Exploring Long Term Venture Success in the Smart City Entrepreneurial Ecosystem

By

Bonnie Rohde

Albright College

13th and Bern Streets

Reading, PA 19604

**Abstract**

Innovation and entrepreneurship are what cities produce, due to their diverse concentrations of talent, people and companies (Jacobs, 1961). Smart cities deploy innovative technology in pursuit of solving the problems of urbanization; yet, according to Sarma and Sunny, 2016, the innovations developed in the venture backed entrepreneurial ecosystems are not supporting long term ventures. This paradox suggests that smart city entrepreneurial ecosystems present particular challenges for building mature, job creating businesses needed to fund investments in urban modernization. Cities that invest in modernizing technologies need methods for sustaining the long term costs and maintenance. This study uses cluster analysis as a means for organizing smart cities based on their business development, entrepreneurial ecosystems, and location demographics to determine which smart cities are able to build long term ventures.

**Introduction**

Innovation and entrepreneurship are what cities produce, due to their diverse concentrations of talent, people and companies (Jacobs, 1961). As this was true in prior centuries, the emergence of the “Smart City” within the past decade, with a clear focus on addressing socio-economic and socio-ecological concerns of global urbanization, should excel at producing innovation and entrepreneurship. In some smart cities this is the result and there is the creation of innovation hubs, entrepreneurial projects, venture capital funding, and corporate backers (Guzman & Stern, 2016; Sarma & Sunny, 2017). This collection of governments, industries, citizens, investors, and entrepreneurs focused on economic, social and environmental sustainability are civic entrepreneurial ecosystems (Sarma & Sunny, 2017).

 Smart cities are now starting to show their true potential as the technology they deployed over the past ten years is reflected in the educational, industry, and city environment (Wiig, 2014). There are varied definitions for smart cities, and various progressions toward smart cities (Lazaroiu, & Roscia, 2012; Lee, Hancock, & Hu, 2014; Lee, Phaal, & Lee, 2013). The smart city is ill defined and is additionally referred to as a digital city, green city, and sustainable city (Leydesdorff & Deakin, 2011; Shahrokni et al., 2015; Wiig, 2014). IBM defines smart cities as cities that use technology to transform their operations, and core systems to optimize finite resources (IBM Smarter Cities Competition, 2013; Paroutic, Bennett, & Heracleous, 2014). Green smart cities are defined as cities that deploy technologies to improve management of city operations, services to local citizens, industrial development, and intergovernmental governance (Siuryte & Davidaviciene, 2016; Yanrong & Whyte, 2016). Smart cities are also viewed as forward-looking with positive performance in the improvement of the economy, people, governance, mobility, environment, quality of life, and with socially responsive, highly educated citizens (Alawadhi, Aldama-Nalda, Chourabi, et al., 2012).

For the purposes of this study, a “smart city” is a city that is incorporating three or more categories of technologies to improve the effectiveness and efficiency of the cities operations, infrastructure, public services, and/or emergency services. The technologies are grouped into four key categories, which include: 1. ICT (information and communication technologies), 2. Smart IoT (Internet of things, sensors that continually communicate the status of what they are sensing)/Cloud which includes Smart Grid, Smart Waste, Smart Transportation, and Smart Operations, 3. Ed-Tech services through University clusters, and 4. Open City Data (city generated data available for developers to use to create city services apps) (Giffinger & Gudrun, 2010; Kitchin, 2015; Lanza et al., 2016). A smart city will be utilizing at least three of these technologies and has deployed them successfully for more than five years. The city must also have long range plans to manage their smart infrastructure and plans for future investments, which reflect the forward-looking attitudes required for smart city success (Yanrong & Whyte, 2016).

Smart city technologies according to Yanrong and Whyte (2106), are needed to address the ‘counter-urbanization’ of cities which means cities are growing and with this growth comes traffic congestion, increased waste treatment, increased energy consumption, the need for racial inclusion, and improved education and employment. Progressively designed smart cities are being developed to address these issues (Hollands, 2008 ;Yanrong & Whyte, 2016). According to the 2016 World Cities Report by the UN Human Settlement Program, there are five trends affecting the world’s cities that include: 1. Increased urbanization of small and medium-sized cities, 2. Decentralization of government, 3. Climate change, 4. Growing international migration, and 5. Social inequality (Kitchin, 2014; UN Habitat, 2016). Social inequality between the rich and poor has been reported in 2017 as the highest in three decades (Hollands, 2015; Yanrong & Whyte, 2016). There are 3.42 billion people living in urban areas in the world and this is expected to grow to 12 billion by 2025 (UN Habitat, 2016).

 As smart city technologies have emerged throughout the world, there are lessons that can be learned from cities and countries that have been successful in their deployment, and specifically in how smart city technology deployment impacts entrepreneurial ecosystems. The U.S.’s previous administration issued a press release in the fall of 2015, which announced several initiatives to provide grant-funding opportunities to cities interested in deploying smart city technologies (Obama White House, 2015). IBM, Cisco, AT&T, the Kauffman Foundation, Google, USDOT, and many organizations and municipalities in the U.S. have been instrumental in driving smart city initiatives. The initiatives include competitions, public-private partnerships, grant opportunities, venture capital backed innovation hubs, and technology (Obama White House, 2015; IBM, 2013; Sarma & Sunny, 2017).

**Statement of the Problem**

Although smart cities deploy innovative technology in pursuit of solving the problems of urbanization, the innovations developed in the venture, backed entrepreneurial ecosystems are not supporting the development of long term ventures (Sarma & Sunny, 2016). Local entrepreneurs come up with ideas to solve local problems, develop the solution backed by grants and venture capital, but are not able to build industries that employ urban workers for extended periods of time (Sarma & Sunny, 2016). The U.S. is supporting smart city initiatives with public funds and includes private funding from venture capitalists, and industry (Sarma & Sunny, 2017). According to the Black & Veatch Smart City/Smart Utility Report of 2017, the number one issue city leaders must overcome to enable smart city initiatives is budget constraints (Robinson, 2017). To address budget constraints, 45.9% of city leaders look for additional tax revenue from increased economic development (Robinson, 2017). Comparing how the smart cities in the U.S. develop smart city entrepreneurial ecosystems, will help to uncover how to move from local solutions to long term ventures to increase economic development. Smart city theory is a descriptive theory (Fawcett & Downs, 1986), which describes and summarizes unique characteristics of a phenomenon through similar observations. The lack of a common definition for smart city that is accepted by academics and practitioners makes the study of smart cities difficult (Nam & Pardo, 2011). Entrepreneurial ecosystems and innovative ecosystems have been evaluated in the literature (Feldman, 2014; Glaeser, 2007; Guzman & Stern, 2016; Koryak, Mole, & Lockett (2015), but not in the smart city context. There is a gap in the literature in smart city entrepreneurial ecosystems and long term venture development (Chourabi et al., 2012; Nam & Pardo, 2011b; Sarma & Sunny, 2016).

**Theoretical Framework**

 Smart cities are comprised of six key building blocks: 1. Smart people, 2. Smart mobility, 3. Smart environment, 4. Smart living, 5. Smart economy, and 6. Smart governance (Kumar & Dahiya, 2017). The six components of an ideal city developed at the turn of the 19th century and used to define smart cities include 1. Economy, 2. Governance, 3. People, 4. Science and technology, 5. Living, and 6. Environment (Luque-Ayala & Marvin, 2015; Mardacany, 2014). Smart economy is crucial to the smart city building blocks and is why many cities invest in the smart city technologies. Kumar and Dahiya describe the following 19 attributes of a smart city economy.

1. A smart city understands its economic DNA.
2. A smart city is driven by innovation and supported by universities that focus on cutting-edge research, not only for science, industry and business but also for cultural heritage, architecture, planning, development, and the like.
3. A smart city highly values creativity and welcomes new ideas.
4. A smart city has enlightened entrepreneurial leadership.
5. A smart city offers its citizens diverse economic opportunities.
6. A smart city knows that all economics works at the local level.
7. A smart city is prepared for the challenges posed by and opportunities of economic globalization.
8. A smart city experiments, supports, and promotes sharing economy.
9. A smart city thinks locally, acts regionally, and competes globally.
10. A smart city makes strategic investments on its strategic assets.
11. A smart city develops and supports compelling national brands.
12. A smart city insists on balanced and sustainable economic development (growth).
13. A smart city is a destination that people want to visit (tourism).
14. A smart city is nationally competitive on selected and significant factors.
15. A smart city is resourceful, making the most of its assets while finding solutions to problems.
16. A smart city excels in productivity.
17. A smart city has high flexibility of labour market.
18. A smart city welcomes human resources that enhance its wealth.
19. A smart city’s inhabitants strive for sustainable natural resource management and understand that without this its economy will not function indefinitely.

Ford, O’Neal, and Sullivan (2010) also indicate that smart “management and policy tools” need to include clean growth initiatives to support the smart economy such as subsidized business incubators, small business investment, tax incentives, university research grants, direct start-up investment, and indirect venture capital investment through fund sponsors. Smart city theories and research identify similarities of discrete observations and are categorized as “descriptive” theories (Fawcett & Downs, 1986). Much of the research on smart cities focuses on the mobility, or science and technology elements of smart cities where smart economies and smart people are lacking (Nam & Pardo, 2011).

Smart cities for this research study, deploy more than one type of smart city technology category. The technologies are grouped into four key categories, which include: 1. ICT (information and communication technologies), 2. Smart IoT (Internet of things, sensors that continually communicate the status of what they are sensing)/Cloud which includes Smart Grid, Smart Waste, Smart Transportation, and Smart Operations, 3. Ed-Tech services through University clusters, and 4. Open City Data (city generated data available for developers to use to create city services apps) (Giffinger & Gudrun, 2010; Kitchin, 2015; Rathore, & Rho, 2016).

 **Significance of the Study**

 As smart cities unfold around the U.S. to address the pressing needs of urbanization, successful deployments need to be studied to help city governments improve their urban planning, social services, public safety, and improve their use of scarce resources. Specifically, the impact on building entrepreneurial ecosystems that develop long term ventures that drive and support economic prosperity, is crucial to the success of these urban economies. Cities that do not embrace the use of these key technologies will become disadvantaged in providing the resources required for economic development (Ehrenhalt, 2012; Gilbert, 2010; Gilbert & Masucci, 2011). Management of the massive amounts of data generated by individuals, cities, and industries is crucial for success in the future economy (Chen, Jeon, & Kim, 2014; Robinson, 2017; Tolentino, 2017). The use of Artificial Intelligence to connect automated cars and manage traffic congestion is one solution that cities without smart technologies would not be able to support (Tolentino, 2017). Increasing big data demands for managing health information, climate monitoring for emergency notification, IoT sensor data, drone and swarm capabilities in managing emergencies, and future technologies to improve the efficiency of cities require high speed, always on, Internet connections (Thrift, 2014; Tolentino, 2017; AlDairi & Tawalbeh, 2017; Oyana, 2011). Cities that are not investing in these modernizing technologies will fall behind and will no longer be attractive to business and citizens that rely on these technologies.

**Research Question**

 What are the major characteristics of smart cities’ entrepreneurial ecosystems that develop growing, long term ventures? This question challenges the paradigm structure of many innovation and entrepreneurial ecosystems. New products and development directives in organizations are guided by the strategy of the organization (Pisano, 2015). The strategic directive of venture capital backed funds is to provide an immediate return to the investors. This drives short term project oriented innovation rather than long term ventures (Guzman & Stern, 2016). Additionally, grant based funding supports the investor through payments based on progress. The entrepreneur must complete the project to obtain the full funding which also drives project based solutions rather than long term ventures (Sarma & Sunny, 2017). Lastly, established industries take the local entrepreneurial idea and create systematic solutions (Sarma & Sunny, 2017). Many times the systematic solution becomes a repackaging of the established industry existing technology, “repackaged”, and the local entrepreneurial idea is lost (Sarma & Sunny, 2017).

As smart cities use technologies to solve the issues of urbanization, smart cities can use the methods of IT strategy (MOTC, 2009). Dave Aron in his Gartner video on “Creating winning IT Strategies” defines the need for IT strategy to be based on the strategy of the business (MOTC, 2009). Without the core strategic direction, IT becomes a cost center of exponential proportions with no cohesive strategy (MOTC, 2009). Instead, disparate IT projects are deployed for short-term interest groups, (MOTC, 2009). Many cities deploy smart city technologies in a piece meal fashion due to funding constraints (Robinson, 2017). This lack of a strategic, holistic focus causes disjointed, isolation, lack of knowledge sharing, and an increased potential for failure.

**Venn Diagram**

 The ability of the city to deploy smart city technologies to solve urban problems, the length of time they have been deployed and the amount of technologies being used all impact the status of the smart city. The entrepreneurial ecosystem incorporates layers of entrepreneurial support such as business incubators, innovation hubs, innovation competitions, government funding, entre- *Figure 1*. Fields of Knowledge.

preneurial coaching, and entrepreneurial education (Sarma & Sunny, 2017). Long term ventures build jobs to support urban populations, smart city investments, and grow the economy of the smart city. In Figure 1 the literature review focuses on the critical intersection where the three concepts of smart city, entrepreneurial ecosystem and long term venture overlap.

**Definition of Terms**

1. IoT – internet of things, sensors that generate data about an item they are monitoring.
2. ICT – information and communications technologies that include high-speed fiber-optic

Broadband infrastructure.

1. Smart City - is a city that is incorporating three or more technologies to improve the effectiveness and efficiency of the cities operations, infrastructure, public services, and emergency services.
2. Counter-urbanization – growth in the populations in cities is causing traffic jams, waste treatment needs, lack of racial inclusion, increased energy consumption, and the need for employment (Yanrong & Whyte, 2016).
3. Ed-tech – technologies used to digitize and automate the educational environment in Smart Cities also known as Smart education (Williamson, 2015).
4. Open-Data – the sharing of e-government and operational data generated by city operations. This data is used by developers to create improved smart city citizen apps (Mattoni, Gugliermetti, & Bisegna, 2015).
5. Entrepreneurial (Innovative) Ecosystem – The collection of governments, industries, citizens, investors, and entrepreneurs focused on economic, social and environmental sustainability (Isenberg, 2014).

**Summary**

 Determining how long term ventures can be developed through smart city entrepreneurial ecosystems will assist urban leaders in their plans for smart city investment. Data will be collected from city documents, existing smart city research for the U.S., existing economic reports on new businesses and their existence, and city demographics.

**Literature Review**

**Smart Cities**

Cities of the world today are being bombarded by an onslaught of pressure for change due to population growth, aging infrastructure, digital citizens, unprecedented amounts of generated data, demands for data and its security, transportation gridlock, the need for sustainability, technological innovation, and lack of resources (Herzberg, 2017; Yanrong & White, 2016). More than 60% of the world’s population is expected to be urban by 2050 (Bernardo, 2017; Song, Srinivasan, Sookoor & Jeschke, 2017). Table 1 includes the prominent studies on how smart cities are defined, measured, deployed, and their potential risks.

**Agreement**

 Several of the researchers agree that smart cities and cities in general, help to drive economic revival through partnerships between public entities like government and private enterprise (Glasmeier, & Christopherson, 2015; Salvador, Trillas, Ricart, Rodriguez, Ferradans, & Fageda, 2014). The various organizations that collaborate for smart city technology development, create an ecosystem that supports business growth (Glasmeier, & Christopherson, 2015). Peng, O’Farrell, and Kiran (2014) agree that public private partnerships are needed to provide successful smart city services.

 Several authors agree that smart cities include technologies to improve communications through mobile carriers (Peng, O’Farrell, & Kiran (2014), transportation technology to alleviate traffic congestion (Arroub, Zahi, Sabir, & Sadik, 2016), and sharing of data collected through the Internet of Things network of sensors (Arroub, Zahi, Sabir, & Sadik, 2016).

**Disagreement**

Glasmeier and Christopherson (2015) explain that smart cities are ill-suited in solving the

The major problems of urban life. Poverty, failing schools, disinvestment in neighborhoods, and poor planning by placing cities in environmentally risky locations, are problems that smart technology in cities, does little to solve (Glasmeier, & Christopherson, 2015). The GSMA study and the IESE study do not agree on the factors that designate a smart city (Peng, O’Farrell, & Kiran, 2014; Berrone, & Ricart, 2017). Each of the smart city indexes have different cities listed as the best example of a smart city (Peng, O’Farrell, & Kiran, 2014; Berrone, & Ricart, 2017).

 The World Economic Forum report on Harnessing Public-Private Cooperation to Deliver the New Urban Agenda (2017), discussed many issues with Public Private Partnerships due to lack of transparency, non-disclosure of ongoing maintenance costs of smart city technology deployments, and lack of sustainable partnerships between government and private enterprise.

There are concerns over the security of data, critical infrastructure for water and electricity, transportation vehicle data, and the potential for lost jobs due to Artificial Intelligence all enabled by smart city technology (AlDairi, & Tawalbeh, 2017; Arroub, Zahi, Sabir, & Sadick, 2016; Bataweel, 2015; Carrington, 2016). There are additional concerns over the extensive costs of smart city technology and the ongoing costs to support them (Calzada, & Cobo, 2015; Diaz-Diaz, Munoz, & Perez-Gonzalez, 2017; Dumitru, 2017). The loss of personal privacy is a grave concern to many as the government deploys surveillance technology throughout smart cities (Forni, & Meulen, 2016; Garcia, Ruiz, & Gomez-Nieto, 2016; Klauser & Albrechtslund, 2014). Simply because the technology is available, should it be widely deployed at the expense of urban citizens?

Table 1.

*Smart cities defined.*

|  |  |  |  |
| --- | --- | --- | --- |
| Author(s) | Focus of Study or Sample data selection | Research Topic Importance | Results |
| Arroub, Zahi, Sabir, & Sadik (2016); Albino, Berardi, & Dangelico (2015) | Overview of Smart City characteristics | Technological impact to architecture, infrastructure, & innovation | Smart city technology used to provide opportunities for people, innovation, and quality of life. |
| Peng, O’Farrell, & Kiran (2014) | Index of Smart Cities developed by GSMA | Public and private partnerships for successful smart cities services. |  Focus on mobile-based solutions to enhance the quality of life and entrepreneurship in the world’s cities. |
| Berrone, & Ricart (2017) | IESE Cites in Motion Index 2017 | City evolution and ranking of the world’s smartest cities |  New York is the world’s smartest city followed by London, Paris, San Francisco, Boston, and Amsterdam |
| Glasmeier, & Christopherson; Salvador (2015); Trillas, Ricart, Rodriguez, Ferradans, & Fageda (2017) | Debates the term “smart cities” | Collaborative governments of smart cities help drive innovation. | Public private partnerships between multiple stakeholders expedites the delivery of integrated services in smart cities. |
| Alawdah (2017); Chin, (2017) | Determines list of smart cities, Alawda develops own index and Chin uses cluster analysis | Research methodologies to define smart cities in the U.S. | Alawda smart city list not correlated with other researchers’ smart city lists. Chin’s smart city list is correlated with other indexes and list of identified smart cities |

**Limitations**

 There is little empirical evidence supporting the views in the research on smart cities. Several studies indicate the need for this type of case study research (Sarma, & Sunny, 2017; Guzman, & Stern, 2016). There is limited agreement on the definition of a smart city due to the technological transformations in the field (Glasmeier, & Christopherson; Salvador, 2015; Trillas, Ricart, Rodriguez, Ferradans, & Fageda, 2017). Many of the studies are isolated observations of a specific city or region that may not be transferrable to other geographic areas (Yanrong & Whyte, 2016).

**Context**

The United States has a population of 325 million, a median age of 38, and 83% of the population is urban (Worldometers, 2017). The United States’ strengths are their government support of smart city development, their highly educated population, and their support of entrepreneurship through ease of access to capital and connectivity (Colson, 2017).

 Smart cities in the region will be identified through cluster analysis by the level of progress they have with smart city technology deployments based on the results of the 2016 Smart Cities Survey from the United States Conference of Mayors issued January 2017, the Sustainable Cities Index from 2016, the IESE Cities in Motion Index 2017, the Index of Smart Cities developed by GSMA, the ITU-T Smart Sustainable Cities report, and additional smart city studies.

**Entrepreneurial Ecosystems**

Entrepreneurial ecosystems support entrepreneurship and help create jobs (Burns, 2017; Pool & Itallie, 2013). Entrepreneurial ecosystems consist of active and potential entrepreneurs, mentors, investors, universities, large companies, and support platforms like incubators, accelerators, venture capital, and cheerleaders (Fig. 2, Pool & Itallie, 2013). Entrepreneurial ecosystems support start-ups which are companies designed to grow fast (Pool & Itallie, 2013; Stam & Spigel, 2016). To measure the success of entrepreneurial ecosystems, Pool and Itallie, 2013, recommend looking at three outputs: number of startups created, number of jobs created, and the amount of wealth created, revenue.

*Figure 2.* Entrepreneurial Ecosystem Logic Model. (Pool & Itallie, 2013).

Support platforms include organizations and institutions that help facilitate the flows of technology, talent, resources, and capital between stakeholders (Pool & Itallie, 2013). Cheerleaders connect ecosystem participants and their ideas, knowledge, and deals (Pool & Itallie, 2013).

 Isenberg (2011), defines six domains of the entrepreneurship ecosystem that include Policy, Finance, Markets, Culture, Supports and Human Capital (Fig. 3).



*Figure 3*. The six domains of the entrepreneurial ecosystem. (Isenberg, 2011).

The literature defines entrepreneurial ecosystems, provides measurement tools to evaluate them, includes examples of successful ecosystems, and explains how these ecosystems may be failing society (Table 2).

Table 2.

*Entrepreneurial Ecosystems defined.*

|  |  |  |  |
| --- | --- | --- | --- |
| Author(s) | Focus of Study or Sample data selection | Research Topic Importance | Results |
| Auerswald, (2015); Guzman & Stern (2016); Sarma, & Sunny (2017) | Civic entrepreneurial ecosystem: Smart city emergence in Kansas City | Entrepreneurial ecosystem impact on sustainable ventures in smart cities |  Entrepreneurial ecosystems in smart cities drive short sighted responses by entrepreneurs due to venture backed funds and need for immediate returns |
| ANDE (2013); Pool, & Itallie (2013); Renault (2017); Taich, Piazza, Carter, Wilcox (2016) | Measuring Entrepreneurial Ecosystems and comparative study between Boston and Baltimore | Key elements for determining Entrepreneurial Ecosystem success | Survey tools, methodologies, and databases for measuring, entrepreneurial ecosystem, use case on Boston and Baltimore |
| Florida & King (2016); Glaeser (2007);Gonzalez-Uribe, & Leatherbee (2016) | Startup capital, accelerators, and entrepreneurship and urban growth | Effects of entrepreneurship ecosystem elements on urban growth | Successful use cases and examples of these elements in use |
| Isenberg (2011); Isenberg (2014) | Defining six elements of Entrepreneurship Ecosystems | Clear definition, easily measured | Elements to qualify entrepreneurship ecosystems. |

**Agreement**

Trillo (2014), concludes that urban regeneration is successful when an active network of multiple stakeholders are engaged in developing an entrepreneurial ecosystem. Trillo (2014) also discusses the communitarian approach to value creation through striking a balance between individual and public good by implementing relational values on economics. Entrepreneurial ecosystems thrive on the relationships built between organizations, government, entrepreneurs, and business in the pursuit of new business generation, job growth, revenue generation, and sustainable solutions (ANDE, 2013).

 Gonzalez-Uribe, & Leatherbee (2016) describe the positive effects of business accelerators on venture performance from start-up Chile. Specifically how mentorships through business accelerators improved the success of government sponsored entrepreneurship programs (Gonzalez-Uribe, & Leatherbee, 2016). Florida and King (2016) researched the urban startup neighborhoods and discovered that less than 0.2% of all zip codes attracted more than $100 million in venture capital investment. The top 20 neighborhoods account for more than $10 billion in venture capital investment (Florida & King, 2016). The top 20 neighborhoods include nine in San Francisco, fine in San Jose, three in Boston, and one in San Diego, Dallas, and New York.

**Disagreement**

Sarma, and Sunny (2017), view the entrepreneurial ecosystems in smart cities as a key driver to the failure of long term venture establishment. Sarma and Sunny (2017), view the venture capital backed environment for entrepreneurs as too influential in only meeting short term funding objectives. The whole focus of entrepreneurial ecosystems taints the environment in smart cities, and thwarts the ability of entrepreneurs to learn to grow their businesses (Sarma, & Sunny, 2017).

Guzman and Stern (2016), have reservations on how venture capital stymies long term venture growth due to short term, project based funding structures. Entrepreneurs rely on the funds, but are only funded when they meet specific short term milestones. The focus is in sprints rather than long term planning and extended growth. The entrepreneurial ecosystems strength is in start-ups rather than long term venture development.

**Limitations**

 Guzman and Stern (2016), Florida and King (2016), and Sarma and Sunny (2017) are working papers and their research has not been verified. The ANDE (2013) survey tools was designed for international entrepreneurship rather than U.S. Isenberg’s (2011) six element entrepreneurial ecosystem model is complex and difficult to apply. The Pool and Itallie (2013) entrepreneurial ecosystem model is easier to read, but does not clearly explain the interdependencies between the elements and their impacts.

**Long Term Ventures**

 Long term ventures are businesses that grow jobs and are in existence for longer than five years. Table 3 lists research on long term ventures and the development in smart cities. Successful entrepreneurial ventures typically build clusters to help sustain their venture (Feldman, 2014). Entrepreneurs also are more successful if they choose a region they want to support (Feldman, 2014). Entrepreneurs can improve their business longevity if they obtain training and education in entrepreneurship and long term strategy planning (Martiz, Koch, & Schmidt, 2016; Koryak, Mole, & Lockett, 2015). There is a lack of literature on long term venture growth in smart cities and the entrepreneurial ecosystems that support them. There are research articles that can support each individual element, but there isn’t one cohesive study that considers entrepreneurial ecosystems in smart cities for long term ventures.

Table 3.

*Entrepreneurship and long term ventures defined.*

|  |  |  |  |
| --- | --- | --- | --- |
| Author(s) | Focus of Study or Sample data selection | Research Topic Importance | Results |
| Wiig (2014); Brett, & Woelfel, (2016); Cray et al. (2011). | Philadelphia after deploying smart city initiatives in the Navy Yard and building quality jobs | Results of smart city deployment on urban life | Income inequality, lack of jobs for un-skilled, and limited benefits except for gentrification of district |
| Martiz, Koch, & Schmidt (2016); Koryak, Mole, & Lockett (2015) | Entrepreneurship education and entrepreneurship ecosystems | The need for educating entrepreneurs to improve success | Education in longer term strategic thinking and planning helps entrepreneurs plan for long term ventures |
| Dahl & Sorenson (2012): Feldman (2014) | The disparity of results from investment in geographic regions | Determination of success and failure of investment in Entrepreneurial Ecosystems | Human agency in the desire to build innovation and entrepreneurship is the sole driver of its success |
| Bednarzik (200); Kritikos (2014) | Entrepreneurs impact on jobs and economic growth | Pros and cons on entrepreneurship and its effects | For entrepreneurs to flourish regulations need to support not hinder start-ups and society must be prepared for the impact of innovation and change |

**Agreement**

 Long term ventures can be sustained if the entrepreneur is in a region they want to support (Feldman, 2014). If an entrepreneur starts their business in their hometown, it can be more successful than if the entrepreneur starts the business in a random location. Venture capital could be regulated to provide extended funding rather than pushing for immediate returns (Kritikos, 2014). Educating entrepreneurs to manage their business, develop strategic plans, and understand financial decision improves the long term success of the business (Martiz, Koch, & Schmidt, 2016; Koryak, Mole, & Lockett, 2015)

**Disagreement**

Wiig (2014), researched the smart city initiatives in Philadelphia and their impact on the economy. He discovered there was little improvement on urban life due to continued lack of jobs for unskilled labor and significant wage disparities (Wiig, 2014). Wiig (2014) also discovered the smart city initiatives were only rhetoric to feed into the cities facade of innovative urban cities (Soderstrom, Paasche, Klauser, 2014). Smart city technologies have little to do with urban sustainability, job growth, and economic prosperity and are only methods of marketing (Wiig, 2014). Taking limited city resources and using them for temporary smart city “bells and whistles” is a waste of tax dollars that could be used to help urban citizens (Wiig, 2014).

**Limitations**

Wiig’s research was a recently published dissertation, Feldman evaluated isolated observations of entrepreneurship success which have limited application to long term ventures. Kritikos supports the need for regulations that facilitate start-ups, which varies across each municipality and has limited applicable recommendations. There is limited empirical research and agreement between researchers in what allows businesses to move from venture to growing business and even high growth business (Koryak, Mole and Lockett, 2015). These limitations help to support the need for further research of smart city entrepreneurial ecosystems, and the models needed to support long term ventures.

**Literature Review Summary**

The literature review supports the research question, hypothesis, and study design. There are varied definitions of smart cities in the literature hence the need to define a smart city for this research. Entrepreneurial ecosystems have varied definitions yet are critical lynch pins in the success of entrepreneurial ventures. Research on long term venture development by entrepreneurs was limited, leaving the research question ready for exploration. To assist in smart city classification and organization, a cluster analysis will be used similar to the Chin (2017) dissertation that incorporates new venture and long term venture activity.

**Methodology**

A smart city comparison list will be based off of a similar cluster analysis model used by Chin (2017) to evaluate mobility in smart cities. Entrepreneurial metrics such as number of new businesses, revenues produced, number of employees, date founded and age of business will be used in the cluster analysis. The factors will be based off of the requirements for a successful entrepreneurial ecosystem model from Pool and Itallie (2013). Table 4 lists the proposed socioeconomic, environmental, population, and entrepreneurship activity factors that will be used for the cluster analysis model to evaluate the entrepreneurial ecosystem of the smart city. Data will be collected from the 2010 Census, the 2015 American Community Survey (ACS), the 2016 Esri Market Potential database, and the longitudinal data on new business ventures will be collected from Mergent. Variables include population, socioeconomic, entrepreneurship, and technological characteristics. Table 4 summarizes the data used for this study and a detailed description and analysis of individual attributes will be found in Appendix A.

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| --- | --- | --- | --- |
| Table 4. |   |   |   |
|   |  |  |  |   |
| *Data selected for analysis of smart city entrepreneurial ecosystem* |
| Type | Attribute | Source |   |   |
| P | Population Total | 2015 Census |   |
| P | Population Growth | 2010 Census, 2015 ACS |
| SE | Educational Level | 2015 Census |   |
| SE | Age, 18 - 34 years | 2010 Census  |   |
| SE | Age, 35 to 65 years | 2010 Census |   |
| SE | Age, 65 years and over | 2010 Census |   |
| E | No. of Employees at Start ups | Mergent |  |   |
| SE | No. of Adult Workers | 2015 ACS |   |
| SE | No. of High-Tech Employees | 2015 ACS, Mergent |
| SE | No. of Large Firms | Mergent |  |   |
| T  | Market Potential Index | 2016 Esri Market Potential |
| E | No. of Start-ups Created | Mergent, City Website |
| E | No. of Start-up Jobs Created | Mergent |  |   |
| E | Amount of Start-up Revenue | Mergent |  |   |
| E | Age of Start-up | Mergent |   |   |
| P Population  |
| E EntrepreneurshipSE Socioeconomic |  |  |   |
| T Technology |   |   |   |

Entrepreneurship Density will be calculated from dividing the number of employees in start-ups

by the number of adult workers, and will be included in the cluster analysis. (Pool & Itallie,

2013).

**Cluster Analysis**

Cluster analysis is an exploratory statistical method of grouping more similar objects together using cluster methods (Hill, & Lewicki, 2007). A two-step cluster analysis identifies groupings after a pre-clustering method is run using hierarchical clustering, and automatically selects the number of clusters. The structures are not known prior to running the cluster analysis. Cluster analysis is used for this research study to identify smart city entrepreneurial ecosystem strategies for like communities. The factors in Table 4 will be used to evaluate the same 35 cities listed in Table 5 identified by Chin (2017), which represents smart cities from the USDOT Smart City Challenge and the Texas Innovation Alliance, and the same cities on the list of fastest growing cities by population in the U.S. (Bernadino, 2017).

|  |  |
| --- | --- |
| Table 5. |   |
|   |   |
| *Smart city evaluation list.* |   |
| City | City |
| Austin, TX\*/\*\*/\*\*\* | Boston, MA\*\*\* |
| Columbus, OH\*/\*\*\* | Boulder, CO\*\*\* |
| Denver, CO\*/\*\*\* | Buffalo, NY\*\*\* |
| Kansas City, MO\*/\*\*\* | Charlotte, NC\*\*\* |
| Pittsburgh, PA\*/\*\*\* | Chicago, IL\*\*\* |
| Portland, OR\*/\*\*\* | Cleveland, OH\*\*\* |
| San Francisco, CA\*/\*\*\* | Detroit, MI\*\*\* |
| Arlington, TX\*\*/\*\*\* | Los Angeles, CA\*\*\* |
| Bryan, TX\*\*/\*\*\* | New Brunswick, NJ \*\*\* |
| College Station, TX\*\*/\*\*\* | New York, NY\*\*\* |
| Corpus Christi, TX\*\*/\*\*\* | Philadelphia, PA\*\*\* |
| Dallas, TX\*\*/\*\*\* | Phoenix, AZ\*\*\* |
| El Paso, TX\*\*/\*\*\* | Seattle, WA\*\*\* |
| Forth Worth, TX\*\*/\*\*\* | South Bend, IN\*\*\* |
| Houston, TX\*/\*\*\* | St. Louis, MO\*\*\* |
| San Antonio, TX\*\*/\*\*\* | Tampa, FL\*\*\* |
| Ann Arbor, MI\*\*\* | Washington, DC\*\*\* |
| Baltimore, MD\*\*\* | Total 35 |
| \* Smart City Challenge Finalist |
| \*\*Texas Innovation Alliance Partners |
| \*\*\* Fastest Growing Cities in the U.S. |

Data will be collected on population, socioeconomic, entrepreneurship, and technology for the 35 cities from pre-existing databases.

 This research is investigating smart city factors that could indicate how long term venture development can be supported in the entrepreneurial environment of smart cities. The smart city research and theory indicate that innovation and entrepreneurship are by-products of smart city technology investment. Cities need funding to support the long-term maintenance of the smart city technology investments. Long term ventures are needed to support smart city population needs for jobs and the cities’ needs for revenue.

**Proposed Methods of Analysis**

The factor analysis of the city data will be collected, factors that correlate will not be used in the cluster analysis to remove biases. Cluster groupings will be determined using Wards cluster method (Hill, & Lewicki, 2007).

This research will help cities plan and develop entrepreneurial ecosystems that support the development of long term ventures in the smart city context. The hope is the research findings will clearly determine variables through cluster analysis that have a clear impact on the success of long term ventures in smart cities. Best practices will also be researched to help build a model for future smart city initiatives that support economic development. The city cluster analysis will present city peer groups with similar entrepreneurial ecosystem needs. This will allow for strategic recommendations to be developed for each peer cluster group to maximize results.

Discussion of results including maps and figures, Findings, and Conclusion are pending.

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