional, political, social, and cultural environment of Brazil [Nardon and Aten (2008)]. Similarly, some personality trait dimensions were found to influence mobile payment adoption in Germany and South Africa [Martens *et al*. 2017)]. Cultural influences of uncertainty avoidance, individualism, and long-term orientation have been found to have significant influences on the perceived usefulness and perceived ease-of-use regarding the intentions to adopt mobile technology for commerce in Taiwan and Malaysia [Hung and Chou (2014)]. The adoption of solar photovoltaic distributed system was not only a technology advancement but a cultural phenomenon in China [Liu *et al*.

(2015)]. Lee and Ungson (2008) used cultural factors to explain the quick adoption of the internet in Korea. Similarly, other studies that suggest the influence of culture on adoption of solar cooking in India and Burkina Faso [Otte (2014)] and an energy-cultures framework suggested in the context of New Zealand [Stephenson *et al*. (2010)] contribute to the discussions on the effect of national culture on technology adoption. Individualistic societies were found to take less time to accept and implement new ideas, products and processes [Herbig and Palumbo (1994)]. Therefore, it can be inferred that cultural values can promote, resist, or shape technology use [Bagchi *et al*. (2004); Bagchi *et al*. (2003); Johns *et al*. (2003); Maitland and Bauer (2001); Sørnes *et al*. (2004)].

Individuals in countries high in self-expression feel free to express their own views and are therefore more inclined to innovate and adopt new ideas. In other words, the people from such societies are freethinking. Such freedom to think and act independently is expected to promote the creativity of entrepreneurs making them more innovative [Shane (1993)]. Typically, individuals in such free thinking and expressive societies will be inclined to make their own choices. In a survival economy, on the contrary, the latitude to make such choices could be limited since adopting something new (such adopting new technology) could be both expensive and contrary to the existing norms in society. As discussed in the earlier sections, the shift from survival societies to societies high on self-expression values is associated with economic prosperity and freedom from restrictions on personal choice [Inglehart (2006)]. Individuals in such societies, we argue, will be more open to adopt new technologies, compared to those in survival societies. Such societies will appreciate the importance of technology and how latest technology can be the foundation for the creation of innovative products. Such societies will also be open to increased collaboration between universities and businesses in order to facilitate

the adoption and application of new technology. Further, these societies which are high on self-expression (versus survival), will be high performance oriented as they fully understand that incorporating advanced technologies into their national framework of daily life will emerge as the economic engines of the future [Steers *et al*. (2008)]. Shying away from technology adoption may curtail competitive advantage and in turn affects standard of living [Steers *et al*. (2008)] which is a key motivation of societies high on self-expression (versus survival).

Our above inference finds support in cross-cultural studies examining the influence of individualism-collectivism on national level technology adoption. As mentioned earlier, individualism-collectivism addresses the same dimension of cross-cultural variation as does self-expression-survival values [Inglehart and Oyserman (2004)]. New information and communication technology adoption and diffusion has been found to be strong in countries with high individualistic cultures [Erunbang and Jong (2006); Kovacic (2005); Yap *et al*. (2006)].

In summary, despite the general agreement over the theoretical basis between national cultural values and entrepreneurial innovation, the underlying mechanisms pertaining to innovation performance needs to be explored [Wang and Kafouros (2009)]. As shown in figure 1, we suggest that one of the key mechanisms that mediate the relationship between self-expression and entrepreneurial innovation is the national level extent of technology adoption. Hence, we propose.

> **Proposition 3**. *The effects of self-expression on technology entrepreneurial innovation are indirect, positively mediated by national level of extent of technology adoption.*

4. Discussion

Given that innovation (including entrepreneurial innovation) is only as good as the extent of its adoption and use by the potential end user [Autio *et al*. (2014)], exploring and determining the

contextual factors that shape a society's orientation towards adoption of technology becomes imperative. While we acknowledge that the extent to which formal institutional support influences the feasibility of TEIs [Pathak *et al*. (2014)], the primary aim in this conceptual study is to identify antecedents that shape a society's perception toward technology adoption that then increases the likelihood of individuals engaging in entrepreneurial innovations. The conceptual framework proposed in the study specifically highlights the role of societal-level *self-expression values* and national-level extent of *technology adoption* for individual-level likelihood of engaging in TEI. We posit that the effect of self-expression on TEI is indirect, mediated positively by national-level extent of technology adoption. This renders the mechanism of technology adoption in a country as a more proximal whereas cultural values as a more distal antecedent of entrepreneurial innovation. We infer that the benefits and effectiveness of government efforts geared towards improving formal institutional structures that assist entrepreneurial innovation would however only be felt if those that adopt innovations are self-expressive in the first place. We contribute to the theoretical discussions on entrepreneurship by elaborating the mechanisms which lead to entrepreneurial innovation. Given the theoretical association between entrepreneurship and innovation, the question of contextual influences on entrepreneurial innovation has received limited attention [Autio *et al*. (2014)]. In particular the core articles of NSI literature has limited mention of entrepreneurship [Acs *et al*. (2014)]. Our conceptual framework contributes to extant literature on entrepreneurship research in general and entrepreneurial innovation specifically in the following manner.

Much of the past cross cultural comparative research, at the country level, for entrepreneurial activity, has focused primarily on economic factors [Blau (1987); Blanchflower and Oswald (1994); Blanchflower (2000); Evans and Leighton (1989); Meager (1992); Acs *et al*.

(1994); Audretsch *et al*. (2002); Sternberg and Wennekers (2005); Uhlaner and Thurik (2006)]. However, since a high level of unexplained variation in entrepreneurial activity across cultures remains when only economic variables are considered [Freytag and Thurik (2007)]. Scholars have also looked at cultural factors to explain this variation [Hofstede *et al*. (2004); Wennekers *et al*. (2007); Noorderhaven *et al*. (2004)]. Most studies use the variables developed by Hofstede to measure cultural values, individualism, masculinity, uncertainty avoidance and power distance [Hofstede *et al*. (1980, 2004); Wennekers *et al*. (20070; Noorderhaven *et al*. (2004)]. Our study, by using self-expression values in society to explain entrepreneurial activities, contributes to growing literature that use values of post materialism to explain entrepreneurial activity [Uhlaner and Thurik (2007); Stephan *et al*. (2015)].

Our study specifically addresses the activity of technology entrepreneurial innovation. While innovation literature has been mainly about structure and innovations, entrepreneurship literature has been mainly about the individual or the firm [Zahra and Wright (2011)]. Further, the institutional tradition of NSI literature, which suggests that it is the country's institutions that create and disseminate new knowledge, has not focused on the individual-level agency of entrepreneurial innovation [Autio et al. (2014)]. From the GEM dataset, it is evident that the contribution of entrepreneurs to innovation is higher in high-income countries where self-employment rates tend to be lower as compared to low-income countries. This observation calls for increasing attention to understand how context influences the micro level activities of entrepreneurial innovation [Autio *et al*. (2014)]. Despite the above gap this line of comparative research on entrepreneurial innovation remains limited [Autio and Acs (2010); Autio *et al*. (2013); Bowen and De Clercq (2008); Levie and Autio (2011)]. Given the strong theoretical relationship between entrepreneurship and innovation, our study, through a multi-level

conceptual framework, contributes to the recent calls for research to understand the salient mechanisms through which context influences entrepreneurial behavior [Autio *et al*. (2014)].

Our study specifically contributes to theory by outlining the aspects of culture that are relevant for entrepreneurial innovation [Stephan and Pathak (2016)]. In the review by Hayton and Cacciotti (2013), it is suggested that advancing theory linking culture and entrepreneurial activity hinges on explaining the mechanisms that link cultural values with entrepreneurial activity i.e. the 'how' and 'what' building blocks of theory development [Stephan and Pathak (2016); Wennberg *et al*. (2013)]. Norm theory [Cialdini and Trust (1998)] enables to differentiate the 'what', i.e. cultural value, and theorize about the mechanism ('how') through which entrepreneurial innovation is influenced. Technology and innovation have been common themes which have been used to understand economic growth and development [Frank (1998)]. We have developed the notion at the societal level of the extent to adopt new technology as a significant mechanism through which cultural values influence entrepreneurial innovation. Our proposed framework potentially support the notion that cultural values (self-expression) impact entrepreneurial innovation indirectly through the societal level of technology adoption.

4.1. *Implications and Future Research*

Our proposed framework have implications for policy and for further empirical research. It has been shown that governments that base their procurement decisions of technology products on technical performance rather than on cost price clearly drive innovation in their country, implying that countries where firms are more aggressive in absorbing technology score high on entrepreneurial innovation [Hollanders and Arundel (2007)]. In the present world of globalization, it is understood that countries that possess more advanced technologies and incorporate such technologies into daily life emerge as leading economies; such country level

adoptions of new technologies are however dependent on cultural contexts [Steers *et al*. (2008)]. So, governments can develop their policies in order to encourage contexts where values of self-expression can flourish. Doing so can specifically improve the investment environment in countries where incentives can be provided for absorbing new technology. Literature on innovation has primarily targeted on high technology [Rotaba et al. (2012)]. Future research may need to develop further on understanding how our conceptual model could be applied to different levels of technology (high tech, medium tech, and low tech) in understanding the mediating mechanisms of culture-technology entrepreneurial innovation relationship.

Future research can also factor the role of consumers in our proposed framework. Our proposed framework specifically addresses the context that drive entrepreneurial innovation, or in other words its deals with the supply-side of entrepreneurial innovation [Andrew *et al*. (2009)]. How does consumer demand for innovation drive entrepreneurial innovation? Bhide [2006, 2008] suggests that entrepreneurial innovation may not flourish if consumers are not willing to buy innovative products. Bhide further suggests that Americans were more willing buyers of innovative products than are the Europeans. Firms who involve customers in their innovation processes (specifically in the product design and development) can benefit [Weber *et al*. (2012)]. The probability of adoption of the new product by the customer could increase as the user has been part of its creation. The influence of the demand-side of innovation, research on which is seemingly underdeveloped [Ashby and Mahdon (2009); Frenkel *et al*. (2015)], may need to be factored in our proposed conceptual model to further develop the understanding of the mechanisms that drive entrepreneurial innovation.

Further, our proposed framework after factoring the demand-side of innovation, can also motivate future cross-comparative entrepreneurship research that specifically addresses the

mechanisms that drive entrepreneurial innovation. In particular, it can spur empirical work that compares innovation in developing economies (with traditional survival values) and developed economies (with self-expressive values). While consumer demand for technology innovations may be increasing in developing economies, the supply of TEIs in such economies may not be as high as in the developed economies. Our conceptual model may also be extended to understand the conditions under which innovation may happen in societies high on survival values, as characterized by necessity based entrepreneurship in such societies [Hechavarria and Reynolds (2009)]. For example, research has found relationships between the entrepreneurial characteristics and technology acceptance in developing economies [Acheampong *et al.* (2014)]. Policy initiatives related to R&D support, technology development and technology transfer have resulted in increased innovation in emerging economies [Yesilay *et al*. (2015)]. Empirical work on the above complemented with case studies from developing countries and societies high on survival values can tease out policy related initiatives to facilitate technology adoption in such countries and societies that can spur entrepreneurial innovation.

Finally, our proposed framework may also need to be viewed in the context of the Fourth Industrial Revolution. Since the arrival of the Fourth Industrial Revolution as declared by Klaus Schwab and the World Economic Forum, there has been considerable discussions about it [Lee *et al*. (2018)]. The Fourth Industrial Revolution, as defined by scholars is characterized by an amalgamation of technologies that blurs the boundaries between the physical, digital, and biological domains [Schwab (2017)]. The amalgamation is characterized by connectivity, big data, automation, intelligent agents, robotics, artificial intelligence, 3 D printing, among others where the new wave of innovations is linked to the web [Lee *et al*. (2018)]. Future research may need to extend theorizing based on our framework, since digitization and increased global

networking as part of the Fourth Industrial Revolution, may make access to resources easier, leading to other constraints such as geo-political challenges that may need to be considered.

Our proposed framework also needs to be established empirically. Publicly available data on individual-level entrepreneurial innovation can be obtained from the GEM project dataset [Bosma (2013); Pathak *et al.* (2014); Reynolds *et al*. (2005)]. This dataset which contains individual-level responses on entrepreneurial innovation can be complemented with data on societal-level (1) self-expression obtained from the World Values Survey, and (2) extent of technology adoption from the World Economic Forum. Based on extant research on cross cultural comparative entrepreneurship controls at the country level and individual levels need to be used in the model.

Suggested country levels controls are as follows. Rates of entrepreneurial activities across countries vary with their levels of economic development [Lepoutre *et al*. (2013)]. This can be controlled using the gross domestic product (GDP) per capita [Aidis *et al*. (2012)] obtained from the World Bank database. Government effectiveness policies can be controlled for by obtaining data on government effectiveness from the World Government Indicators (WGI) database [Minniti (2008); Pathak and Muralidharan (2018)]. The innovation environment of the country can also be controlled for. This can be obtained from the World Economic Forum's Global Competitive Index (GCI) reports [Pathak *et al*. (2014)]. GCI reports country's innovation environment, which is a composite of the capacity for innovation, quality of scientific research institutions, company spending on R&D, university-industry collaboration in R&D, government procurement of advanced technology products, availability of scientists and engineers, and utility patents and intellectual property protection [Pathak *et al*. (2014)].

The suggested controls at the individual level are as follows. Individual's age [Arenius and Minniti (2005); Reynolds *et al*. (2005)], gender [Hechavarria *et al*. (2012)], and education level of entrepreneurs need to be controlled for. It is also suggested that individual attitudes such as perceived entrepreneurial self-efficacy, entrepreneurial intentions, fear of failure, and ties to entrepreneurs be controlled for [Muralidharan and Pathak (2017); Pathak and Muralidharan (2018)]. Since our conceptual model is a multi-level model, a random effect logistic regression is suggested to consider country-level and individual-level variables simultaneously and the asses the relative impact of each. Our suggested empirical model for testing is shown in figure 3.

------Please insert figure 3 about here------

5. Conclusion

Entrepreneurial innovation is an important entrepreneurial activity closely linked to economic growth and development. We integrate insights from literature on culture, innovation, and entrepreneurship and propose self-expression values as an important predictor of technology entrepreneurial innovation. We also show, through a multi-level design, that societal level self-expression values influence entrepreneurial innovation at the individual level through the societal level extent of technology adoption. We show that self-expression values as a distal influencer and national level extent of new technology adoption as a proximal driver of individual level entrepreneurial innovation. In doing we contribute to a better understanding of the mechanisms through which cultural values influence entrepreneurial activities. We hope our proposed model will motivate future conceptual and theoretical work that examines the mechanisms through with societal cultural values influence entrepreneurial behavior.

References

Acheampong, G., Braimah, M., Quaye, D. M. and Buame, S. K. (2014). Impact of demographic factors on technological orientations of bop entrepreneurs in Ghana. *International Journal of Innovation and Technology Management*, **11**, 6: 1450037.

Acs, Z. J., Audretsch, D. B. and Evans, D. S. (1994). *Why does the self-employment rate vary across countries and over time?* (No. 871). CEPR Discussion Papers.

Acs, Z. J., Autio, E. and Szerb, L. (2014). National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, **43**, 3: 476-494.

Aidis, R., Estrin, S. and Mickiewicz, T. M. (2012). Size matters: Entrepreneurial entry and government. *Small Business Economics*, **39**: 119-139.

Aldhaban, F., Daim, T., Harmon, R. and Basoglu, N. (2020). Technology Adoption in Emerging Regions: Case of the Smartphone in Saudi Arabia. *International Journal of Innovation and Technology Management*, https://doi.org/10.1142/S0219877020500030

Andrew, J.P., DeRocco, E.S. and Taylor, A. (2009). The Innovation Imperative in Manufacturing: How the United States can restore its edge. Boston: Boston Consulting Group.

Arenius, P. and Minniti, M. (2005). Perceptual Variables and Nascent Entrepreneurship. *Small Business Economics*, **24**,3: 233–247.

Ashby, K. and Mahdon, M. (2009). Measuring the nature of demand for innovation in the UK: The challenges of an indicator approach. NESTA Innovation Index working paper, June.

Audretsch, D.B., Thurik, A.R., Verheul, I. and Wennekers ARM (2002). Entrepreneurship: determinants and policy in a European-US comparison. Boston/Dordrecht: Kluwer Academic Publishers.

Autio, E. and Acs, Z. (2010). Intellectual property protection and the formation of entrepreneurial growth aspirations. *Strategic Entrepreneurship Journal,***4**, 3: 234-251.

Autio, E., Kenney, M., Mustar, P., Siegel, D. and Wright, M. (2014). Entrepreneurial innovation: The importance of context. *Research Policy,***43**,7: 1097-1108.

Autio, E., Pathak, S. and Wennberg, K. (2013). Consequences of cultural practices for entrepreneurial behaviors. *Journal of International Business Studies,* **44**, 4: 334-362.

Autio, E., Sapienza, H.J. and Almeida, J.G. (2000). Effects of Agee at Entry, Knowledge Intensity, and Imitability of International Growth. *Academy of Management Journal, **43***, 5: 909-924.

Bagchi, K., Cerveny, R., Hart, P. and Peterson, M. (2003). The influence of national culture in information technology product adoption. *In Proceedings of the Ninth Americas Conference on Information Systems*, 957-965.

Bagchi, K., Hart, P. and Peterson, M.F., (2004). National Culture and Information Technology Product Adoption. *Journal of Global Information Technology Management,* **7**, 4.

Baughn, C. and Neupert, K. (2003). Culture and national conditions facilitating entrepreneural start-ups. *Journal of International Entrepreneurship*, **1** : 313–330.

Baumol, W. J. (2002). *The free-market innovation machine: Analyzing the growth miracle of capitalism*. Princeton University press.

Bhidé, A. (2006). Venturesome Consumption, Innovation and Globalization. Paper for a Joint Conference of CESifo and the Center on Capitalism and Society "Perspectives on the Performance of the Continent's Economies." Venice, 21-22 July.

Bhidé, A. (2008). *The Venturesome Economy: How innovation sustains prosperity in a more connected world*. Princeton, NJ: Princeton University Press.

Blanchflower, D. G. (2000). Self-employment in OECD countries. *Labour economics*, **7,** 5: 471-505.

Blanchflower, D. G. and Oswald, A. J. (1994). *The wage curve*. MIT press.

Blau, D. M. (1987). A time-series analysis of self-employment in the United States. *Journal of political economy,* **95**,3: 445-467.

Blaug, M. (1986). *Economic history and the history of economics*. Brighton: Wheatsheaf.

Bosma, N., Acs, Z., Autio, E., Coduras, A. and Levie, J. (2009). Global Entrepreneurship Monitor 2008 Executive Report: 65. London: GERA.

Bosma, N. (2013). The Global Entrepreneurship Monitor (GEM) and Its Impact on Entrepreneurship Research. *Foundations and Trends in Entrepreneurship,* **9**, 2: 143–248.

Bowen, H. P. and De Clercq, D. (2008). Institutional context and the allocation of entrepreneurial effort. *Journal of International Business Studies,* **39**,4: 747-767.

Busenitz, L.W., Gomez, C. and Spencer, J.W. (2000). Country Institutional Profiles: Unlocking Entrepreneurial Phenomena. *Academy of Management Journal,* **43** ,5: 994–1003.

Cantwell, J. (1995). The Globalisation of Technology: What Remains of the Product Cycle Model? *Cambridge Journal of Economics,* **19**: 155-174.

Carsurd, A. and Krueger, N. (1995). Social psychology: behavioral technology for understanding the new venture initiation processes. *Advances in Entrepreneurship and Growth,* **2**: 73–96.

Casson, M. (1990). *Enterprise and competitiveness*. New York: Oxford University Press.

Chandler, G. N., Keller, C. and Lyon, D. W. (2000). Unraveling the determinants and consequences of an inn ovation-supportive organizational culture. *Entrepreneurship: Theory and Practice,* **25**,1: 59-59.

Chidamber, S. and Kon, H. (1993). A Research Retrospective of Innovation Inception and Succes: The Technology-Push Demand-Pull Question. WP 3767. Productivity From Information Technology "PROFIT" Research Initiative. Sloan School of Management, Massachussets Institution of Technology.

Cialdini, R. B. and Trost, M. R. (1998). Social influence: Social norms, conformity, and compliance. In D. Gilbert, S. Fiske, and G. Lindzey (Eds.), *The handbook of social psychology*: 151–192. McGraw-Hill.

Dakhli, M. and De Clercq, D. (2004). Human capital, social capital, and innovation: a multi-country study. *Entrepreneurship & regional development*, **16**, 2: 107-128.

Djankov, S., La Porta, R., Lopez-de-Silanes, F. and Shleifer, A. (2002). The regulation of entry. *Quarterly journal of Economics,* 1-37.

Elster, J. (1983). *Explaining technical change: A case study in the philosophy of science*. CUP Archive.

Erumban, A.A. and deJong, S.B. (2006). Cross-country differences in ICT adoption: A consequence of Culture? *Science Digest,* **41**: 302-314.

Evans, D. S. and Leighton, L. S. (1989). The determinants of changes in US self-employment, 1968–1987. *Small Business Economics,* **1**, 2 :111-119.

Fazel, H., Laplume, A. O. and Muralidharan, E. (2015). Technological innovation and adopter self-construal. *International Journal of Innovation and Technology Management*, **12**, 4: 1-23.

Frank, M. W. (1998). Schumpeter on entrepreneurs and innovation: a reappraisal. *Journal of the History of Economic Thought,* **20**, 4: 505-516.

Freeman, C. (1994). The economics of technical change. *Cambridge Journal of Economics,* **18,** 5: 463-514.

Frenkel, A., Maital, S., Leck, E. and Israel, E. (2015). Demand-driven innovation: An integrative

systems-based review of the literature. *International Journal of Innovation and Technology Management*, **12**, 2: 1550008.

Frese, M. (2015). Cultural practices, norms, and values. *Journal of Cross-Cultural Psychology*, **46** , 10: 1327-1330.

Freytag, A. and Thurik, R. (2007). Entrepreneurship and its determinants in a cross-country setting. *Journal of Evolutionary Economics,* **17**, 2: 117-131.

Garud, R., Gehman, J. and Giuliani, A. P. (2014). Contextualizing entrepreneurial innovation: A narrative perspective. *Research Policy,* **43**,7: 1177-1188.

Garud, R., Jain, S. and Tuertscher, P. (2008). Incomplete by design and designing for incompleteness. *Organization Studies,* **29**, 3: 351-371.

Hagedoorn, J. (1996). Innovation and entrepreneurship: Schumpeter revisited. *Industrial and Corporate Change*, **5**, 3: 883-896.

Hart, D. M. (Ed.). (2003). *The emergence of entrepreneurship policy: governance, start-ups, and growth in the US knowledge economy*. Cambridge University Press.

Hayton, J. C. and Cacciotti, G. (2013). Is there an entrepreneurial culture? A review of empirical research. *Entrepreneurship and Regional Development,* **25**, 9-10: 708-731.

Hayton, J. C., George, G. and Zahra, S. A. (2002). National culture and entrepreneurship: A review of behavioral research. *Entrepreneurship Theory and Practice,* **26**,4: 33.

Hechavarria, D.M. and Reynolds, P.D. (2009). Cultural norms and business start-ups: the impact of national values on opportunity and necessity entrepreneurs. *International Entrepreneurship Management Journal,* **5** :417–437.

Hechavarria, D. M., Ingram, A., Justo, R. and Terjesen, S. (2012). Are women more likely to pursue social and environmental entrepreneurship? In K. D. Hughes & J. E. Jennings (Eds.), *Global women's entrepreneurship research: Diverse settings, questions and approaches* (pp. 135-151). Cheltenham, UK: Edward Elgar.

Herbig, P. A. and Palumbo, F. (1994). The effect of culture on the adoption process: a comparison of Japanese and American behavior. *Technological Forecasting and Social Change*, **46**, 1: 71-101.

Hessels, J., Van Gelderen, M. and Thurik, R. (2008). Entrepreneurial aspirations, motivations, and their drivers. *Small Business Economics*, **31**,3: 323-339.

Hewitt-Dundas, N. (2004). The adoption of advanced manufacturing technology and innovation strategy in small firms. *International Journal of Innovation and Technology Management*, **1**, 1: 17-36.

Hofstede, G. (1980). Motivation, leadership, and organization: do American theories apply abroad? *Organizational Dynamics*, **9**,1: 42-63.

Hofstede, G. (2001). *Culture's Consequences* (2nd ed.). Thousand Oaks: Sage Publications.

Hofstede, G., Noorderhaven, N. G., Thurik, A. R., Uhlaner, L. M., Wennekers, A. R. and Wildeman, R. E. (2004). Culture's role in entrepreneurship: self-employment out of dissatisfaction. *Innovation, entrepreneurship and culture: The interaction between technology, progress and economic growth*, 162-203.

Hollanders, H. and Arundel, A. (2007). Differences in socio-economic conditions and regulatory environment: explaining variations in national innovation performance and policy implications. *INNO Metrics*.

Hsieh, T. J., Chung, H. J. and Lo, H. (2010). The impact of top management team conflict on new product development: A cross-cultural perspective. *International Journal of Innovation and Technology Management*, **7**, 2: 193-208.

Hung, C. L. and Chou, J. C. L. (2014). Examining the cultural moderation on the acceptance of mobile commerce. *International Journal of Innovation and Technology Management*, **11**,2: 1450010.

Hung, H. and Mondejar, R. (2005). Corporate Directors and Entrepreneurial Innovation An Empirical Study. *Journal of entrepreneurship*, **14**,2: 117-129.

Inglehart, R, (1997). *Modernization and Postmodernization: Cultural, Economic and Political Change in 43 Societies.* Princeton: Princeton University Press.

Inglehart, R. (2006). Mapping Global Values. *Comparative Sociology,* **5**, 2/3.

Inglehart, R. and Baker, W. (2000). Modernization, Cultural Change and the Persistence of Traditional Values. *American Sociological Review, (February)*, 19–51.

Inglehart, R. and Oyserman, D. (2004). Individualism, autonomy, self-expression and human development. In H. Vinken, J. Soeters, and P. Ester (Eds.), *Comparing cultures, dimensions of culture in a comparative perspective* (pp.74–96). Leiden, The Netherlands: Brill.

Inglehart, R. and Welzel, C. (2005). *Modernization, cultural change, and democracy: The human development sequence*. Cambridge University Press.

Johns, S. K., Smith, M. and Strand, C. A. (2003). How culture affects the use of information technology. *Accounting Forum,* **27**,1: 84-109.

Jones, G. K. and Davis, H. J. (2000). National culture and innovation: Implications for locating global Rand D operations. *Management International Review,* 11-39.

Kafouros, M. I., and Buckley, P. J. (2008). Under what conditions do firms benefit from the research efforts of other organizations? *Research Policy,* **37**, 2: 225–239.

Kedia, B. L., Keller, R. T. and Jullan, S. D. (1992). Dimensions of national culture and the productivity of RandD units. *The Journal of High Technology Management Research*, **3**, 1: 1-18.

Kirzner, I.M. (1979). *Perception, opportunity and profit: Studies in the theory of entrepreneurshi*p. Chicago, Illinois: University of Chicago Press.

Kogut, B. and Singh, H. (1988). The effect of national culture on the choice of entry mode. *Journal of International Business Studies,* **19**(3), 411–432.

Kovačić, Z.J. (2005). The Impact of National Culture on Worldwide eGovernment Readiness. *Informing Science Journal, 8*.

Krueger, N.F. (2000). The cognitive infrastructure of opportunity emergence. *Entrepreneurship Theory and Practice,* **24**,3: 5–23.

Krueger, N.F. and Carsrud, A.L. (1993). Entrepreneurial intentions: applying the theory of planned behavior. *Entrepreneurship and Regional Development,* **5**,4: 315–30.

Krueger, N., Liñán, F. and Nabi, G. (2013). Cultural values and entrepreneurship. E*ntrepreneurship and Regional Development,* **25**, 9-10: 703–707.

Kumar, V. (2014). Understanding cultural differences in innovation: A conceptual framework and future research directions. *Journal of International Marketing*, **22**, 3: 1-29.

Lee, S.M. and Peterson, S.J. (2000). Culture, entrepreneurial orientation, and global competitiveness. *Journal of World Business,* **35**, 4: 401–416.

Lee, S.M. and Ungson, G.R. (2008). Towards a theory of synchronous technological assimilation: the case of Korea's Internet economy. *Journal of World Business,* **43**,3: 274-289.

Lee, M., Yun, J. J., Pyka, A., Won, D., Kodama, F., Schiuma, G., ... and Yan, M. R. (2018). How to respond to the fourth industrial revolution, or the second information technology revolution? Dynamic new combinations between technology, market, and society through

open innovation. *Journal of Open Innovation: Technology, Market, and Complexity*, **4**, 3: 21.

Lepoutre, J., Justo, R., Terjesen, S. and Bosma, N. (2013). Designing a global standardized methodology for measuring social entrepreneurship activity: The Global Entrepreneurship Monitor social entrepreneurship study. *Small Business Economics*, **40**: 693-714.

Levie, J. and Autio, E. (2011). Regulatory burden, rule of law, and entry of strategic entrepreneurs: An international panel study. *Journal of Management Studies,* **48**,6: 1392-1419.

Liu, X., Sun, Y. and Kaloustian, T. S. (2015). Cultural Factors Influencing Domestic Adoption of Solar Photovoltaic Technology: Perspectives from China. *China Media Research*, **11**,4.

Madsen, T. K. and Servais, P. (1997). The internationalization of born globals: An evolutionary process. *International Business Review,* **6**,6: 561-583.

Maitland, C.F. and Bauer, J.M. (2001). National level culture and global diffusion: The case of the Internet. In C. Ess (Ed.), Culture, technology, communication: Towards an intercultural global village (pp. 87128). Albany, NY: State University of New York Press.

March, J. G. and Simon, H. A. (1958). *Organizations*.

Martens, M., Roll, O. and Elliott, R. (2017). Testing the technology readiness and acceptance model for mobile payments across Germany and South Africa. *International Journal of Innovation and Technology Management*, **14**, 6: 1750033.

Marx, M., Strumsky, D. and Fleming, L. (2009). Mobility, skills, and the Michigan non-compete experiment. *Management Science,* **55**, 6: 875-889.

Meager, N. (1992). The fall and rise of self-employment (again): a comment on Bögenhold and Staber. *Work, Employment and Society,* **6**,1: 127-134.

Meijer, E.M. and Ling, R. (2001). The adoption and use of ICT services in Europe: Potential acceptance of mobile broadband services, EURESCOM P903, www.eurescom.de/_ftproot/web- deliverables/public/P900-series/P903/ICT_use_ante.pdf.

Minniti, M. (2008). The role of government policy on entrepreneurial activity: Productive, unproductive, or destructive? *Entrepreneurship Theory and Practice*, **32:** 779-790.

Muralidharan, E. and Pathak, S. (2017). Informal institutions and international entrepreneurship. *International Business Review*, **26**, 2: 288-302.

Muralidharan, E. and Pathak, S. (2018). Sustainability, transformational leadership, and social entrepreneurship. *Sustainability*, **10** ,2: 567.

Muralidharan, E. and Pathak, S. (2020). Home Country Institutions and International Entrepreneurship: A Multi-Level Framework–Institutions and International Entrepreneurship. In J.G.L. Dantas and L.G. Carvalho (Eds.), *Handbook of Research on Approaches to Alternative Entrepreneurship Opportunities*: 291-314. IGI Global.

Nakata, C. and Sivakumar, K. (1996). National culture and new product development: An integrative review. *The Journal of Marketing,* 61-72.

Nardon, L. and Aten, K. (2008). Beyond a better mousetrap: a cultural analysis of the adoption of ethanol in Brazil. *Journal of World Business,***43**,3: 261-273.

Nelson, R. R. and Winter, S. G. (1982). The Schumpeterian tradeoff revisited. *The American Economic Review,* **72**, 1: 114-132.

Noorderhaven, N., Thurik, R., Wennekers, S. and Stel, A. V. (2004). The role of dissatisfaction and per capita income in explaining self-employment across 15 European countries. *Entrepreneurship Theory and Practice,* **28**,5: 447-466.

Noseleit, F.(2010). The entrepreneurial culture: guiding principles of the self-employed. In A. Freytag and R. Thurik (Eds.), *Entrepreneurship and Culture*: 41–54. Berlin: Springer.

Obschonka, M., Goethner, M., Silbereisen, R. K. and Cantner, U. (2012). Social identity and the transition to entrepreneurship: The role of group identification with workplace peers. *Journal of Vocational Behavior,* **80**, 1: 137-147.

Otte, P. P. (2014). A (new) cultural turn toward solar cooking—evidence from six case studies across India and Burkina Faso. *Energy Research & Social Science*, **2**: 49-58.

Oyserman, D., Coon, H. M. and Kemmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin,* **128**,1: 3 - 72.

Patel, P. (1995). Localised Production of Technology for Global Markets. *Cambridge Journal of Economics,* **19**: 141-153.

Pathak, S. and Muralidharan, E. (2016). Informal institutions and their comparative influences on social and commercial entrepreneurship: The role of in-group collectivism and interpersonal Trust. *Journal of Small Business Management*, **54**: 168-188.

Pathak, S. and Muralidharan, E. (2018). Economic inequality and social entrepreneurship. *Business & Society*, **57**,6: 1150-1190.

Pathak, S., Muralidharan, E. and Laplume, A. (2014). Home country factors and the decision to internationalize technology-based new ventures: A multi-level study of early-stage entrepreneurs. *Frontiers of Entrepreneurship Research*, **34**, 19: 1.

Preece, S. B., Miles, G. and Baetz, M. G. (1999). Explaining the international intensity and global diversity of early-stage technology-based firms. *Journal of Business Venturing,* **14**: 259-281.

Rao, B., and Mulloth, B. (2017). The role of universities in encouraging growth of technology-based new ventures. *International Journal of Innovation and Technology Management*, **14** ,4: 1750014.

Rauch, A., Frese, M., Wang, Z. M., Unger, J., Lozada, M., Kupcha, V. and Spirina, T. (2013). National culture and cultural orientations of owners affecting the innovation–growth relationship in five countries. *Entrepreneurship & Regional Development*, **25**, (9-10): 732-755.

Reynolds, P. D. (1997). New and small firms in expanding markets. *Small Business Economics,* **9**: 79-84.

Reynolds, P.D., Bygrave, W.D., Autio, E., Cox, L.W. and Hay, H. (2002). *Global entrepreneurship monitor, 2002 executive report*. Babson College, London Business School and Kauffman Foundation.

Reynolds, P., Bosma, N., Autio, E., Hunt, S., De Bono, N., Servais, I., ... and Chin, N. (2005). Global entrepreneurship monitor: Data collection design and implementation 1998–2003. *Small Business Economics,* **24**, 3: 205-231.

Rogers, E.M. (1995). *Diffusion of Innovations*. (4th ed.). New York: The Free Press.

Rosenberg, N. (1972). Factors affecting diffusion of technology. *Explorations in Economic History*, **10**, 1: 3–33.

Rostow, W. W. (1992). *Theorists of economic growth from David Hume to the present: with a perspective on the next century*. Oxford University Press.

Rotaba, Z. and Beaudry, C. (2012). How do high, medium, and low tech firms innovate? A system of innovation (Si) approach. *International Journal of Innovation and Technology Management*, **9**, 5: 1250034.

Sadeghi, M. E. and Sadabadi, A. A. (2015). Evaluating Science Parks Capacity to Create Competitive Advantages: Comparison of Pardis Technology Park and Sheikh Bahaei

Science and Technology Park in Iran. *International Journal of Innovation and Technology Management*, **12**, 6:1550031.

Santarelli, E. and Pesciarelli, E. (1990). The emergence of a vision: The development of Schumpeter's theory of entrepreneurship. *History of Political Economy,* **22**,4: 677-696.

Scherer, F. (1980). *Industrial Market Structure and Economic Performance*. (2nd ed.). Chicago: Rand McNally.

Schumpeter, J.A. (1934). *The theory of economic development*. Cambridge, MA: Harvard University Press.

Schwab, K. (2017). The Fourth Industrial Revolution; Crown Business: New York, NY, USA.

Shane, S. A. (1992). Why do some societies invent more than others? *Journal of Business Venturing,* **7,**1: 29-46.

Shane, S. A. (1993). Cultural influences on national rates of innovation. *Journal of Business Venturing,* **8**: 59–73.

Shteynberg, G., Gelfand, M. J. and Kim, K. (2009). Peering into the ‘‘Magnum Mysterium’’ of culture: The explanatory power of descriptive norms. *Journal of Cross-Cultural Psychology*, **40**, 1: 46–69.

Sørnes, J-O., Stephens, K. K., Sætre, A. S. and Browning, L. D. (2004). The reflexivity between ICTs and business culture: Applying Hofstede’s theory to compare Norway and the United States. *Informing Science Journal,* **7**: 1-30.

Steenhuis, H. J. and De Bruijn, E. J. (2012). Technology and economic development: A literature review. *International Journal of Innovation and Technology Management*, **9** ,5: 1250033.

Steensma, H.K., Marina, L. and Dickson, P.H. (2000). The influence ofnational culture on the formation of technology alliances by entrepreneurial firms. *Academy of Management Journal,* **43**, 5: 951–973.

Steers, R.M., Meyer, A.D. and Sanchez-Runde, C.J. (2008). National Culture and the adoption of new technologies. *Science Digest,* **43**: 255-260.

Stein, M.I. (1974). *Stimulating Creativity*, Vol 1. New York: Academic Press.

Stephan, U., Uhlaner, L. M. and Stride, C. (2015). Institutions and social entrepreneurship: The role of institutional voids, institutional support, and institutional configurations. *Journal of International Business Studies,* **46**, 3: 308-331.

Stephan, U. and Pathak, S. (2016). Beyond cultural values? Cultural leadership ideals and entrepreneurship. *Journal of Business Venturing*, **31**, 5: 505-523.

Stephan, U. and Uhlaner, L. M. (2010). Performance-based vs socially supportive culture: A cross-national study of descriptive norms and entrepreneurship. *Journal of International Business Studies,* **41**, 8: 1347-1364.

Stephenson, J., Barton, B., Carrington, G., Gnoth, D., Lawson, R. and Thorsnes, P. (2010). Energy cultures: A framework for understanding energy behaviours. *Energy policy*, **38**, 10: 6120-6129.

Stern, S., Porter, M. and Furman, J.L. (2000). The National Determinants of Innovative Capacity. Working Paper 7876, National Bureau of Economic Research.

Sternberg, R. and Wennekers, S. (2005). Determinants and effects of new business creation using global entrepreneurship monitor data. *Small Business Economics,* **24,** 3: 193-203.

Storey, D. J. (1994). *Understanding the small business sector*. London: Routledge.

Taylor, M. Z. and Wilson, S. (2012). Does culture still matter? : The effects of individualism on national innovation rates. *Journal of Business Venturing*, **27**,2: 234-247.

Thanawala, K. (1994). Schumpeter's theory of economic development and development economics. *Review of Social Economy,* **52**,4: 353-363.

Thomas, L. and Autio, E. (2012). Modeling the ecosystem: a meta-synthesis of ecosystem and related literatures. *Proceedings DRUID Society*.

Thomas, A. S. and Mueller, S. L. (2000). A case for comparative entrepreneurship: Assessing the relevance of culture. *Journal of International Business Studies,* **31**, 2: 287–301.

Tidd, J., Pavitt, K. and Bessant, J. (2001). *Managing innovation* (Vol. 3). Chichester: Wiley.

Tung, R. L., Walls, J. and Frese, M. (2007). Cross-cultural entrepreneurship: the case of China. In J. R. Baum, M. Frese, and R. A. Baron (Eds.), *The psychology of entrepreneurship*: 265–286. Mahwah, NJ: Lawrence Erlbaum Associates.

Uhlaner, L. M. and Thurik, R. (2007). Postmaterialism influencing total entrepreneurial activity across nations. *Journal of Evolutionary Economics,* **17**, 2: 161–185.

Van Ark, B., Inklaar, R. and McGuckin, R. H. (2002). Changing Gear: Productivity, ICT and service: Europe and the United States, University of Groningen and The Conference Board, mimeograph.

Wang, C. and Kafouros, M.I. (2009). What factors determine innovation performance in emerging economies? Evidence from China. *International Business Review,* **16**: 606-616.

Webb, J. W., Tihanyi, L., Ireland, R. D. and Sirmon, D. G. (2009). You say illegal, I say legitimate: Entrepreneurship in the informal economy. *Academy of Management Review,* **34**, 3: 492-510.

Weber, M. E., Weggeman, M. C. and Van Aken, J. E. (2012). Developing what customers really need: involving customers in innovations. *International Journal of Innovation and Technology Management*, **9**, 3: 1250018.

Welter, F. (2011). Contextualizing entrepreneurship—conceptual challenges and ways forward. *Entrepreneurship Theory and Practice,* **35**, 1: 165-184.

Wennberg, K., Pathak, S. and Autio, E. (2013). How culture moulds the effects of self-efficacy and fear of failure on entrepreneurship. *Entrepreneurship and Regional Development,* **25,** 9-10: 756-780.

Wennekers, S., Thurik, R., van Stel, A. and Noorderhaven, N. (2007). Uncertainty avoidance and the rate of business ownership across 21 OECD countries, 1976–2004. *Journal of Evolutionary economics,* **17**, 2: 133-160.

Williams, L. K. and McGuire, S. J. (2010). Economic creativity and innovation implementation: the entrepreneurial drivers of growth? Evidence from 63 countries. *Small Business Economics*, **34** ,4: 391-412.

Wonglimpiyarat, J. (2017). Tax and S&T Policies for Research Commercialization: Perspectives of Southeast Asian Countries. *International Journal of Innovation and Technology Management*, **14** ,4 :1750017.

Yap, A. Y., Das, J., Burbridge, J. and Cort, K. (2006). A composite-model for e-commerce diffusion: Integrating cultural and socio-economic dimensions to the dynamics of diffusion. *Journal of Global Information Management,* **14**, 3: 17-38.

Yesilay, R. B., Ar, I. M. and Temel, S. (2015). The Relationship Between Direct Government Support for R&D and Patents in Emerging Economies: A Turkish Case Study. *International Journal of Innovation and Technology Management*, **12**, 5: 1550021.

Zahra, S., Ireland, R. D. and Hitt, M. (2000). International expansion by new venture firms: International diversity, mode of market entry, technological learning, and performance. *Academy of Management Journal,* **43**, 5: 925-950.

Zahra, S. A. and Wright, M. (2011). Entrepreneurship's next act. *The Academy of Management Perspectives,* **25**, 4: 67-83.

Figure 1: Conceptual model

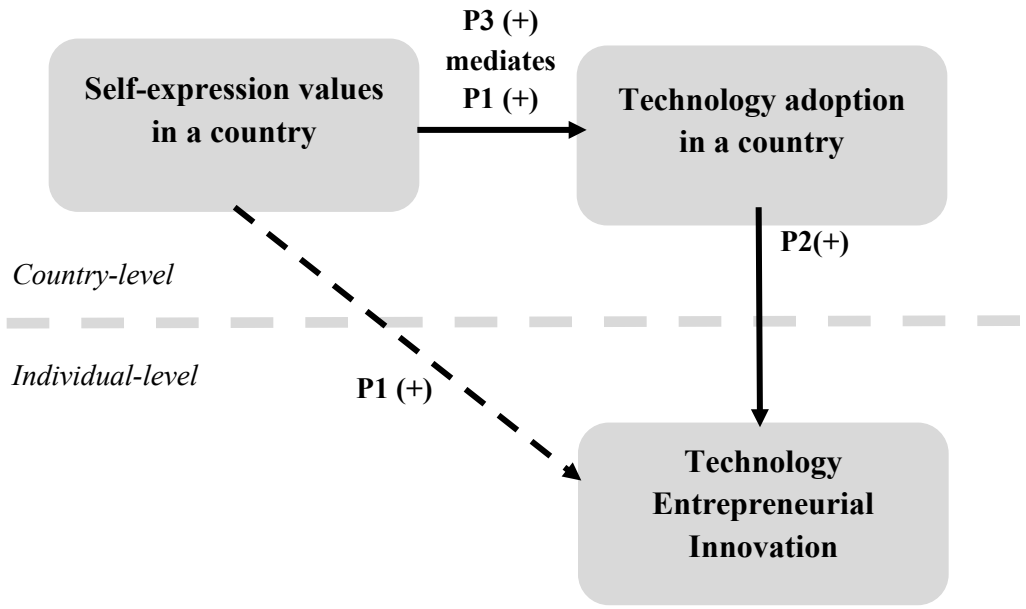

Figure-2: Needs and Industrial Revolution

Source: Adapted from Lee et al. (2018)

Figure 3: Suggested Empirical Framework